making science real

MAke science Real in sCHools (MA.R.CH.)

Pilots - Final Report

Lifelong Learning Programme

With the support of the Lifelong Learning Programme of the European Union

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Lifelong Learning Programme

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Contents

Summary

This document provides a description of the organisation and implementation of pilots that have been designed and deliver as a work package of the project MARCH. The work package Leader (SciCo, P5) in close collaboration with all partners in all programme countries has organised a series of pilots aiming to spread and improve the previously identified good practices (WP3).

WP4: Pilots - Objectives

- **To develop a methodology for the pilots in schools;**
- **To implement a pilot in each country;**
- **To coach educators with the aim to ensure sustainability of the project.**

As seen below, all three objectives were successfully addressed by the pilots. This report describes the process of the pilots that lasted 13 months (M23- M35) and aims to give a comprehensive overview of the methodology, results and deliverables of the pilots implemented. Furthermore, this report includes the analysis of the feedback survey conducted in all countries before and after the pilots and the outcoming evaluation of the pilots.

This document is created from the input of all partners and aims to complement the ones produced in the previous work packages (WP2 and WP3)[1][2][3] and to provide collectively an overview of the state-of-the-art in science education in the participating countries during the phase of the project.

[1] Galev T. (2015) "The State of the Art in Science Education: Results of MA.R.CH. Empirical studies", Sofia: Bulgarian Academy of Sciences.
[2] Statauskiene L., Mazgelyte R. (2015) "Defining a good practice in STEM education within a framework of MARCH Project", Vilnius: Education Development Centre
[3] Papadimitriou, S. (2016) "MAKE SCIENCE REAL IN SCHOOLS (MA.R.CH.) WEBINARS – FINAL REPORT", Athens: Educational Radiotelevesion, Ministry of Education, Research and Religious Affairs, Greece

PART A – PILOTS REPORT

MAking science Real in sCHools – the project

MARCH is a Comenius network that brings together institutions, NGOs and educational establishments in a co-operative learning environment so as to share innovative content and best practices in Science Education for secondary schools (ages 11-16) and to highlight and promote the important contribution of science to sustainable cities. It consists of nine partners that come from seven European countries: the UK, Greece, Germany, Serbia, Lithuania, Bulgaria and Portugal.

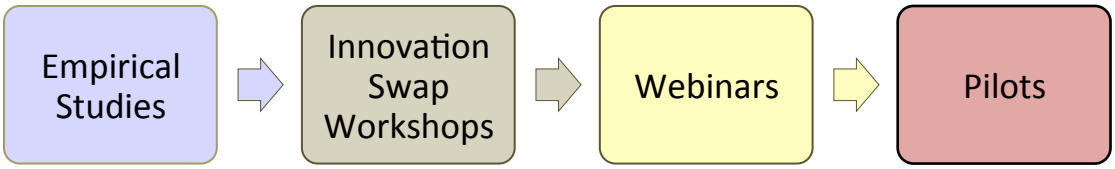
The network's key objectives are:

- **To make science teaching more attractive to the students**
- **To help young people to actively contribute to the learning process**
- **To argue in favour of the relevance of science to everyday life**
- **To promote science as a force that can build up active citizens**
- **To highlight the relationship between science skills and future employability**

Partners use a collaborative learning environment to share innovative content and best practices in Science Education for secondary schools under the theme of "Sustainable Cities".

Methodology

The pilots were based on the outcomes of the previous stages of the MARCH programme. The pilots' design was built on the Results of MARCH empirical studies, took into consideration the good practices and methodologies presented in the local and international swap innovation workshops and used the new tools and techniques developed through the webinars.



Work flow Chart

The first step of the pilots' phase was to collect based on the previous steps 21 good practices that have been successfully applied to schools in the partner countries of MARCH and beyond. These good practices were highlighted at the first two international conferences of MARCH, brought together and combined at the Swap Innovation workshops and agreed by the MARCH partners in the Berlin and Belgrade project meetings. The good practices were then put into an educational guide (toolkit) for teachers where the good practices and featured examples were categorised into six axes.

This categorisation emerged from the good practices, however it is not exclusive; some practices might fit more than one field, some others might be broader than the narrow title of the category. The toolkit presented them this way to enhance better understanding and easy navigation among the numerous examples.

After the creation of the toolkit, it was circulated among all countries in teachers and in schools and then educators were invited to attend coaching sessions to introduce the methodology developed and encourage the teaching community to apply the pilots in their schools.

Following up from the coaching sessions, the application of the pilots was ready to begin. Depending on each country's curriculum needs and school timings, teachers were encouraged to test the good practices in their own classes, incorporate them in their lessons and open up to new learning paths aiming to make science teaching more attractive and enjoyable for the students.

It was mentioned and underlined by all MARCH partners that teachers should not feel obliged to copy and paste the good practices from the toolkit to their class, but to feel free to adopt them and adjust them, making sure the practice they were applying was serving their own needs in the classroom. This flexible approach aimed to encourage the spread of the good practices, as well as the sustainability of the project, on the understanding that a practice that serves the classroom needs, is a practice the teacher will keep applying.

The adaptation and adjustment of the pilots lead successfully to creating variations and improving the practices in a different way in each country, as mentioned below (see Project Outcomes).

The steps for a teacher to participate in the MARCH pilots were simple and straightforward. In a nutshell, teachers were asked to:

1. **Get inspired by the good practices collection and identify the one(s) fitting in your classroom**
2. **Decide on the time and resources you have available and adjust accordingly**
3. **Visit MARCH website and share your plans**
4. **Apply the pilot in your classroom**
5. **Evaluate your results using before and after questionnaires**
6. **Present your work with photos/ ppt presentation/ video**
7. **Spread the word to your colleagues!**

The toolkit and the coaching sessions both involved resources like lesson plan templates, questionnaires, interesting websites and guidelines on how to present their results in the end.

The pilots took place from February 2016 until October 2016 in 143 schools in Europe.

Educational Value of Pilots

The pilots achieved most of their goals and served well the entire project's objectives, identifying and spreading good practices across all partner countries, making the educators and policy makers aware of innovative methodologies in their field, encouraging students to approach STEM in a different, out-of-the-textbook way and inspiring careers in science. Furthermore, the pilots' data were of major significance for putting together the final Recommendations document that was disseminated in ministries and high-level education officials in Europe.

MARCH methodology was very student-oriented, young people were present in all conferences and innovation swap workshops and had their say, while themes like sustainability, active citizenship and connecting science to everyday life were constantly present.

The educational goals of the pilots included:

- **Make STEM attractive to the students**
- **Engage students in projects with a strong collaborative character, working in teams and receive peer feedback**
- **Develop the confidence of the students in STEM subjects**
- **Make students aware of the wide variety of STEM careers**
- **Promote scientific thinking, reasoning, critical thinking and problem solving**
- **Connect everyday life examples and phenomena with science and technology through an interdisciplinary, cross-curricular approach**
- **Encourage the development of social, co-operative, creativity and communication skills**

In addition, the educational goals of the pilots also include skills related with the professional development of the teachers, serving the lifelong learning purpose of the programme. These goals included:

- **Encourage the teachers to search for innovative methodologies that fit their classroom needs**
- **Create a network of teachers who will share, review and apply good practices in all partner countries**
- **Provide a discussion platform among policy makers, teachers and students**
- **Promote new practices in teaching that make STEM subjects appealing to the students**
- **Promote collaboration among teachers of different expertise to achieve a holistic approach of a subject**
- **Inspire teachers to participate in science projects with the active engagement of their students**

Key Outcomes

Organising the pilots in collaboration with schools and important local stakeholders, as mentioned in detail in each country's pilots' analysis, had a positive impact for teachers and students which is obvious also from the willingness of most schools in all partner countries to continue applying the good practices and innovative methodologies they piloted through MARCH.

Quantitative facts and spread

Pilots Quantitative Goals [4]	Pilots implementation
3500 students 500 teachers 35 coaching sessions	9080 students 1395 teachers 35 coaching sessions

Pilots Spread in Europe

MAP link: https://goo.gl/KeDP8X

Qualitative facts and improvement of the good practices

[4] As stated in the initial Description of Work (proposal)

Project Qualitative Objectives	Pilots Contribution towards project objectives
Improve perception of science in secondary schools **Increase numbers of young people who chose a career in science** **Increase capacity/skills in teachers for engaging creatively with their students in scientific themes and for delivering innovative methodologies in this field** **Improve policies for effective science education**	**The wideness and the variety of the good practices implemented, as well as the positive feedback received for the pilots through evaluation forms (see page 75) are strong indicators of the positive attitudes students developed for science** **Pilots included interacting with researchers, as well as other STEM professionals in a wide range of activities. Teachers were asked to link each project and subject with potential careers and employability. The pilots helped students develop skills like communication and cooperation that are considered necessary for the 21st century human power and potential entrepreneurs.** **The pilots phase was crucial for the capacity building in teachers who had the opportunity to practically apply all the content they discussed in the local and international workshops, as well as at the webinars and the conferences. MARCH pilots supported the implementation of the innovative methodologies previously identified, partners boosted networking, gave insights and encouraged flexibility to achieve adaptation and alignment to each school's local and separate needs and in many occasions experts were called on board to assist and to advise. Teachers were give content,**

Establish of sustainable links with key European players in Science Education	resources and were encouraged to take up **ownership** of the project. While key dissemination activities like participating at the **Education World Forum** and the dissemination of the **Recommendations Paper** which was based on the **pilots' findings** were both addressed to high level policy makers, when the pilots were implemented they were involving and actively engaging stakeholders and policy makers in a lower level – almost like building a **grassroots movement** aiming to include the **new methodologies** in the **schools agendas**. For this, stakeholders like Heads of Science, Educational Councils or School Counselors were approached, invited to participate and to contribute to the pilots. This resulted in engaging effectively local policy makers and decision makers, having them as guest speakers at the coaching sessions, enriching the local MARCH network and getting support for the teachers from their local school community. A series of actions were implemented aiming to connect MARCH and its teachers' network with key European players in Science Education. Representatives of ScientiX[5] participated as speakers in the coaching sessions and pilots were presented in local and

[5] The community for science education in Europe, http://www.scientix.eu/

	international conferences like Inspiring Science, Media and Learning Conference and ESOF (Euroscience Open Forum). Teachers participating in the pilots made good use of the project's contacts and this resulted in international collaborations and co-designing future projects.

To sum up, the key outcomes of the pilots are as following:

- **Broader reach than what expected initially with the number of students being double than the one set in the initial proposal**
- **Teachers empowerment with innovative methodologies, good practices, content and resources**
- **Creation of an active network and encouraged teachers to undertake ownership of the project**
- **Placing students in the centre of the process and having their voice heard**
- **Linking science with everyday life and employability**
- **Inspire teachers to include elements in their lesson plans that makes STEM subjects practical, attractive and enjoyable while cultivating new real-life skills to their students**

Giving emphasis on listening the students' ideas and suggestions

Variations and Challenges

As mentioned in previous MARCH documents including the Interim report, initial time planning did not take into full consideration the school year and the way it is shaped around the calendar year, which resulted in pilots starting earlier or later than initially planned – a variation that did not affect their quality nor the fine tuning among partners. Each partner actively engaged the local educational community and followed their time plan. Flexibility was a key quality throughout the pilots' season and it resulted in making more pilots feasible. This was also a good variation, since in the beginning of the project it was thought that each country would implement one or two pilots, while in the proposal it was stated that each country had to implement at least one. The aftermath was that all countries realised a double-digit number of pilots, contributing to a broad variety of approaches and improvements to the original practices and also making the various methodologies spread much wider.

Different countries faced different challenges while implementing the pilots, but a common and particularly strong point was that teachers felt under-connected with their local policy makers or ministries and they while they were eager to try new ways of teaching, they were not feeling supported enough. This is a challenge noted down at the

Recommendations' Paper where it is stated that "Policy-makers at all levels need to recognise STEM teaching as a driver of innovation and professional career development". Other challenges faced in some countries were lack of equipment, lack of an existing STEM network that could be exploited by MARCH partners, lack of teachers with a science background, predefined curricula and difficulties in approaching students that were not already interested in science.

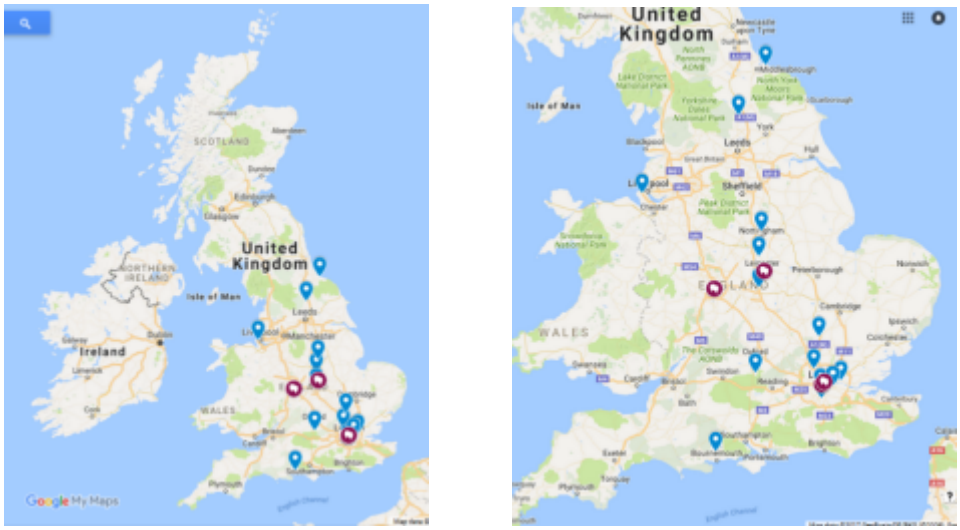
The pilots per country

In the following section all the pilots implemented by each country are going to be presented

UK

Summary

UK implemented 18 pilots in schools organised by the British Science Association (P2). The pilots were well spread across the country. 745 students and 19 teachers got actively involved and applied the pilots in their schools, adjusting the suggested good practices to fit their classroom needs. Another 119 teachers and 50 partners were involved during the coaching sessions of the pilots, while dissemination included a broad range of schools and partners' networks.



Pilots spread in the United Kingdom

Coaching Sessions

There were five (5) coaching sessions organised in the UK attended by 199 educators and 50 partners as following:

Title[6]	Date	Location	Number reached
CREST Local Coordinator Conference coaching session	18/09/2015	The Science Museum, London	20 Educators
Partners Event coaching session	24/11/2015	The Dana Centre, London	50 Partners
Association for Science Education Conference coaching session	06/01/2016	University of Birmingham, Birmingham	55 Educators
Schools Science Conference 2016 coaching session	20/04/2016	University of Westminster, London	20 Educators
Practical Action trainee teacher coaching session	15/06/2016	Leicester University, Leicester	24 PGCE trainee science teachers

Participating Schools and Pilots implemented

Rocket Science Project	
School	Ashcroft Technology Academy
Teacher	Farah Khan
Short Description	The students participated in the Rocket Science "Space seeds" Project, whereby Astronaut Tim Peake sent a batch of rocket lettuce seeds that had spent 6 months on the ISS, along with a batch of rocket lettuce seeds that had spent 6 months here on Earth, to participating schools to grow on site and compare. The identity of which batch was the actual "Space seeds" was kept

[6] In case the coaching session was part of a bigger event (Conference, meeting, symposium, etc) the name of the event will be featured in this column.

	secret until after the project was completed. The purpose of the project was to use the collaborative data from participating schools to research into Mankind's colonisation of other planets. 8 students participated in this original project which is aligned with the *Nature Inspires* practice from Germany.
Stroop Test and Does Music Enhance Performance - British Science Week Activity	
School	**Didcot Girls' School**
Teacher	**Lynn Nickerson**
Short Description	**Stroop Effect. Explained the Stroop effect. Showed examples. Gave students paper, coloured pens, access to computers, neuroscience for kids' website and BSA activity pack sheets and asked then to work in groups to design their own Stroop Effect test and try it out on their group. Lots of great creative ideas were produced. Did similar with Music and performance. Explained the concept, gave activity pack sheet, supplied some sports equipment and timers and asked students to work in groups and do their own expt to see if music affected performance. 27 students participated in this double-major pilot, which combines *ICT, Hands-On and Mixing Science with the Arts.***
The social impact of 3D printing	
School	**Haberdasher Askes School for Girls**
Teacher	**Kate Bridge**
Short Description	**The students produced a display board on the uses and problems with 3D printing and whether they should be licensed. 48 students participated in this pilot inspired by the good practice Junior Science Café from Germany.**
Fantastic plastics	
School	**Jo Richardson Community School**
Teacher	**Karolina Ochwat**
Short Description	**The students completed the 'Fantastic Plastics' activity from Practical Action, which involved students identifying plastics and exploring their chemistry. This scientific enquiry enables exploration on the impact and efficacy of reuse and recycling plastic and ends with the students designing and making of products from waste plastics of their own. 30 students participated in this pilot which combines *Hands-On and Mixing Science with the Arts.***
Ashton Island	

School	**Loughborough Grammar School**
Teacher	**Robert Saunt & Paul Jackson**
Short Description	**The students took part in the school's STEM cross curricular week. They completed the Ashton Island project which saw them looking at how to survive on a remote Island for five years without damaging the island in any way: from looking at a plethora of renewable energy sources; to the various flora and fauna which may or may not be poisonous to eat.** **A variety of STEM Ambassadors and famous guests attended throughout the week; including: Dallas Campbell, BBC Presenter; Sir Tim Hunt, Nobel Prize Winning BioChemist; Nicky Morgan; MP for Loughborough and Secretary of State for Education; Mayor and Mayoress of Charnwood; Dean of Natural Sciences from Imperial College London. During the week students were working towards a Bronze CREST Award which was awarded.** **This pilot combines *STEM Ambassadors* and *CREST Awards* (both from the UK), as well as a variation of *Field Trips in Local Ecosystems* from Portugal. 118 students participated.**
1. Wind Power Challenge **2. Water for the world** **3. Windmills**	
School	**Lutterworth College**
Teacher	**1. Helen Webb** **2. Diljit Hardy** **3. Kelly Baker**
Short Description	**1. Following a brief introduction that included two videos on wind power and a discussion on variables, students worked in teams of four to plan and build a windmill that could lift a cup of weights from the floor to their desk without them touching it. 17 students participated in this challenge that is inspired by the *Magical Village* activity from Serbia.** **2. Water for the world** **Looked at water all round the world and how we use it. Had to find a way to clean the water using materials provided Looked at water all round the world and how we use it. Had to find a way to clean the water using**

	materials provided. 29 students participated in this activity which is connected with *Hands-on activities* and S*ustainable cities -IBSE* from Portugal. **3. Windmills** **Students had one hour to design and test a windmill to lift a cup of weights from the floor to the desk. 28 students participated in this activity.**
Forensic Science – CREST Award	
School	**Oakwood Academy**
Teacher	**Stacey Wheeler**
Short Description	**Based on forensics, teachers set up a crime scene in school and the students had to solve the murder using science. This pilot was part of *CREST Awards* from the UK and all 7 students who participated achieved a Bronze CREST Award.**
Spaces for Science	
School	**Outwood Academy Ripon**
Teacher	**M. Carpenter**
Short Description	**Poster competition to educate about science in unusual places. There was a variety of subjects, including space ecology, reactions and forces. 10 students participated in this activity which is related with the *Science and Art* axis as well as *Science Day* from Greece (the exhibition part and interactions).**
1. Building a telescope 2. Stroop test – British Science Week 3. Building Pyramids	
School	**Overton Grange School**
Teacher	**1. Bryony Garley & E. Taylor 2. Christine Barry 3. Bryony Garley**
Short Description	**All students took part in a number of British Science Week activities that saw them getting *Hands-On*. The 'building a telescope' activity involved students creating a telescope that used two different types of lens to magnify distant objects, and then find out how this works. The 'stroop test' activity saw students investigating how the brain processes information and how diseases can affect this. The 'building pyramids' activity involved students working in teams of between two and four people in order to build a pyramid and test its properties.**

Design a wind turbine	
School	St Peter's Catholic Voluntary Academy
Teacher	Angela Elvin
Short Description	Students were challenged to design and build a wind turbine which was then tested and used to generate electricity. 30 students participated in this activity was inspired by Winter physics camp from Serbia.
Fantastic Plastics	
School	St Ursulas Convent School
Teacher	Kathryn Cruickshanks
Short Description	Research project involving either full investigations on making plastics, or environmental impacts of plastics or innovative future polymers. 120 students participated in this pilot where research is done similar to the *Research Placements for Students* from Portugal.
Stroop test – British Science Week Activity	
School	St. Francis' College
Teacher	Julia Glanville
Short Description	Students did the "stroop test", and then a discussion about brain scanning techniques, and the use of various tests in diagnoses. Students then produced their own hypotheses and devised their own variations of the stroop test, testing them on each other. 42 students participated in this playful *Hands-On* activity.
Electric Voice Theatre – Entomologists Anonymous	
School	Upper Ferndown School
Teacher	Sarah Dymond
Short Description	The students formed a music group that imitated the noises and voices of the insects and studied the lives and habits of a series of insects in order to create an original music show where each song narrated a true science story. 59 students participated in a pilot that is connected with *Theatre Sports* from Lithuania and *Mixing Science and the Arts*..
Teabag trouble – British Science Week Activity	
School	Upton Hall School FCJ
Teacher	Emma Seed
Short Description	The students group investigated the best material to make teabags from. They tested 4 different materials for their durability and how well the tea brewed! 4 students participated in this playful pilot which follows the *IBSE* methodology from Portugal.

Highlights

A particular highlight of the UK pilots was Upper Ferndown School who took part in the partner-led pilot with Electric Voice Theatre. In this pilot, the students started off sceptical about the activity but ended up really enjoying their experience and felt they took a lot away from the full day of activity. The best thing was that a selection of students actually came to the MARCH Final International Conference and performed at lunchtime, and their enthusiasm and enjoyment of the pilot was shared with all the Conference attendees.

Many students completed a CREST research project as part of the pilots, which saw them conducting their own projects which is less teacher-led and more student-focused, further developing their independent working skills, as well as problem-solving and communication. Some students also worked as part of larger teams.

One particular pilot at Loughborough Grammar School was a huge success! A variety of STEM Ambassadors and famous guests attended throughout the week of activities including high profile STEM celebrities, Nobel Prize winners and even MP Nicky Morgan; MP for Loughborough and Secretary of State for Education.

Exploitation

The majority of schools who took part in the pilot registered for CREST awards, which means the teacher and the students will continue to enjoy STEM enrichment outside of the MARCH project. By providing them with the means to undertake CREST, students will have the opportunity to tackle a research project of their choosing!

The best practices from the MARCH educational toolkit were integrated into a '30 inspirational ideas' booklet[7], which has been shared with 100s of teachers, through various events BSA has been involved with since their creation, such as the STEM in Ed event in Swansea (September 2016), the MARCH boat-party in London (November 2016) and at the ASE Conference in Reading (January 2017). Through sharing these booklets, the best practices from the MARCH project have been spread even broader and they are going to be used by more teachers in more projects and by many schools in their STEM enrichment activities.

[7] https://www.britishscienceassociation.org/news/crest30

Photos



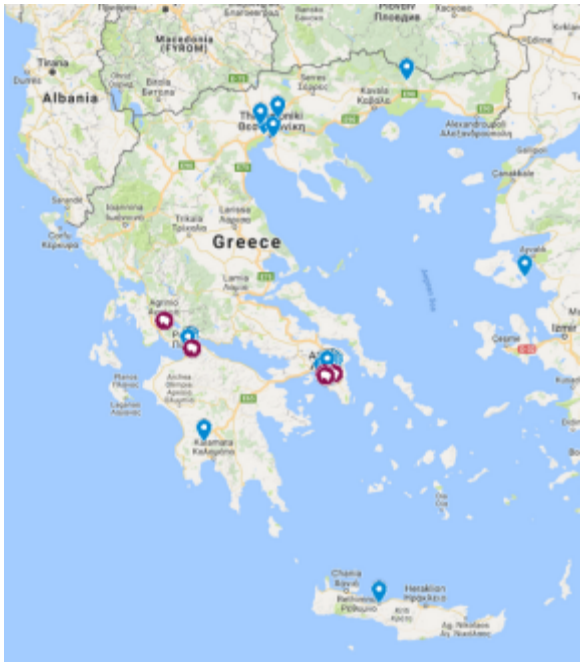




Greece

Summary

Greece implemented 28 pilots in schools organised by SciCo (P5) in collaboration with the Educational Radiotelevision Directorate of the Ministry of the Education (P9). The pilots were well spread across the geographical areas of Greece. 845 students and 29 teachers got actively involved and applied the pilots in their schools, adjusting the suggested good practices to fit their classroom needs. Another 163 teachers were involved during the coaching sessions of the pilots, while dissemination included a call to all the Greek schools through the Ministry of Education that sent a circular announcement. In addition, SciCo implemented its own pilot in collaboration with the programme "Open Schools" of the Municipality of Athens.



Pilot spread in Greece

Coaching Sessions

There were five (5) two-hour coaching sessions organised in Greece attended by 163 teachers as following:

Title	Date	Location	Number of teachers

MARCH Coaching Session	**29/02/2016**	**Patras Science Centre, Patras**	**55**
MARCH Coaching Session	**01/03/2016**	**Music School of Agrinio, Agrinio**	**23**
1st National Conference on "School Curricula and Textbooks: from the past to the future"	**05/03/2016**	**Pierce, the American College of Greece during the**	**11**
Symposium: "Cutting Edge Technologies in the educational practice"	**06/03/2016**	**Avgoulea – Linardatou Schools, Athens**	**40**
Athens Science Festival	**08/04/2016**	**Technopolis of the Municipality of Athens**	**34**

Participating Schools and Pilots implemented

Robotics in the classroom	
School	**3rd Secondary School of Rethymno**
Teacher	**Altas Evangelos**
Short Description	**Students built a moving robot in the classroom and then used it to study movement and velocity in Physics. 22 students participated. This good practice was presented in the toolkit as *Robotics* form Lithuania.**
Enriching Everyday Biology Teaching with Theatre Sports	
School	**Experimental General Senior High School of Patras**
Teacher	**Arlapanos George**
Short Description	**Competitive dramatic improvisation in the form of Theatre Sports supported the Biology teaching, offering a way to enrich the learning of general human anatomy and physiology concepts and giving to the students an opportunity to relax, play and cooperate through this way of improvisational team creative expression. This good practice was presented in the toolkit as *Theatre Sports* form Lithuania.**
Static Electricity – the Manual	
School	**Echinos Secondary School of Xanthi**
Teacher	**Epsimos George**
Short	**A small group of 12 students worked in teams of 2-3**

Description	**people, performed a series of hands-on electrostatic experiments and once they had understood how they worked, they created an audiovisual manual, aka a video. This was inspired by *School Lab* from Greece.**
Reflections and maths	
School	**Geitonas Private School**
Teacher	**Tzaris Dimitris, Lois Polykarpos**
Short Description	**These two teachers engaged their classroom in studying maths in an unusual setting: the lab! Using a set of mirrors and lasers they studied the reflective properties of conical structures. This is an activity under the general axis of hands-on activities and it was taught using *IBSE* from Portugal. 25 students participated.**
Chemistry in Everyday Life	
School	**3rd High School of Ilion**
Teacher	**Kappatos Stamatios**
Short Description	**28 students participated in the Athens Science Festival performing experiments previously studied in the classroom. They show and explain the experiment process to their classmates or students of other schools and this way they understand in greater depth themselves the theory 'behind' the experiment. Some of the popular experiments of the day: "Hot Ice", "Dancing Bubbles", "Blue Bottle", "Lemon Battery". This was inspired by the *Science Day* presented in the toolkit from Greece.**
Physics in the Playground	
School	**41st High School of Athens**
Teacher	**Kosmidis Vasileios**
Short Description	**Three different classes of students (60 in total) applied a different perception in Physics: they visited the playground to study forces, the conservation of energy, torque, movement in ramps and angular momentum. They filmed their efforts and linked it to the lesson. This is a combination of outdoor activities and creating new media, presented in the toolkit as *Physics Winter Camp* from Serbia and *Use of online, virtual and remote labs* from Bulgaria.**
Eratosthenes on stage	
School	**Arts School of Gerakas**
Teacher	**Kotarinou Panagiota, Florou Paraskevi**
Short Description	**A collaboration among the teachers of Mathematics and English, where 25 students studied the experiment**

	of Eratosthenes who measured Earth's circumference 200 years BC with a remarkable accuracy. Students performed the experiment themselves and then studied pieces in literature, poetry and literature about the subject and then created and presented their own brief theatre play in both languages. This is an application of the *Sports Theatre* from Lithuania.
Measuring heights with a sextant	
School	**Meligala Secondary School of Messini**
Teacher	**Kourakos Petros**
Short Description	**Using a sextant, students went outside in their schools' backyard but also around their local area and measured the heights of trees, houses and tall buildings in an original effort to understand the tangent acute angle of triangles. Discussion followed about modern equipment used by topographers and architects. Approximately 50 students participated in this pilot inspired by outdoor activities and learning outside the classroom and specifically *Field trips to local ecosystems*, from Portugal**
The fractions of Edmodo	
School	**3rd Secondary School of Echedoros, Thessaloniki**
Teacher	**Lalakidou Vasiliki**
Short Description	**The project was designed to propose an interdisciplinary mathematical-musicological teaching of fractions. The blended education was held on Edmodo digital environment, in the classroom and in the school's yard. It connected two different subjects of the curriculum (fractions and rythm) and also it connected science with real life (culture, history of mathematics). There was a tele-cooperation of general and special education classes gave the opportunity for the communication of all participants (20 students and 2 teachers) in and out of class. This activity was inspired by mixing science and art (distantly related with *Theatre Sports* from Lithuania in a more musical way) while also used software and *e-learning classrooms* as in Bulgaria.**
Maths and Arts	
School	**4th Secondary School of Chalandri, Athens**
Teacher	**Lamprinidis Konstantinos**
Short Description	**Using the software The *Goemeter's Sketchpad 4.07,* students studied geometry by drawing and explored symmetries in a digital environment. The project scaled**

	up and ended up as a cultural (arts) programme for the local Municipality.
Wanna bet?	
School	**26th High School of Athens**
Teacher	**Lazos Panagiotis**
Short Description	**An entire classroom is tricked… they think the experiment they are going to do is quite straightforward but Physics always has its way to surprise you… after they accept the challenge and try to understand what happened, they pass on their knowledge to the entire school and create a humorous science exhibition that travels across Athens in various science events. 32 students participated in this pilot inspired by *Science Day* from Greece and *STEM Ambassadors* from the UK**
Digital Maths	
School	**2nd High School of Ag. Athanasios**
Teacher	**Manaras Nikolaos**
Short Description	**The course management was done through the e-learning platform Gunet eClass, which is a complete Course Management System. Students with the help of digital technology were involved in a series of collaborative or individual learning activities with worksheets both in-class and online. For each chapter of the book we created digital content with theory and exercises for understanding and practicing. By using the mathematical software Geogebra potential students experimented in various geometric constructions. Online evaluation criteria at the end of each chapter gave feedback to the students to achieve the objectives. Students also created Augmented Reality posters for the Mathematical Week. 12 students participated and it was inspired by the *E-learning Platform for Secondary Education* from Bulgaria.**
Applied Chemistry : Cosmetics	
School	**Greek French School of Piraeus Jean D' Arc, High School**
Teacher	**Marinos Ioannou**
Short Description	**Students studied the dominant role of chemistry in the manufacture of cosmetics and soaps. The main focus was to identify harmful to human skin and body chemicals used by companies in the composition of cosmetics, a thorough study of their effects and composition of natural cosmetics and soap, avoiding**

	the use of these substances. Students attempted to synthesize moisturizer for the face, antiseptic, glycerin soap, olive oil soap and lip-balm. The group visited cosmetics companies and was trained in moisturizer production. In cooperation with the Association of Greek Chemists, the team took part in the Athens Science Festival to showcase its results. The group of 26 students also visited the Chemistry department of the University of Athens. This pilot combined The *Magical Village* from Serbia and *Research Placements* (Interacting with Researchers) from Portugal.
Scratch for Arduino	
School	**Experimental High School of Mytilene, University of Aegean**
Teacher	**Antonios Neiros**
Short Description	**The students are using the computer language S4A (Scratch for Arduino) in order to program an Arduino Uno. The class consisted of 16 students and the main goal is to design a circuit (with a led and a resistance), with the Arduino Uno and to program it by using the computer language S4A. This pilot was inspired by *Robotics* from Lithuania.**
STEM and the environment	
School	**6th Secondary School of Thessaloniki & 24th High School of Thessaloniki**
Teacher	**Neratzis Nikolaos**
Short Description	**This pilot combined environmental sciences with special education and ICT. It combined Inquiry Based Learning and the GRAASP digital platform to help the students create, understand the subject and have a smooth induction in STEM. Ten students participated from two different schools in Thessaloniki. Students participating were blind or vision impaired. This was a pilot inspired by *Online, visual and remote labs in Science Education* from Bulgaria.**
Flipping Classrooms	
School	**50th Primary School of Patras & 15th Secondary School of Patras**
Teacher	**Papadakis Spyridon, Makrodimos Nikolaos, Arlapanos George, Gariou Angeliki**
Short Description	**This was a pilot applied in two different schools, a Primary and a Secondary School in Patras to teach**

	Mathematics/ Geography and Biology espectively. It engaged in total 52 students. The "flipped classroom[8]" model was applied and it became evident that time management in the classroom was improved and students' involvement in the educational process was strengthened. This pilot was inspired by the good practice *Flip the Classroom* by Serbia and Germany; it was localised and improved the practice using a control group and the teachers aim to publish the results in a pedagogy journal. This pilot was supported by the local school Counsellor, Spyros Papadakis who was very active in encouraging the spread of the good practices in his region.
1. Chemistry Wonderland 2. Earth, Life and Herbs 3. Water and Cavafy	
School	**1st Arsakeio High School**
Teacher	**Patsilinakou Evdokia**
Short Description	**The teacher implemented in total three different pilots, reaching more than 90 students in her school.** **Chemistry Wonderland** **Chemistry Wonderland is a board game on the fundamental knowledge areas of Chemistry, based on questions and answers** **The objectives of this project focus on inspiring students with creativity, the development of cooperation through understanding both basic and advanced concepts in a pleasant and inventive way.** **This pilot was inspired by the *Magical Village* from Serbia and the *Science Day* from Greece.** **Earth, Life and Herbs** **Application of acid properties, bases, pH indicators and mixtures (solutions mainly) in everyday life. Cross-disciplinary program that included trips in the schools various gardens (botanical garden, flower garden, kitchen garden, and orchard). Students studied the chemistry behing growing herbs and then were asked**

[8] **The "flipped classroom" model attempts a different way of organising the educational process according to which the traditional methods of learning at school and studying at home are interchanged. The teacher's role is shifted from traditional lecture to guidance, support and individualization. Students usually learn the next lesson from home through videos, usually prepared by their teachers.**

	to plant, process and present a complete agricultural product, ready for the market. This way they applied their scientific knowledge to an everyday life topic and developing their entrepreneurial skills. This pilot was inspired by *Learning outside the classroom: field trips to local ecosystems,* from Portugal **Water and Cavafy** **The "Rain", poem by the Greek poet Cavafy becomes a classroom activity about the importance of water. The poet used the physical properties of water to describe a variety of feelings. Students studied these properties (capillarity, osmosis, surface tension, photosynthesis and its function as a transport medium of nutrients for plants) in an original *Science and Art* project.**
Personalised Learning through ICT	
School	**2nd Secondary School of Neo Psychiko, Athens**
Teacher	**Poupaki Eirini**
Short Description	**The teacher used ICT to personalise the learning process for each one of the 60 students of her classes, in collaboration with other colleagues from different disciplines. Inspired by *Learning by doing in science education using ICT* from Bulgaria.**
Drawing Geometrical Flowers	
School	**Assiros High School**
Teacher	**Sampsonoglou Panteleimon**
Short Description	**Having as a starting point the basic theory of regular polygons, 30 students studied Geometry in the computer lab, using the dynamic geometry programme GeoGebra. They designed regular polygons in the same circle and then transformed their mathematical design into an artistic flower, colouring hexagons, arcs and circles and matching their intersections. This was a combination of *Using Online, Visual and Remote Labs* from Bulgaria and *Mixing Science and Art*.**
1. WWW: Wide World Water **2. Math and Robotics**	
School	**Ralleion Secondary School of Piraeus**
Teacher	**Tourlos Ioannis**
Short Description	**The teacher implemented in two different pilots, reaching 43 students in his school.** **WWW: Wide World Water**

	An experiential approach to teaching of renewables in primary and secondary education, which includes activities and skills development of students groups, doing experiments inside and outside the classroom. Inspired by the *Physics Winter Camp* from Serbia, during the International SWAP workshop in Sofia, Bulgaria. **Math and Robotics** **How would you measure the circumference of the circle? How about by making a robot and make it walk around it using sensors? An innovative approach that combines ICT and math. Students used Lego Mindstorm to buld their robots and competed against each other for the most accurate measurement. This pilot was inspired by *Robotics* from Lithuania.**
Energy through the Ages	
School	**1st Experimental Secondary School of Athens**
Teacher	**Trampidou Georgia (teacher), Florou Eleni (researcher)**
Short Description	**A cross-curriculum activity that combines the courses of Physics and Resources Managent, students studied the effects of electricity in the modern civilization and collected through activities and experiments informations about electricity sources, their reserves and the environmental problems arising, focusing on nuclear energy and the phenomenon of radioactivity. During their work on the energy capter students visited the National Centre for Scientific Research Demokritos to discuss with researchers and have their questions answered. 26 students took part in this pilot which resembles to *Junior Science Café* from Germany and was inspired by *M.E.R.E.* the Greek hands-on good practice on Energy.**
A science day inspired from Ancient Greece	
School	**42nd Secondary School of Athens**
Teacher	**Tsoukala Eleni**
Short Description	**This is a hands-on activities pilot that used Inquiry Based Science Learning to engage students with Physics and Maths, using examples from the history of science related to Ancient Greece. At the end of the day the students performed the experiment of Eratosthenes and did stargazing. The pilot was inspired by the *Science Day* good practice from Greece.**

Open Schools: STEM	
School	132nd School of Athens
Teacher	SciCo team (Pappa Elpiniki, Anna Christodoulou)
Short Description	SciCo collaborated with the Municipality of Athens and its educational programme called "Open Schools" to implement robotics in schools in underprivileged areas during summer 2016, following up from the feedback gathered in Athens Science Festival 2015 in the local MARCH workshop that indicated that teachers are willing to explore robotics in their classroom but lack resources and expertise. The pilot was addressed to 15 students at their school during the summer break. The class was joined by 10 refugee children who lived in the surrounding area.

Highlights

The pilots in Greece are characterised by diversity in various levels: the participating students number varies in the various schools, from small pilots with specific objectives, like the blind and vision impaired students induction in STEM through ICT used at the 6th Secondary School of Thessaloniki for five (5) students to large ones, like the science day implemented at the Experimental High School of Patras with the active participation of 100 students and a much larger audience.

One of the most notable highlights of the pilots is the flipping classrooms pilot in the city of Patras. Inspired by the good practices of Serbia and Germany and having a remarkable fertile ground for growth, since the teachers involved were keen in exploring the respective literature and going one step further, flipping classrooms in Greece was used to teach biology both in the 15th Secondary School of Patras and at the 50th Primary School. Its adaptation and localisation to the needs of the Greek students, in combination with the increased performance of the students in comparison with a control group of the same target group in the same school, are leading the teachers' team (Papadakis, Gariou, Makrodimos, Arlapanos) to undertake the writing of a scientific paper in the area of Pedagogy.

On a different topic, it is remarkable how schools from rural areas took advantage of their surroundings and implemented pilots under the

Outdoor Activities axis. Two examples are quite intriguing: mathematics out of the classroom where students calculated the height of various objects in accordance with the geometry curriculum in the area of Messini, in South Greece (Peloponnese) and where students drew geometrical flowers, using the GeoGebra software in their school yard (qualifying for both ICT and Outdoor Activities) in the town of Assiros, in Northern Greece.

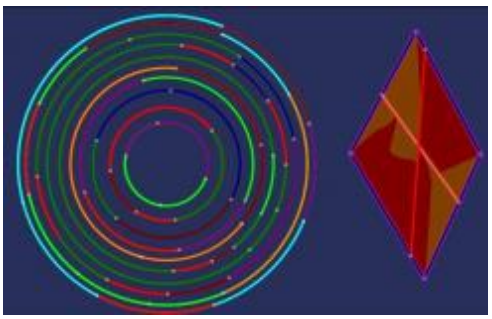
Exploitation plans:

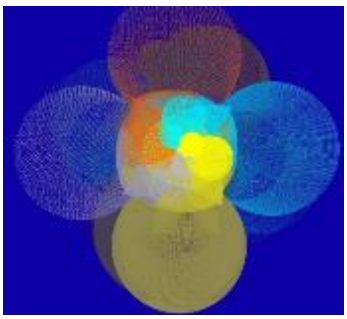
Most of the participating teachers are willing to keep up and keep implementing the MARCH good practices in their lesson plans and deliveries. In order to further empower them a networking day will be organised at the Ministry of Education, where teachers who have implemented the pilots will be invited to discuss challenges, common problems and solutions and collaboration opportunities.

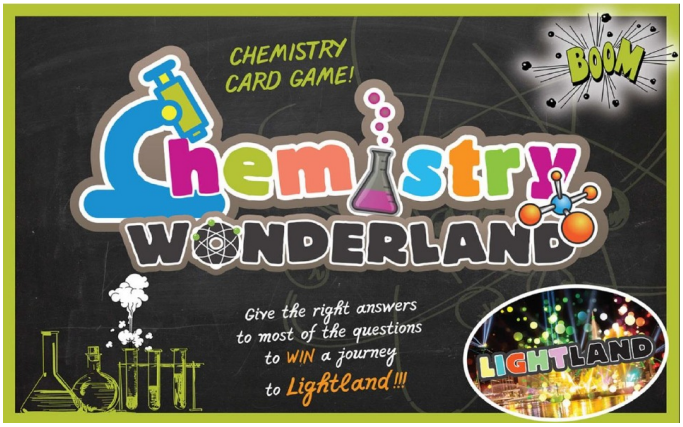
In addition, after its successful collaboration with the Municipality of Athens at the Open Schools programme, SciCo has been offered the opportunity of expanding the robotics activities to more schools for the entire school year of 2016 – 2017. It is worth mentioning that participating schools are facing problems like lack of resources and high ratios of children coming from refugee families and have found robotics to be a "common ground" for socialisation and communication among students from very different backgrounds.

Finally, a small team of highly dedicated teachers (Ioannis Tourlos from Ralleion High School, John Chiotelis from the Experimental High School of Patras, Evdokia Patsilinakou from Arsakeion Private School) have expressed their interest in creating a "MARCH network" where teachers will exchange equipment and good practices in a local level and invite each other in their schools in various events and occasions, aiming to keep their contacts, to enhance collaboration and to further develop their teaching tools and skills.

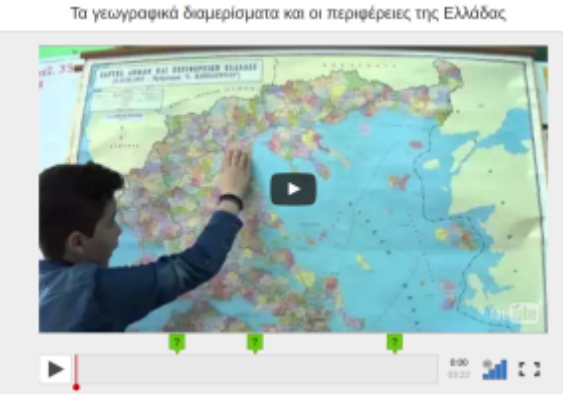
Photos






CHEMISTRY
CARD GAME!
BOOM
Chemistry
WONDERLAND
Give the right answers
to most of the questions
to WIN a journey
to Lightland !!!
LIGHTLAND


LIGHTLAND
Chemistry
WONDERLAND



Germany

Summary

Germany implemented 21 pilots in schools organised by Jungvornweg (P4). The pilots were well spread across the country. 891 students and 41 teachers got actively involved and applied the pilots in their schools, adjusting the suggested good practices to fit their classroom needs. Another 93 teachers were involved during the coaching sessions of the pilots, while dissemination included a broad range of schools and partners' networks.

Pilots spread in Germany

Coaching Sessions

There were five (5) coaching sessions organised in Germany attended by 93 teachers as following:

Title	Date	Location	Number of teachers
MARCH Coaching Session	18/05/2016	Dresden/online	27
MARCH Coaching Session	20/05/2016	Dresden/online	13
MARCH Coaching Session	23/05/2016	Dresden/online	33
MARCH Coaching Session	25/05/2016	Dresden/online	9
MARCH Coaching Session	30/05/2016	Dresden/online	11

Participating Schools and Pilots implemented

City of the future	
School	**Asam-Gymnasium München**
Teacher	**Thomas Seibold, Stefan Hoeft, Judith Martin, Gabriela Graben, Markus Hirschl, Christine Trecker, Verena Tautz, Stefan Eberstadt**
Short Description	**In this project, 52 students engaged in the question of how we will be living together in cities in the future. The students informed themselves first, then developed their own visions and models. Activities included Experiments, expeditions (for example, taking samples in the local river, testing buildings for their eco efficiency), communication with experts, building models. This pilot merged many of the proposed methodologies: Science and Art, Hands-on Activities (*Physics Winter Camp* from Serbia) and Learning outside the Classroom (*Field trip to local ecosystems* from Portugal)**
Less paper waste at our school	
School	**Grund- und Gemeinschaftsschule Schacht-Audorf**
Teacher	**Elona Gutschlag**
Short Description	**24 students worked together in this pilot. The topic the students were concerned with, was paper waste. They first learned how paper is made and how it can be recycled. They then collected waste paper at the school and produced recycled paper themselves, finding out what are important criteria for it to be usable. The recycled paper was then used in arts classes. This pilot included IBSE and field trips from Portugal, as well as activities from Hands On Activities and Mixing Science with Art.**
We are building our future city	
School	**Grundschule Treuchtlingen**
Teacher	**Julia Bieber**
Short Description	**23 students were involved in this project that combines arts with environmental science. The class built visionary future cities, using plastic waste materials. The students documented their work in texts, reflecting their thoughts on the topic and their project actions. This pilot used Hands-On methodologies as well, similar to *M.E.R.E.* from Greece and *Sustainable Cities* from Portugal.**
4sustainable	

School	**Gymnasium Brede**
Teacher	**Stefanie Reichelt**
Short Description	**21 students visited Greece and different sites there, e.g. a salt plant, debating actively with experts and each other how areas can be supplied with water in a sustainable way and whether water supply should be privatised or not. The pilot included teaching other students about their project and experience. This pilot is a merge of Junior Science Café from Germany, Science Day: Become expert for a day from Greece and Field trips to local ecosystems from Portugal.**
Sustainable Technologies: Engineering the European Town of the Future"	
School	**Gymnasium Graf-Anton-Günther-Schule**
Teacher	**Günter Bernert and Dr. Silke Schünemann**
Short Description	**19 students were concerned with the topic climate change and sustainibility. They informed themselves about the current situation, discussed their own habits, and then developed their own ideas and solutions for our daily life and our future – regionalle and globally. Activities included visiting a photovoltaic facility in Bremen, making a fictional journey to 2030, working in teams, developing visions of future houses and future transportation and presenting them, cooperating with local companies and educational institutions (e.g. the regional environment center) and learning about different occupational opportunities. This pilot merged good practices under the axes: Hands On, Interacting with Researchers and Learning Outside the classroom.**
Student Technology Academy «LüttING»	
School	**Gymnasium Kronshagen**
Teacher	**Afshin Faroki**
Short Description	**As 10 «little scientists», the students worked on their own project: builing vehicle sensors (in cooperation with a big automobile company). They worked in school but also at the University lab. Additionally to getting engaged in STEM, they learned about science career opportunities. There was a cooperation with the University of Kiel and Mercedes during this pilot which is inspired by the *Research Placements for Students* (Interacting with Researchers) from Portugal.**
"Home"	
School	**Gymnasium am Neandertal**
Teacher	**Kerstin Haußels, Silke Schaefer, Swantje Fuhrmann,**

	Herbert Griesmann, Simona Grothkast, Peter Käser, Carsten Nummert
Short Description	**The school conducted a student competition for all students of all grades (altogether approximately 400 students). The topic was «Home» and the students were supposed to compile art works on the question of how they want their home town to look and work in the future. Students from all grades were awarded. This pilot is a variation that combines *School Lab* from Greece, *CREST Awards* from the UK and *Theatre Sports* from Lithuania.**
Our Mediterranean school garden	
School	**Gymnasium Neckartenzlingen**
Teacher	**Maja Messer, Harry Filkorn, Steffen Mall**
Short Description	**During the school's project days, 8 students redecorated the school garden. Due to the climate change, they wanted to try to plant Mediterranean plants like lavender, thyme, olives, and lemons. A professional gardener helped, supplied them and explained his work. There was a collaboration with a local company for the gardening part of the activity. This pilot is inspired by *The Magical Village* from Serbia and *Field Trips* from Portugal.**
Researcher class	
School	**Hallertau-Gymnasium in Wolnzach**
Teacher	**Markus Fiederer**
Short Description	**76 students from the 5th and 6th grade worked in small groups on STEM subjects that they find interesting. E.g. they visited the student Physics lab at the University of Regensburg and worked on small research assignments there on the topics photovoltaics and solar thermal energy. This pilot was inspired by Research Placements from Portugal.**
"How do we want to live in the future?"	
School	**Käthe-Kollwitz-Oberschule Potsdam**
Teacher	**Ms. Herke**
Short Description	**17 students discussed over a series of questions. How will our planet look like in the future? How do we want to live? Those were the questions the students asked themselves. In four groups, they developed large paintings together on the following topics: 1) energy, 2) consumption, 3) transportation, 4) rain forest This was a Mixing Science and Art project where students worked together with an artist in cooperation with the**

	Potsdam Museum.
Our House – Fit for the Future	
School	**Kreisgymnasium Neuenburg**
Teacher	**Andreas Kalt**
Short Description	**Which role will our houses play in protecting the environment in the future? The 19 students who participated first learned about our climate system and how humans influence the environment. They then examined houses with respect to their climatic characteristics and construction elements. Finally, they constructed four models for sustainable building and displayed them in the city's public library. This pilot combines Hands-On Activities with Learning Outside the Classroom.**
Gentrification in Berlin's Schillerkiez	
School	**Lilienthal Gymnasium Berlin**
Teacher	**Ivar Gustavus**
Short Description	**The Schillerkiez is a Berlin district which is changing rapidly, being subjected to gentrification. 15 students explored the district, looking at buildings, public art, the use of buildings, noises, etc. They documented all of it and created a map of the area and its changes. This pilot is a variation of *Sustainable Cities* from Portugal.**
Studying the Sea	
School	**Lise Meitner Gymnasium in Willich-Anrath**
Teacher	**Jan Gohla**
Short Description	**16 The students learned all about how complex the ocean is as a habitat. How the oceans of the world developed, how ocean currents come about, etc. All students developed their own little research project and produced a project thesis. E.g. on topics like the vertical migration of plaktonic organisms, the current problem of ocean acidification, the chemistry of ocean water as buffer system, gaining energy from algea or using data bases to reconstruct the oceans' evolution on the computer. Activities included experiments, field trips and building plankton towers and hydrophones. The pilot was inspired by *Research Placement* and *Field Trips* from Portugal.**
Energiesparen ist Smart	
School	**Mannlich-Realschule Plus Zweibrücken**
Teacher	**Mr. Lösch**

Short Description	**7 students got involved in the topic smart home. They programmed a Raspberry Pi 2 for a smart home center. They developed the following applications for it among others: humidity sensor, temperature sensor, door and windows control, weather forecast, etc. Coding project followed up by participation in a student competition. The project was inspired by Robotics from Lithuania.**
Science United	
School	**Nikolaus-Christian-Sander-Schule**
Teacher	**Ms. Hoffmann, Ms. Willmer-Klumpp, Mr. Kanstinger**
Short Description	**11 students were involved in this pilot. «Experiments unite» was the motto under which the organisation Science & Technology gave six different workshops on different topics for the researcher group at the school. They were additionally joined by 12 refugee children.**
Jugend forscht	
School	**Otto-Hahn-Schule Hamburg-Jenfeld**
Teacher	**Mr. Otto, Mr. Penno and Mr. von Deyn**
Short Description	**34 students participated in this pilot where students split in teams of all ages developed their own projects with the guidance of their teachers. Works included building bones artificially, 3d printing, smartphone batteries, etc. Following up, they presented their work in the competition «Jugend forscht». 16 teams participated, 8 of them plus the teachers were awarded. E.g. works on building bones artificially, 3d printing, smartphone batteries, etc. During the pilot there were many opportunities for cooperation with universities and companies.**
Our environment, our future	
School	**Realschule im Feytal**
Teacher	**Peter Schick**
Short Description	**The students first learned about energy. They conducted experiments with a Windkoffer. They then constructed and built their own little wind power plant and a wind wheel which was showcasted in the town hall. Finally, they visited a biogas plant where the farmer explained to them how it works. This project is related with *M.E.R.E.* from Greece. 23 students participated in this pilot.**
Urban Gardening	
School	**Sophie-Scholl-Schule Berlin**
Teacher	**Leopold Kneidinger**
Short	**33 students designed their school garden and are now**

Description	**experimenting there in different fields for different subjects. They have a biotope for Biology, they bake bread there and talk about nutrition and health issues. They chose their own topics and projects. The students are writing a blog about their garden at sophieschollschulgarten.wordpress.com This activity is related with *Field Trips* from Portugal.**
MINT after eight	
School	**Theodor-Heuss-Gymnasium Waltrop**
Teacher	**Dirk Schulz**
Short Description	**The teacher has created a lecture series where he invites scientists regularily to talk about fascinating science topics in a comprehensible way to the students. The last topic, for excample, was «Fear of the week – why we are afraid of the wrong things». So far, approximately 50 students have attended the lectures. This good practice is building up on *Junior Science Café* and *Big Bang Theory* from Germany.**
Science faire on the topic "City of the future"	
School	**Ursulinenschule Fritzlar**
Teacher	**Mr. Hermann**
Short Description	**15 students organised a science fair on the topic «city of the future». They invited scientists to talk about their projects in city development. E.g. a researcher from Bangkok talked via skype about urban farming in megacities. This pilot is inspired by *Science Day* from Greece.**
City of the Future	
School	**Willy-Brandt-Gesamtschule**
Teacher	**Ms. Bardey**
Short Description	**16 students participated in this pilot. First, the students explored their city, learning about its history. Then they chose places in the city they wanted to change and built their own models of places and buildings and put together a phantasy future city. Together with an artist, they constructed video robots that could be motioned through the model city, so that the viewer can experience a walk through the city. This original pilot combines Robotics from Lithuania, Field Trips from Portugal and Virtual Labs from Bulgaria.**

Highlights

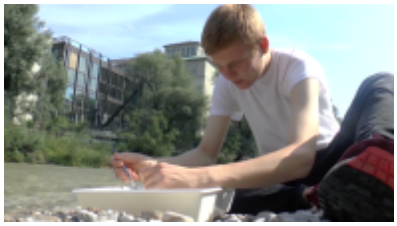
German pilots included many strong links between schools and research institutes like the University of Kiel and the University of Regensburg as well as to big companies like Mercedes. Next to thinking through questions of sustainability on a very interdisciplinary and practical level, the students got valuable insights on science career possibilities by meeting real researchers.

In addition, many projects involved debating and collecting students' ideas and presenting them to others, thus developing a sense of active citizenship in the students. Some projects had a European perspective, including an exchange with a Greek school and joined project work on the topic of sustainability. At many schools, teachers from different subjects collaborated for the projects on a cross-curricular level.

Exploitation plans

Many of the schools will continue with the projects they developed as pilots. They will also keep up and further develop the connections they have built up with out-of-school partners. Jungvornweg will be continue presenting the outcomes and key findings of the pilot stage of MARCH to teachers, educational stakeholders, and media representatives.

Photos









Mobile
Klimaschutzschule
Oldenburg
ZUKUNFT


HHUT

Serbia

Summary

Serbia implemented 21 pilots in schools organised by the Centre for Science and Art Promotion -CSAP (P8). The pilots were well spread across the country. 570 students and 29 teachers got actively involved and applied the pilots in their schools, adjusting the suggested good practices to fit their classroom needs. Another 135 teachers were involved during the coaching sessions of the pilots, while dissemination included a broad range of schools and partners' networks.

Pilots spread in Serbia

Coaching Sessions

There were five (5) coaching sessions organised in Serbia attended by 135 teachers as following:

Title	Date	Location	Number of teachers
Coaching session	25/08/2016	Cacak	30
Coaching	27/08/2016	Nis	30

session			
Coaching session	**29/08/2016**	**Kikinda**	**30**
Coaching session	**30/08/2016**	**Smederevo**	**30**
Coaching session	**31/08/2016**	**Beograd**	**15**

Participating Schools and Pilots implemented

SMALL ANATOMY	
School	**Elementary school "Vuk Karadzic", Zitkovac**
Teacher	**Danijela Stefanovic**
Short Description	**Creating a model of the body and the work of internal organs (breathing and digestion), made the presentation and renewal of learned material. This was a *hands-on* activity where 32 students participated.**
Integers, numerical lines and other parts of Universe	
School	**Upper Primary School Sveti Sava Kikinda**
Teacher	**Danilo Borovnica**
Short Description	**57 students researched the topic, drew a model of the Solar System and Milky Way, and developed an understanding of the objects contained in the Solar System and Milky Way and of the distances between objects on the Earth, Solar System and Milky Way. They used ICT to search and find additional information on different free on-line resources which leads to new knowledge about Milky Way and Solar System. Then they connected this information with their curriculum Algebra and Geometry. This activity was inspired by the use of astronomy software like in the *Light Pollution* good practice from Greece.**
What is stronger: water or air?	
School	**Primary school Mlada pokolenja Kovacica, Serbia**
Teacher	**Darina Poljak**
Short Description	**School class was held in the school yard, questioning whether the water is "stronger" than air, or how it manifests water pressure and air pressure. Students in pairs experimented with every day materials, discussed and reasoned about the hydrostatic phenomena. As an extra material, they measured the circumference of the Earth through Eratostene's experiment. 22 students**

	participated in this *hands-on* pilot.
Creating a model of traffic lights	
School	**Elementary school "J.J.Zmaj" Svilajnac**
Teacher	**Ivan Zarkov**
Short Description	**Practical application interface technology based on modeling, connecting hardware electronic work interface and application of computers. 10 students participated in this pilot combining ICT and *Robotics* from Lithuania.**
The art of thinking	
School	**Elementary school "Stefan Nemanja" Nis**
Teacher	**Dusica Markovic**
Short Description	**This is a large scale pilot inspired *by Science and Art*. 110 students participated in this pilot where they were asked to make their own artistic creations inspired by science.**
Outside the classroom	
School	**Elementary school"Goracici", Goracici**
Teacher	**Jelena Ivanovic**
Short Description	**The students were taken to the park, to observe the environment but also to use the benches, tables, chess boxes, slides and swings to reproduce phenomena from Physics and Biology. This had a stimulating effect on the development of intellectual skills through fun and games. 12 students participate in this pilot, inspired by *Field Trips* from Portugal.**
MARCH in September, with Archimedes' pickles	
School	**Elementary school "Slobodan Sekulić",Užice**
Teacher	**Jelena Radovanović**
Short Description	**The basic idea of this Physics project is acquisition of knowledge on buoyancy and its properties through research work in small groups – at school, in physics classes, but also through non-traditional homework assignments. Students were given an opportunity to go through key stages of research with a minimal help from their teacher: formulation of hypotheses, their testing through various practical activities and reaching conclusions. Besides the hands-on activities, emphasis was placed on critical consideration of information. Exchange of ideas among peers in small groups and freedom of expression of opinions and uncertainties was strongly encouraged. This project is**

	an in-house *Research Placement* following up the good practice from Portugal. 25 students took place.
The demonstrations - labs	
School	**Elementary school "J.J.Zmaj" Svilajnac**
Teacher	**Ljubinka Zarkov**
Short Description	**The demonstrations and laboratory exercises are made in the school hall and are designed for students who needed help for the subject of chemistry. 10 students participated in this *hands-on* pilot.**
Use -not pollute	
School	**Elementary school „Dragisa Lukovic Spanac"**
Teacher	**Ljiljana Pantović, Slavica Atanacković, Katica Maksimović, Slavica Vesović Vasović, Aleksandar Radišić, Snežana Jovanović, Marko Stevanović, Ljiljana Simić, Nebojša Pavlović- group work**
Short Description	***Art and Science* section, collaboration trough different subjects and science themes. 50 students participated in this pilot.**
1. Our environment 2. Air launches	
School	**Elementary school "Stefan Nemanja" Nis**
Teacher	**Marija Milovanović**
Short Description	**During the implementation process, the students have passed through all the stages of scientific research (asking questions, presenting hypotheses, the realization of experiments, discussion of the results, drawing conclusions). Realization is associated with the project *Eco Schools* and this year's theme-energy. 29 students participated in this pilot.**
Immunizations	
School	**Elementary school „Vuk Karadzić",Surcin**
Teacher	**Marina Maksic**
Short Description	**Students interactively learn about natural and artificial immunity trough conversation with scientists. About vaccine, HIV etc. 20 students participated in this pilot, inspired by *Café Scientific Junior* from Germany**
Renew your energy	
School	**Elementary school "Despot Stefan Lazarevic", Babusnica**
Teacher	**Sladjana Cvetković**
Short Description	**Learning outside the classroom, in the interesting places and from the people who are both experts in the**

	field of renewable energy sources, as well as enthusiasts and innovators in our community. Students were then presenting to their peers what they learnt. 15 students participated in this pilot, which combined *Interacting with Researchers* and *Learning Outside the Classroom*.
Our picture: plastic bags - the need or bad habits	
School	**Elementary school "Dimitrije Davidovic"**
Teacher	**Nevena Peric**
Short Description	**The main objective of the implemented activities is to enable students to make decisions on the basis of information about a particular phenomenon. The selected topic on the use of plastic bags is relevant to the students' experience and therefore their interest. Students discussed with experts, debated and then campaigned to ban plastic bags. 22 students participated in this pilot that was inspired by *Sustainable Cities* and *IBSE* from Portugal.**
CELL	
School	**Elementary school "Slavko Rodic", Backi Jarak**
Teacher	**Sladjana Marković**
Short Description	**This pilot was inspired by New technologies and *Using ICT*. Students used software to understand the structure of the cell and then tried to design a cell of their own and see if it could function. 20 students participated in this pilot.**
Mathematics and Forensics	
School	**„15.maj" Prokuplje**
Teacher	**Sladjana Trajkovic**
Short Description	**Students learned about trigonometry in forensics (determining the angle of droplets falling on a horizontal surface, areas of convergence, the distance drops to a point of convergence, the determination of the target and the source of the blood) 23 students participated in this pilot which combined *Theatre Sports* from Lithuania and *IBSE* methodologies from Portugal.**
Whole numbers?	
School	**Elementary school" Slavko Rodic" Krajisnik**
Teacher	**Slavica Beronja**
Short Description	**In class we *use ICT technology*, Edmodo, Plickers and WordPress. 13 students were divided into groups that are tasked to investigate the lowest and the highest**

	temperature in the world and in our country, to find places that are below sea level, to inquire what it means less in the bank, where there are underground garages and to debate on the changes rising sea levels will bring by role-playing.
Stomas and transpiration	
School	**XIII Belgrade Gimnasium**
Teacher	**Tatjana Milovanovic**
Short Description	**Hands –on workshops related to the transpiration of humans. 32 students participated in this pilot. (16 students were from Germany)**
Orthogonal to the plane of projection?	
School	**Elementary school "Desanka Maksimovic", Cokot**
Teacher	**Veselinka Stankovic**
Short Description	**This pilot was inspired by *Flipped classroom*, a good practice recommended both from Serbia and Germany. The teacher created videos to explain basic geometry concepts with a playful touch and then worked on exercises with her students in the classroom. 17 students participated in this pilot.**
Cell- cell membrane osmosis, facilitated diffusion, making cells from plasticine.	
School	**Elementary school" Vuk Karadžić"**
Teacher	**Vesna Milenović**
Short Description	**By performing reflected osmosis and diffusion using every dya materials for their experiments, students learnt about cell membranes (selectively permeable) and way of moving particles in the cytoplasm. 26 students participated in this *Hands-On* pilot.**
Welcome to the magical world of chemistry	
School	**Elementary school"Jovan Ducic", Beograd**
Teacher	**Jelena Mucic**
Short Description	**Students did practical work together as a group and individually and tried to combine Chemistry with other subjects, such as Physics, Maths, even Gymnastics, using different methods and ICT. The main aim was for the students to cultivate an increased interest in Chemistry and to connect it with their everyday life. 25 students participated in this pilot which combined *Hands-on* with *Using ICT*.**
Movement in space	

School	**Elementary school, Subotica**
Teacher	**Mirjana Loncarevic and Svetlana Cvijan**
Short Description	**The students embraced active learning by using true games and hands on activities during their science classes. 23 students participated in this pilot which combined *hands on* with *new media*.**

Highlights

A strong MARCH network has been formed in Serbia. The network has approximately 300 educators interconnected and aiming to develop strong collaborations. Educators are situated across several regions in Serbia. The MARCH project inspired a dialogue about a future perspective to introduce Science as a new school subject which would promote a significant change in school curriculum in Serbia.

In addition, the MARCH project has been very actively communicated to policy makers in Serbia, focusing on high level officials at the Serbian Ministry of Education, Science and Technological Development.

MARCH local workshops and trainings which were organised across the country reflected the general tendencies that Serbian educators are successful in and built in these strengths, giving more emphasis at the following axes: outdoor activities, ICT technologies and multimedia in classrooms, hands-on experimentation, and robotics.

Exploitation plans

As follow up from the project, partners from Serbia will be organising focus groups with policy makers and key stakeholders and discussing curriculum recommendations. They will share their results with other MARCH partners.

In addition, they will actively promote and distribute the recommendations paper to the Ministry of Education, Science and Technological Development of the Republic of Serbia.

They will publish a series of short papers in popular science journals (Elementi, Popular Science Serbia) promoting the good practices and participate in collaborative workshops with 13 Science centres across Serbia to promote the project methodologies.

Finally, they will try to improve mobility and career development of Serbian educators across Europe using ERASMUS+ funding building on the results of MARCH.

Photos



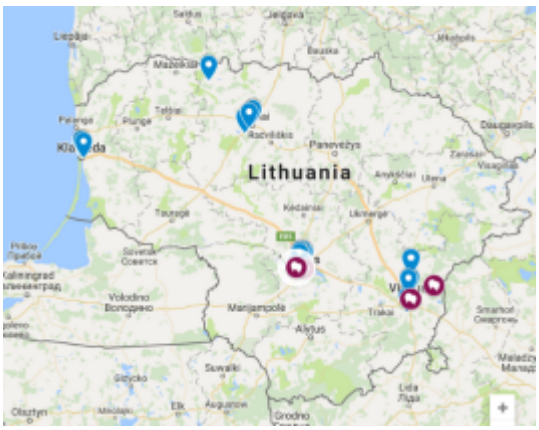




Lithuania

Summary

Lithuania implemented 19 pilots in schools organised by Education Development Centre (EDC) (P6). The pilots were well spread across the country. 2790 students and 130 teachers got actively involved and applied the pilots in their schools, adjusting the suggested good practices to fit their classroom needs. Another 138 teachers were involved during the coaching sessions of the pilots, while dissemination included a broad range of schools and partners' networks.



Pilots spread in Lithuania

Coaching Sessions

There were five (5) coaching sessions organised in Lithuania attended by 138 educators as following:

Title	Date	Location	Number of teachers
MARCH Coaching Session at STEAM network meeting	01/12/2015	Vilnius, Education Development Centre	32
MARCH Coaching Session at STEAM network meeting	02/12/2015	Kaunas, Kaunas Technology University (Faculty of Social, humanitarian sciences and arts)	32
MARCH Coaching Session at STEAM network meeting	04/02/2016	Vilnius, Vilnius Jezuitai gymnasium	30
Exhibition "Modern School 2016"[9]	22/03/2016	Kaunas, Garliava Adomas Mitkus Basic School of Kaunas District	21

[9] Co-organised with "Biuro Pasaulis", business partner

Exhibition "Modern School 2016"	**23/03/2016**	**Kaunas, Garliava Adomas Mitkus Basic School of Kaunas District**	**23**

Participating Schools and Pilots implemented

Healthy Diet	
School	**Klaipėda Simonas Dachas progymnasium**
Teacher	**(7) Virginija Birenienė, Vilma Bergelienė, Džiuljeta Lukoševičienė, Danutė Sebeckytė, Ingrida Peskovienė, Saulius Kavaliūnas, Karolis Makauskas**
Short Description	**30 students participated in this pilot which was inspired by Learning by the *Doing in science education using ICT* good practice from Bulgaria. For the whole month students investigated the influence of various food products on children health. Students used iPads to find, analyze information. Augmented reality application *Aurasma* was used to present their findings.**
Science Day	
School	**Vilnius engineering lyceum**
Teacher	**(8) Roberta Firavičiūtė, Dalius Barkauskas, Aurelija Čebelienė, Rūta Filončikienė, Vaida Garbenienė, Romualdas Kličius, Edita Lukšaitė, Mindaugas Petravičius**
Short Description	**144 students participated in this pilot which was inspired by the *Science Day* good practice from Greece. Vilnius engineering lyceum organised various sciene learning and experimentation activities for 4 days. During those days students had meetings with specialists working in science, science application, engineering fields etc. Students also worked in mixed groups to make experiments, analyze data, make various models.**
Exploring the diversity in forests	
School	**Vilnius Salininkai gymnasium**
Teacher	**(8) Renata Boguško, Agnė Povilaitienė, Petras Lozda, Vilija Vrubliauskienė, Julija Petkienė, Rita Šiaurienė, Božena Milgevičienė, Vaida Liubertienė**
Short Description	**19 students participated in this pilot, which was inspired by the *Out-of School Activities: carrying out field trips to local woodlands* good practice from**

	Portugal. Students visited Varnikai cognitive walkway and explored biodiversity of nearby forest: the soil, animals, plants. Students used various devices to measure pH, humidity, radiation and other characteristics.
STEAM Ambassadors in Kaunas Simonas Daukantas progymnasium	
School	**Kaunas Simonas Daukantas progymnasium**
Teacher	**(3) Aivaras Kunigonis, Laimutė Leonavičienė, Jolanta Žvirblienė**
Short Description	**86 students participated in this pilot which was inspired by the *STEM Ambassadors* good practice from the UK. Teachers and students held several visits to scientists workplaces to get more acquainted to their work and everyday routine.**
Science Camp "Eureka"	
School	**Šiauliai Didždvaris gymnasium**
Teacher	**(6) Virginija Savickaitė, Julija Muningienė, Irina Barabanova, Kristina Muraškienė, Egidijus Adomaitis, Aidas Bertulis**
Short Description	**73 students participated in this pilot which was inspired by the *Physics winter camp* good practice from Serbia. The camp "Eureka" lasted for 5 days. Students explored the topics of environmental protection, participated in training on research methods, designed and performed own mini-research projects, created water filter models and presented their research results to "Eureka" camp participants.**
Science Day – become an expert for a day for Meškuičiai town	
School	**Meškuičiai gymnasium of the Šiauliai Region**
Teacher	**(7) Genovaitė Liepinia, Margarita Vilkonienė, Rosita Serpauskienė, Danutė Navickienė, Erika Valuntienė, Kristina Daukšaitė, Kristina Dagienė**
Short Description	**65 students participated in this pilot, which was inspired by the *Science Day* good practice from Greece. Upper-secondary classes' students tried authentic learning in workplaces. Nearby institutions, small and family businesses were visited, where students performed tasks. The whole experience was evaluated applying six-hat method.**
Science Festival	
School	**Kaunas „Vyturys" gymnasium**
Teacher	**(7) Jolanta Leonavičienė, Aušrelė Petronytė, Irena Šidlauskienė, Jolanta Leonavičienė, Jolanta Žemaitienė, Ona Kazakevičienė, Regina Rupkutė**

Short Description	**80 students participated in this pilot, which was inspired by the *Science Day* good practice from Greece. Teachers have planned a cycle of science promotion events "Science Festival". Students have visited Vilnius Mini Maker Faire event, annual science festival "Spaceship Earth" and participated in "STEAM science day", which was organised at school. In "STEAM science day" students had an opportunity to experiment, create models and involve in other hands-on activities.**
Bionics in Robotics	
School	**Aukštelkė School of the Šiauliai Region**
Teacher	**(2) Irma Bartkevičienė, Lina Valauskienė**
Short Description	**20 students participated in this pilot, which was inspired by the *Nature inspires – Bionics* from Germany. Students were involved in LEGO robot construction and programming activities. They constructed robots, which could help people with various special needs (reduced mobility, eyesight).**
Engineering Day	
School	**Lyceum of Engineering of Kaunas University of Technology**
Teacher	**(26) Aritonė Plungienė, Inesa Rekuvienė, Algė Kilijonienė, Lina Skužinskienė, Rasa Belickienė, Rasa Brundzaitė, Loreta Paulauskienė, Nijolė Alionytė, Vygailė Vaidotienė, Roma Taučienė, Rūta Meiglienė, Loreta Raisanen, Aldona Urbonienė, Nijolė Jakubauskienė, Alma Lažauninkienė, Jolanta Vildžiūnienė, Vaida Valatkienė, Ramunė Kojelavičienė, Egita Junevičienė, Rita Benesevičienė, Rita Gusarovienė, Zenovija Bartlingienė, Robertas Andriuška, Povilas Baltutis, Rytis Koncevičius, Danguolė Zigmantaitė**
Short Description	**1121 students participated in this pilot, which was inspired by the *Science Day* good practice from Greece. Engineering day brought together students, parents, teachers, lecturers from Kaunas Technology university, business representatives and neighborhood community. Participants listened to lectures, took part in engineering workshops. What was peculiar about this event that students became experts for a day – they organised activities for younger students and shared engineering experience gained in engineering**

	internships.
The relevance of air pollution in school	
School	**Kaunas Jonas and Petras Vileisis School - Multifunctional Center**
Teacher	**(7) Vilma Milašiūnaitė, Kęstutis Alšauskas, Aušra Marija Bidvienė, Simona Bikinaitė, Evalda Čeilitkienė, Rita Gusarovienė, Vilma Plutienė**
Short Description	**96 students participated in this pilot, which was inspired by the *Learning by doing in science education using ICT* from Bulgaria. Students had an inquiry-based project about air pollution near school. They went through the whole 6 six inquiry-based learning steps from discussion and question formulation to research results presentation. Students used IT tools to analyze and present data.**
Solar Power plants	
School	**Riese Gymnasium**
Teacher	**(6) Irina Gaidamovič, Inga Saplinskienė, Alicija Bilinska, Edvardas Urbonavičius, Tomas Jakubickis, Lina Miliuvienė**
Short Description	**24 students participated in this pilot, which was inspired by the *Learning by doing in science education using ICT* from Bulgaria. Students had a project on Solar Power plants. They visited local company working in that field, developed and implemented the survey about possibilities to use Solar Power plants in Lithuania.**
Establishing recreation zones in Juodsiliai	
School	**„Silas" Gymnasium of Juodsiliai**
Teacher	**(7) Jurgita Mackevičiūtė, V. Jančiauskienė; E. Treigytė; D. Narkevičius, R. Stipinienė; H. Novicka; N. Zareckaja.**
Short Description	**20 students participated in this pilot, which was inspired by the *Junior Science Café* from Germany. Students identified a local problem – a lack of recreational zones in town. They chose to investigate it. Students consulted with local expert, developed and implemented resudents' survey, explored possibilities for recreational zones and created their projects. Projects were presented to students, teachers, parents.**
I am playing seriously	
School	**Klaipėda M. Mazvydo progymnasium**
Teacher	**(6)**

	Lina Stancelienė, Lina Butkutė, Vida Černiauskienė, Živilė Stankutė, Ramutė Bytautė, Audrius Česnelis
Short Description	**109 students participated in this pilot, which was inspired by the *Learning by doing in science education using ICT* from Bulgaria. Teachers have planned a cycle of integrated lessons and informal education activities in STEM discipline lessons, where students could apply science knowledge in other disciplined through inquiry-based activities, modeling, construction and vice versa.**
Robotics in Jonuciai	
School	**Garliava Jonuciai Progymnasium of Kaunas District**
Teacher	**7** **Jonas Petkevičius, Nijolė Steponavičiūtė, Laima Gaižutienė, Vilma Gedvilienė, Žydrė Bastienė, Aušra Urbikienė, Rasa Salemonienė**
Short Description	**300 students participated in this pilot, which was inspired by the Robotics good practice from Bulgaria. School supported their in-service teacher training about LEGO Robotics. Teachers planned programming lessons for students and integrated in teaching plans, organised informal education activities with LEGO Robotics.**
Science Day in Klaipeda "Ąžuolyno" Gymnasium	
School	**Klaipeda "Ąžuolyno" Gymnasium**
Teacher	**(3)** **Simona Balčiūnienė, Raimonda Dargevičienė, Virginija Gineikė.**
Short Description	**308 students participated in this pilot, which was inspired by the *Science Day* good practice from Greece. The gymnasium was cooperating with higher education institutions, museums, companies and other institutions. During Science Day students had an opportunity to fit into scientists' shoes, participate in experiments, and listen to lecturers. Students visited local laboratories and learned about the projects they are working on.**
Education and recreation space at school	
School	**Vilnius Lyceum**
Teacher	**(8) Jolita Milaknienė, Simas Ignatavičius, Rasa Žemaitaitienė, Virginija Barbaravičiūtė, Eugenijus Rudminas, Darius Šimkus, Irina Čibiraitė, Bronius Skūpas**

Short Description	**10 students participated in this pilot, which was inspired by the *Sustainable Cities using IBSE* from Portugal. Students participated in project-baded activity. They aimed to learn how to change school environment according to Sustainable development principles. Students identified a problem – a lack of safe and modern area in school premises and explored it. In result they developed a blueprint how of new recreational and educational area in the school yard.**
MARCH project in KMUG	
School	**Kaunas Maironis Academic Gymnasium**
Teacher	**(6)** **Daina Krilavičienė, Rita Urbonavičienė, Asta Jakutienė, Daiva Morozienė, Diana Petrauskienė, Audra Valickienė**
Short Description	**21 students participated in this pilot, which was inspired by the *Use of on-line virtual and remote labs in science education* from Lithuania. Teachers have used virtual and remote labs to teach new topics in science classes and to involve students in experiments.**
Junior Science Café	
School	**Siauliai „Romuvos" Gymnasium**
Teacher	**(3)** **Nijolė Bružaitė, Zita Savickienė, Rasa Švobaitė**
Short Description	**144 students participated in this pilot, which was inspired by the Junior Science Café from Germany. Students chose the most interesting 6 topics for them and invited experts to share their ideas and experience in that field. To assess each meeting with the expert, students used IT tools to devel surveys and analyze results. To disseminate results students developed a website and organised a forum for school community.**
Ambassadors' Visits	
School	**Akmenės gymnasium of the Akmenė Region**
Teacher	**(3)** **Laima Zdanavičienė, Rita Piežienė, Erika Sondienė**
Short Description	**120 students participated in this pilot, which was inspired by the STEM Ambassadors from the UK. Teachers aimed to motivate students in science and organised field visits to science institutions, where students could learn more about scientists' work and the interconnectedness of disciplines. Teachers cooperated with scientists from nearby universities and regional park.**

Highlights

2.790 students participated in the Lithuanian pilots along with 131 teachers – the highest number of all countries. This impressive result is reasoned by the active involvement of EDC, which is a part of the school mechanism policy-wise in Lithuania and which highlights the significance policy makers can make when engaged into a purpose.

Teachers in Lithuania, like in some cases in Germany, preferred to work in teams with colleagues.

The highlight of the pilots was implemented by Šiauliai Didždvaris gymnasium, who organised a five-day long Science camp "Eureka", where students from Šiauliai city (total 63) were involved in inquiry-based and hands-on activities. 10 students from Šiauliai Didždvaris gymnasium volunteered in activities. The camp was so successful that each weekend school organises one-day long science camps. The team is invited to perform science experiments in children birthdays.

Exploitation plans:

EDC is implementing a Project *Innovative Teacher – Motivated Student: Collaborative Problem Solving* funded by ERASMUS+ KA2. One of intellectual outcomes is an in-service teacher training programme (40 academic hours) which has a STEAM module, where EDC refers to the MARCH good practices. Shortly, information will be launched to teachers about the possibility to participate in this programme. Partner countries of the Programme include Greece, Portugal, Spain, Italy, Estonia, Latvia, Lithuania, Bulgaria Greece, Portugal, Spain, Italy, Estonia, Latvia, Lithuania and Bulgaria.

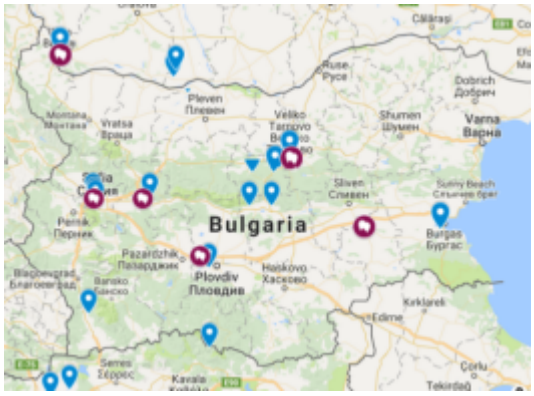
Photos


TOP SECRET
FBI
CRIME SCENE

Bulgaria

Summary

Bulgaria implemented 16 pilots in schools organised by Forum Democrit (P3). The pilots were well spread across the country. 2334 students and 224 teachers got actively involved and applied the pilots in their schools, adjusting the suggested good practices to fit their classroom needs. Another 114 teachers plus 58 teachers from Bulgaria and from 12 other countries[10] were involved during the coaching sessions of the pilots, while dissemination included a broad range of schools and partners' networks.



Pilot Spread in Bulgaria

Coaching Sessions

There were six (6) coaching sessions organised in the Bulgaria attended by 114 teachers plus 58 teachers from 12 countries.

Title	Date	Location	Number of teachers
MARCH Coaching Session	02/04/2016	Institute of Mathematics and Informatics of the Bulgarian Academy of Sciences	23
National Conference on Physics Education of the Union of	09/04/2016	City of Yambol	70

[10] UK, Bulgaria, Italy, Slovakia, Turkey, France, Slovenia, Germany, Greece, Ireland, Jordan and Georgia

Physicists			
MARCH Coaching Session	**22/04/2016**	**Prof.D-r Asen Zlatarov" Professional High school in the city of Vidin**	**12**
MARCH Coaching Session	**05/05/2016**	**Georgi Benkovski Primary School in Mirkovo**	**9**
International Express Yourself 2016 Conference[11]	**10/05/2016**	**City of Plodviv**	**58 teachers from 12 countries**
Sofia Science Festival	**12/05/2016**	**Sofia Theatre**	**15**

Participating Schools and Pilots implemented

Best young scientist - practitioner	
School	**National Military University "Vasil Levski"**
Teacher	**Nikolay Todorov Dolchinkov**
Short Description	**The pilot consisted of a competition held in two stages. In the first round 56 participants solved entertaining practical and applied physics test. The second best 12 of all specialties made themselves a practical model of an "American police siren." The winners in various categories were awarded with certificates and prizes. Students conducted experiments, collected data, established variables, discussed and presented results. 56 students participated in this pilot inspired by the *Science Day* good practice from Greece.**
Physics - yesterday, today and tomorrow	
School	**National Military University "Vasil Levski" PTG "Dr. Nicholas Vasiliadi" gr. Gabrovo School "Bacho Kiro" Pavlikem OU "Vasil Levski" - Razgrad School "St. St. Cyril and Methodius" - Gabrovo School "Emilian Stanev "Veliko Tarnovo, OUэ" St. Patriarch Evtimii "Veliko Tarnovo and other.**
Teacher	**Nikolay Todorov Dolchinkov Nikolay Todorov Dolchinkov**
Short	**The contest for posters was held in two age categories.**

[11] part of the Chain Reaction EU Project http://www.chreact.eu

Description	**Attended by 90 participants from 15 schools. The topics were wide and this allowed participants to submit their preferences in various fields. The best 40 posters exhibition was organised in Corpus University, then 20 posters were exhibited at the Regional Library "PRSlavejkov" Veliko Tarnovo. The winners in various categories were awarded with certificates and prizes. This pilot was inspired by *Science Day* from Greece.**
FISSION 2016	
School	**American College of Sofia**
Teacher	**Dr. Krasimira Chakarova**
Short Description	**150 students plus 25 teachers and 15 jury members participated in this pilot which was inspired by the Science Day good practice from Greece and then joined FISSION2016, an international Science Day, combined with an element of competition for high school students. The idea is that teams create projects in one of three types (Experiment, Working Model, OMED) and in one of five science categories (Biomedical Sciences, Computer Science and Mathematics, Ecology and Environmental Science, Physical Sciences and Engineering, Psychology). The activities included: designing of an own experiment, creating a working model, creating na OMED (Original Maquette, Explanation or Demonstration) for each category. All students also prepared a poster using ICT (related to other good practices of the MARCH project) and prepared an oral presentation, which helps them used STEM education as inspiration in their future career. Certificates and prizes from partners (including 11 tablets) were also given for the best student projects.**
1. The World of Galaxies online lesson 2. Science Day: A day of Physics 3. A day at the Observatory	
School	**First English Language High School in Sofia**
Teacher	**Galina Nencheva**
Short Description	**1. The world of Galaxies An Online lesson was designed based on the current curriculum. 70 students watched online videos about the lesson "World of Galaxies". Thus, the possibility for the good practice distant Learning using ICT from Bulgaria was tested. The videos were produced by a professional astronomer (Mrs. Nina Taneva), who is**

	doing the research for a M.Sc. Degree in teaching. **Links to "The World of Galaxies" video1:** **https://www.youtube.com/watch?v=R7UW1801aOM** **Links to "The World of Galaxies" video 2:** **https://www.youtube.com/watch?v=NAw5ym1Ppn8** **2. Science Day** **30 students were assigned to prepare a short demonstration of an experiment in Physics (related with the schoolbook content). Then they practiced how to present it. All the hand-made experiments were presented by the students in form of contest during a small exhibition. This pilot was inspired by Science Day from Greece** **3. A day at the Observatory** **This pilot was inspired by Field Trips and combined with Interacting with Researchers, both from Portugal. Students visited the Sofia Observatory of the Department of Physics and Astronomy, University of Sofia. The understanding of current astronomical instruments and the history of science and astronomy in particular is part of the scientific method. 46 students visited the Observatory students and had a guided tour and discussions with the researchers. The second part of the evening was a hands-on exercise using stellar maps, a watch and specialized books to understand how to find the four cardinal directions and how to read the night sky. The students learned about the constellations and their importance for the evolution of science.**
ASTROPARTY BAYKAL	
School	**(1) "St. Kliment Ohridski" Primary School at the village of** **Krushovene** **(2) ""Municipality Center for Extracuccilum Activities" at** **village of Baykal** **There were guests from four other schools from the region)** **including the cities of Pleven, Varna, Stara Zagora, Pravetz,** **Dolna Mitropolia, Silistra, Byala Slatina, Trastenik**

Teacher	**Nikolina Rusinova and Ivo Jokin**
Short Description	**A large and variant group of people participated in this pilot including 33 students (with 19 teachers, 3 scientists with expertise in astronomy and 4 stakeholders, including the mayor of Baykal, experts from the Regional Education Inspectorate and an Education Expert from the Municipality of the city of Dolna Mitropolia. The main topic of the party was "*Inquiry Based Learning* to non-formal education in physics and astronomy" (inspired by the namesake good practice from Portugal). When taking part in the pilot, students gain more skills both in theory itself and in making observation experiments of space. They learn how to analyse and describe such experiments.**
Visit the Astronomers!	
School	**8 High School in Sofia, Bulgaria**
Teacher	**Ginka STOIMENOVA**
Short Description	**11 students from the 8th High School in Sofia visited the Observatory of Sofia and learned more about the astronomical instruments. Students *interacted with the Researchers*, similarly with the good practice from Portugal, special presentations for the planets in the Solar System were prepared and presented and a movie about the "Cosmic Eyes of Bulgaria" took part.**
Science Fair Mirkovo 2016	
School	**Georgi Benkovski Primary School (host) There were guests from four other school (Pirdop, Zlatitsa, Chelopech, Chavdar)**
Teacher	**Yordan Hodzhev**
Short Description	**35 students participated in this pilot inspired by the *Science Day* good practice from Greece. A science fair (science day) was organised at Georgi Benkovski Primary school, Mirkovo, where students are able to demonstrate their STEM projects completed during the year. There was a competition and a jury of teachers/ scientists select the winning project in two categories (1-4 grade and 5-7 grade). A great deal of organisation of the event was provided by students.**
TECHNOFEST KAZANLAK	
School	**Professional High School "Ivan Hadjienev" - Kazanlak Students from other schools in the region also**

	participated.
Teacher	**Krasimira CHORBADJIISKA (1) and Georgi DASKALOV (2)**
Short Description	**The pilot edition of the Technofest in Kazanlak was held on the 10th of May 2016. It was designed as a Science Day, inspired by the namesake good practice fom Greece and it aimed to show that science (physics and chemistry) is a fun activity,highly desired in local and international businesses. Students from the region, scientists, inventors and representatives of the business took active part. Major partner from the business included SAP Labs Bulgaria. Other partners from local industires included Arsenal, Kaproni and Stroitelna Mehanizacia. 200 students participated in the following activities: Exhibition of specialties and possibilities for career growth, Competition for science models and experiments, Demonstrations of inventors (3D printing and Mechanincal Arm demonstration by Georgi Chipov, modelling by Milen Totev and "Dynamo" and by tricycle by Daniel Iliev), Presentations of local business partners**
Earth: Known and Unkown	
School	**Zemedelska profesionalna gimaziya "Kliment Timiriyazev"**
Teacher	**Sonya Terziyska**
Short Description	**Inter-school competition with an ecological character. The students works are in the form of an essay, multimedia, video and photo collage poster in the following subject areas: natural and social sciences; entrepreneurship; civic and health education; professional disciplines. This pilot was inspired by *School Lab*, Greece**
Is it possible for your town to be sustainable?	
School	**Private English Language Secondary School "Chelopech"**
Teacher	**Kameliya Savova**
Short Description	**The school is situated in industrial region with 3 metallurgical plants, producing and recasting gold-copper ore. Therefore, the topic of sustainable cities and environmental pollution is with great importance. The idea of the project is inspired by the MARCH**

	workshop which took place at October 2015 in Sofia. The aim of this project is students to propose a solution of an ecological problem through a different approach, to make a research and product and to present it in front of the class. The topic is: "Is it possible your town to be sustainable?" It defines 30% of the term grade. Students divided in groups produced theatrical plays, board games, experiments and a short movie. They were debating on the local issues and expressed their opinions. This pilot was inspired by *Sustainable Cities* from Portugal, *Theatre Sports* from Lithuania, *School Lab* and *Science Day* from Greece *and Learning by doing in science/ education using ICT* from Bulgaria. Links in YouTube to the created videos from the project: https://www.youtube.com/watch?v=MSJLDNUZvTM https://www.youtube.com/watch?v=fDxIUmORSq0
1. Astrobiology Uncovered 2. A Children's Academy of Sciences	
School	**"Prof.D-r Asen Zlatarov" Professional High school in the city of Vidin**
Teacher	**Dessislava TSOKOVA**
Short Description	**1. Astrobiology Uncovered 200 students plus 8 teachers participated in this pilot, inspired by the Science Café Junior from Germany. The Cafe Scientifique Junior on the topic "Astrobiology uncovered" was based on students desire to learn more about the possibility of life in space. Thus they searched online (using ICT) and found a Professor from Sofia Univeristy and author of the only modern Bulgarian book about astrobiology. They invited him in Vidin to present the current trends in astrobiology. A vivid discussion followed. After the café scientifique, all the students were asked to prepare a scientific essay on the topic of "Searching for Life in the Universe" and submit it online. 2. A Children's Academy of Sciences 1147 students plus 82 teachers participated in this pilot inspired by the *Science Day* good practice from Greece. During this month different science topics were addressed in the format of mini events/ science fairs. Students performed experiments, collaborated with**

	other schools, signed up in a MOODLE to work and coordinate online, used the social media and created videos.
Geographic Festival	
School	American College of Sofia in collaboration with Sofia University
Teacher	Dimitar Zhelev
Short Description	The activity took place in the House of Culture in the city of Kazanlak. More than 500 people attended the event, including: 160 students (aged 14-19), 90 teachers, 105 university students and more than 150 geography and Earth sciences enthusiasts. The popular lectures and events, dedicated to geography and Earth sciences, were based on the school curriculum but aimed to further ameliorate the knowledge, including element of statistics analysis (with demography as a test-case). An ICT-based competition involving preparation of a Power Point presentation was also performed. Stakeholders from local businesses, press and the Municipality were present.
LIGHT in our daily lives: photo contest and exhibition	
School	National Military University "Vasil Levski" PTG "Dr. Nicholas Vasiliadi" gr. Gabrovo, Professional School of Home Appliances Plovdiv, "St.. Evtimii ", NU" Sv. Kliment Ohridski " Kyustendil and other
Teacher	Nikolay Todorov Dolchinkov
Short Description	85 students participated in this pilot inspired by Mixing Science and Art. The photo competition had two different categories: "Light of human activity" which had 36 participants from 13 schools and "Light in nature" which had 49 participants from 18 schools. The best 40 photos were organised into an exhibition in the cultural home of the University and Regional Library "P.R.Slavejkov" Veliko Tarnovo. The winners in various categories were awarded with certificates and prizes.

Highlights

Bulgaria was the country with the second higher number of participating students. This might be due to an interesting trend observed in the country: pilots were often not implemented only by separate schools but of clusters of schools from the wider region. The teacher(s) who organised the activities invited colleagues with their

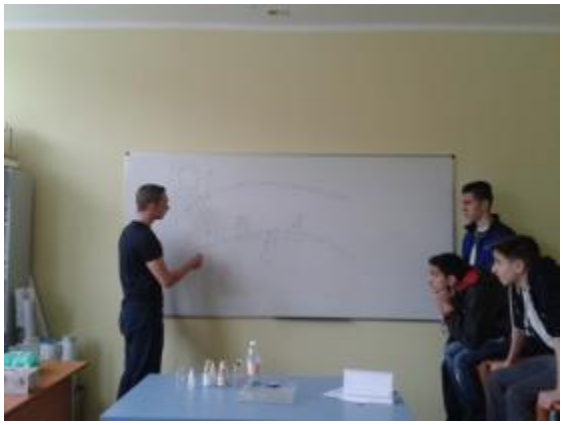
classrooms to join and used a variety of tools to keep discussions and interactions vivid, like online modules, social media, creation of videos, competitions, joint events and more. Astrophysics was the dominant subject of the Bulgarian pilots but in most cases it was uniting different subjects from various disciplines. Science days and competitions turned out to be very popular and in most of the cases either stood alone or complemented another practice, as the pilot's festive finale.

Furthermore, Bulgaria implemented the pilots in the whole country, focusing on some of the most poorly developed regions (e.g. city of Vidin, which is in the poorest region in the EU engaged the biggest number of students). Thus, the pilots encouraged people not normally interested into STEM (e.g. ethnic minorities) to pursue a career in science.

Exploitation plans:

A strong relation with the universities was also developed and strengthened, namely with the University of Sofia, the University of Plovdiv, the University in Veliko Tarnovo. All these have affirmed that they'll continue to encourage science professors to engage with teachers and vice versa thanks to MA.R.CH. The project will also be presented during The European Researchers Night 2017.

Photos

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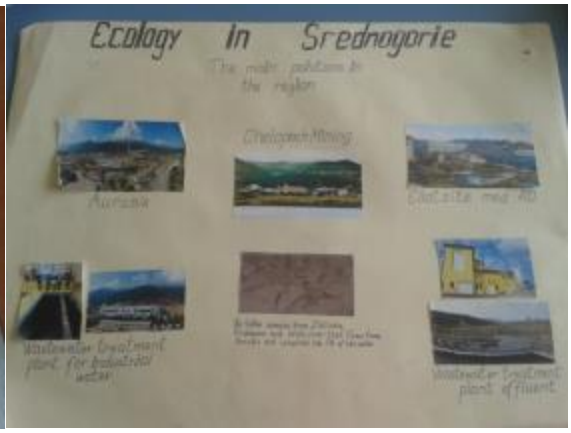
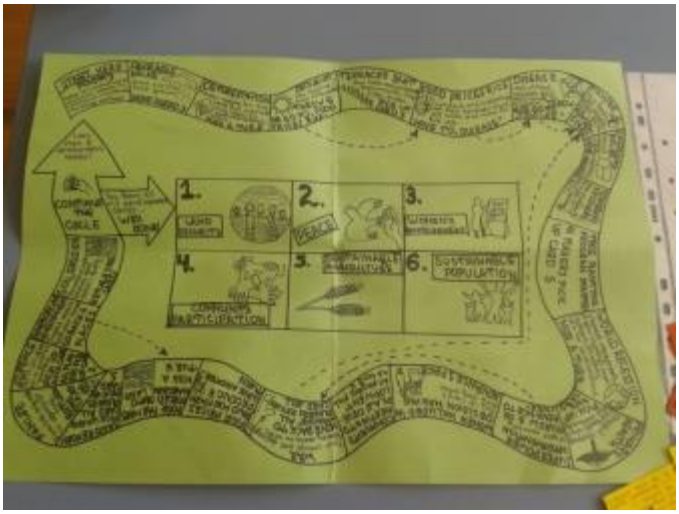

Ecology in Srednogorie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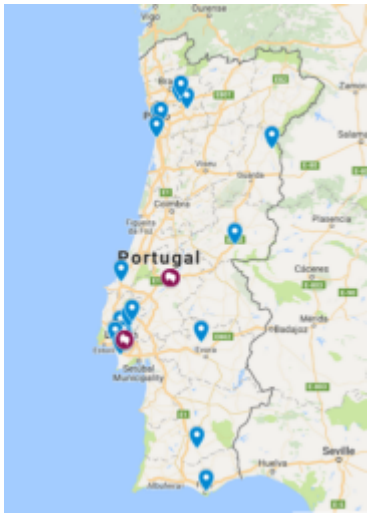
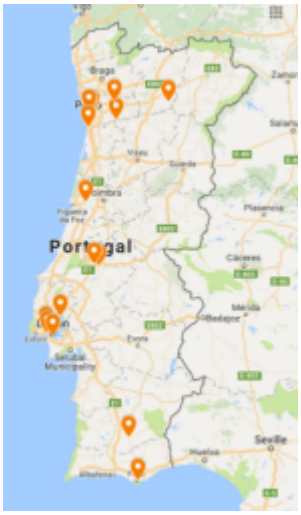
Portugal

Summary

Portugal implemented 37 pilots in schools organised by Ciencia Viva (P7). The pilots were well spread across the country. 905 students and 62 teachers got actively involved and applied the pilots in their schools, adjusting the suggested good practices to fit their classroom needs. Another 99 teachers were involved during the coaching sessions of the pilots, while dissemination included a broad range of schools and partners' networks. As mentioned in the country's highlights below, Portugal did pilots for two consecutive years, thus the categorisation in the section *Participating Schools and Pilots implemented*.



Pilots Spread in Portugal (2015-2016)



Pilots Spread in Portugal (2014–15)

Coaching Sessions

There were four (4) coaching sessions organised in Portugal attended by 99 educators as following:

Title	Date	Location	Number of teachers
MARCH Coaching Session	09/04/2016	Science Centre – Pavilion of Knowledge, Lisbon	10

MARCH Coaching Session	**06/05/2016**	**Science Centre – Pavilion of Knowledge, Lisbon**	**28**
MARCH Coaching Session	**18/07/2016**	**Science Centre – Pavilion of Knowledge, Lisbon**	**51**
MARCH Coaching Session	**10/09/2016**	**Integrated Centre in Science Education, Vila Nova da Barquinha**	**10**

Participating Schools and Pilots implemented

Pilots during the school year 2015-16 (23 pilots, 38 teachers)

Local Ecosystems' Impact on Public Health	
School	**Agrupamento de Escolas João Villaret, Loures**
Teacher	**Teresa Loureiro**
Short Description	**Under the topic From the Window of my School, several classes were invited to learn about the environment surrounding their school, a lowland area nearby the Tagus river. Learning meant watching, taking notes, asking questions as a basis to carry out subsequent research work under the IBSE methodology. Lichens as bio indicators was one of the areas covered, which involved laboratory work and the support of researchers (Lisbon university). Students presented their work in a teachers' seminar. The coordinator of this project presented it in the MARCH conference, London. Students: 90**
Air pollution	
School	**EB2,3 Dom Francisco Manuel de Melo, Amadora**
Teacher	**Helena Moita de Deus**
Short Description	**The impact of air pollution in people's health was the topic studied by a group of students in a school club. Living in a city crossed by a heavy traffic highway was the reason for the topic choice. The work plan was devised to answer initial questions set by the students. The principles of IBSE methodology were behind the whole project. The effects of car emissions (Volkswagen's fraud) were also studied by this group. The group had the support of a**

	researcher from the Lisbon university, namely in the clarification of doubts they were confronted with. A model of a city has been created and used to disseminate the results of the students' findings to be exhibited in the city's Town Hall. A student and a teacher from this school presented the project in the MARCH conference, London. 8 students | Teachers: 2 (Biology and Physics)
Air Quality: reducing car emissions	
School	Agrupamento Pedro Jacques de Magalhães
Teacher	Adelaide Ferreira
Short Description	Groups of students studied a problem affecting the local community: air pollution. Researching on the topic involved carrying out experiments carried out by the students. Finding solutions to reduce this type of pollution involved interviews with local people. The starting point for the air pollution study was a real health problem (Legionella outbreak) that occurred locally, in 2014. The students' findings were presented in a local government session. An expert in air quality from a Lisbon university gave support to the groups from this school (answered sts' questions). The project ran for two school years. Students: 60 | Teachers: 2 (Physics and Biology)
Energy – Thermal insulation	
School	Profissional de Almada
Teacher	César Marques
Short Description	Students from a professional school course were involved in a project to identify the best materials to be used in house construction to guarantee an adequate thermal insulation. Activities, organised according to the IBSE methodology, involved building house models in which tests with different materials were carried out. Two researchers from the Aveiro University and a local organisation expert offered support to this group of students. The project ran for two school years. https://docs.google.com/presentation/d/1E0HtLYAZLDQiyFcjU-PFwKnNpmINz1U2VJrJdnL1n9Q/edit?usp=sharing Students: 13 + 15 in two school years, TOTAL: 28
Urban Solid Waste Treatment | Food Waste	
School	Casa Pia de Lisboa - CED Nossa Senhora da Conceição
Teacher	Ana Mira
Short Description	In order to learn about food waste, this group of students calculated the amount of food waste in the school canteen and in local restaurants. A collaborative work with a local

	organisation that distributes food to people in need was also included in this group's activity. The groups' findings were presented in data charts built in the mathematics lessons. A visit to a local waste treatment station helped these students to learn about another topic: waste treatment. Blog: http://cidadesustentaveis16.blogspot.pt/ N.º of students: 56
River Pollution | Water Quality (wells)	
School	**Agrupamento de escolas de Infias, Vizela, Braga**
Teacher	**Elisa Maria Cardoso Saraiva**
Short Description	**Four groups of students carried out research on water pollution. One of the groups focused on the dangers of drinking water from local wells in the rural community the school is located. A blog has been created to disseminate the students' activities: https://vizelacidadesustentavel.blogspot.pt/ Students: 20 | Teachers: 3**
Environmental recovery of a local beach (Praia Barra-a-Barra)	
School	**Álvaro Velho, Barreiro**
Teacher	**Helena Cristina Pires**
Short Description	**The destruction of the local environment was the starting point for a group of students to put forward proposals to recover the area. Their activities were integrated in a previous school project supported by a national environmental organisation. Along their research, students have worked with the support of local stakeholders, namely the local municipality and a museum curator. Activities involved learning about the local environment, doing laboratory work (water and soil analysis), field work and actions for the local community. The outcomes of this work are published on an e-book. Students have organised a seminar for the school and local community to present their project findings. A local newspaper has published an article about the event. Video (site) : http://alvarovelho.net/cefjard/?p=2850 Students: 17 | Teachers: 3 (Biology, Art and English)**
Tabacco - Air Quality	
School	**Antero de Quental, Azores islands**
Teacher	**José Rebuge**
Short Description	**Tobacco's harmful effects was the topic chosen by these students for their project. Interaction with the national cancer association has offered them the opportunity to learn**

	about real cases. The production of large 3D images to be exhibited in the school entrance and garden was the outcome of the students' work. 20 students (2015-2016 and 2016-2017 school years).
Reducing "Heat Islands" in Urban Areas	
School	Escola Básica Augusto Gil, Porto
Teacher	Manuela Lopes
Short Description	How to reduce the heat in our cities was the problem students in a science club have been invited to find solutions for. This challenge has created the conditions for students to learn biology concepts and ideas aboutf urban planning. Communicating the knowledge acquired has been done through models built in the Art lessons. The models show the planning of a city as well as houses with a focus on green roofs. These activities helped students learn and value natural resources and ecosystems services. During the research and practical work, these young students have been helped by an architect. The project ran for two school years. Students: 6 | Teachers: 2 (Biology and Art)
Energy Production| Biofuels	
School	Agrupamento de Escolas de Almodôvar
Teacher	Raquel Forca
Short Description	"Is it possible to produce biodiesel from used kitchen oil?" was the answer students from this school trying to answer. This involved experiments carried out in the school laboratory. Their findings have been published in a video (www.youtube.com/watch?v=cJGxsxVvXRg). This project entered a national competition and has won it! Students: 57 | Teachers: 4 (Physics, History, Biology)
Is dogs' poo harmful for public health?	
School	Escola Secundária de Camilo Castelo Branco, Carnaxide
Teacher	Cláudia Duarte dos Santos
Short Description	"Is dogs' poo harmful for public health?" This was the question a group of students in a school club tried to answer by analyzing samples in laboratory. A campaign has been organised aimed at changing people's habits. Stickers have been designed and produced by the students. Details about the campaign on a facebook page created by this group (www.facebook.com/A-Poia-872542152865928/?fref=ts). Students: 8
Energy Performance of Buildings	
School	Agrupamento Amato Lusitano, Castelo Branco

Teacher	**Cacilda Basto**
Short Description	**In the geography lessons, a class has carried out a research on the city buildings' sustainability in terms of energy consumption and thermal comfort. The school building was chosen as their case study. Carrying out interviews to the school users and reading about the topic allowed the students to come to a set of recommendations. The students have produced a video and two posters to dissemination their findings. Video: https://player.vimeo.com/video/169275971 Students: 23**
Eco-efficient School | Waste Reuse	
School	**Básica e Secundária de Airães, Felgueiras, Porto**
Teacher	**Ana Margarida Gonçalves**
Short Description	**A group of students have decided to find out how to save energy in their school. This involved studying the patterns of their school's energy (electricity and gas) and water consumption for a two year period and communicating their findings through graphs. After having carried out studied the problem in different subjects on how to reduce water and energy consumption, the students published a set of recommendations for the general public. Teachers: Mathematics, Art, Geography, Physics, Natural Science, Geology, Religion. Blog: http://pceairaes.blogspot.pt/search/label/Projeto%20A%20-%20Cidades%20Sustent%C3%A1veis Students: 20**
Coastal Erosion	
School	**João de Deus, Faro**
Teacher	**Anabella Vaz**
Short Description	**A group of students (12th form) started wondering about the disappearance of a beach in a coastal area in the south of Portugal. This was the starting point for their work. A researcher from the Algarve university guided this group's visit to the location and provided documentation to support the students' initial hypothesis and follow-up research. Their study included interviews to local people to collect their memories about the beach. The findings of this study were presented in a conference of geography teachers. 4 students (club).**
Hydroponics, a sustainable solution	
School	**Agrupamento Manuel Gomes de Almeida, Espinho**
Teacher	**Alberto Caeiro**

Short Description	**Hydroponics and vermicomposting are topics that have been studied by groups of students in their biology lessons. Several experiments have been devised and carried out by these students in order to come to conclusions about the advantages of these techniques. This group plans to make a poster to be presented in a science conference that will take place in Lisbon next July, thus disseminating their work to a larger audience. The project ran for two school years. Students: 48**
A Sustainable Neighbourhood	
School	**Casa Pia de Lisboa - CED Nossa Senhora da Conceição**
Teacher	**Marta Matos**
Short Description	**Students from two classes have studied the changes needed to be introduced in a neighborhood in order to make it sustainable. Models have been created as a way to express these students' plans. Students: 60**
Energy Production / Photovoltaic panels	
School	**Agrupamento de Escolas do Cerco, Porto**
Teacher	**Isabel Pelicano**
Short Description	**A class of secondary education students transformed a classroom in a sustainable energy laboratory, with modules focused on the production, transport and storage of energy and the technology related to its practical applications in industry, agriculture and commerce. In order to plan the modules, the students had to learn the concepts related to the topic. The support of a researcher from the Porto university was of great help. Sessions supported by posters created by the students were prepared for younger students from local schools. This project was integrated in the MARCH project, but also in another project which provided most of the financial support. 22 students.**
The City Biodiversity Hotspots	
School	**Escola Secundária Martins Sarmento, Guimarães**
Teacher	**Miguel Viana**
Short Description	**Calculating the percentage of invasive plants in a nearby urban park that might hinder this biodiversity hotspot was the task of a group of students from this school. Taking part in sessions offered by an environmental institution and learning to use guide books were part of the preparation for the field visits to the . Within a partnership established with the municipality, support from an expert has been offered to the group.**

	Students: 27 (more directly involved: 11)
No cigarette butts at our doorsteps!	
School	**Escola Professor José Augusto Lucas, Linda-a-Velha**
Teacher	**Ana Pinto**
Short Description	**A group of students studied the effects of the cigarette butts in local rivers. Experiments in the laboratory helped them to come to conclusions about the harmful contained in the butts. The students carried out interviews and organised a campaign aimed at changing people's habits both in the local and school communities. Ashtrays built by the students and a video were part of this campaign. The project ran for two school years. Video: https://vimeo.com/195312854 Students: 8**
Environment | Noise Pollution	
School	**Escola Dr. Manuel Gomes de Almeida, Espinho**
Teacher	**Rui Polónia**
Short Description	**Evaluating the impact on one's health of sound levels in a school environment is the aim of this project. Based on the data obtained from an initial study, proposals for improvements to be introduced in the school will be implemented and monitored. As this study needs information from different subject, Science, Physics and Mathematics teachers are involved in it. Partnerships have been established with the Physics Dpt, Aveiro University; the Porto Polytechnic Institute and the Health and Technology Institute (Porto) as the support of experts from different areas is essential for this project. Activities are still running. Students: 60 | Teachers: 3**
Noise Pollution	
School	**Agrupamento Pedro Jacques de Magalhães**
Teacher	**Iolanda Farias**
Short Description	**Noise Pollution The topic chosen by a group of students from this school had to do with the fact that the school is located in a city with heavy traffic (train, highway, road). After having planned their research in an initial brainstorm, students recorded and measured noise in different city areas in order to identify the most heavily polluted. Research activities involved, among others, testing materials to for their insulation characteristics and checking if some were used is sound barriers in the city. The project ran for two years. Students: 28 (4 students leading) | Teachers: 2 (Physics and Biology)**

Sustainable Mobility	
School	Escola Manuel Ferreira Patrício, Évora
Teacher	Isabel Afonso
Short Description	During Science Day, a group of students built models to express their ideas of what a sustainable house should be like. The most creative models have been included in an exhibition open to the local community. Students: 25
Starting a Vegetable Garden	
School	Alves Redol, Vila Franca de Xira
Teacher	Leonor Rocha
Short Description	Students from four classes (special needs) set the task to identify the best spot in the school playground to start a vegetable garden. Therefore, they collected soil samples from different spots and to be analyzed in the school laboratory in the Chemistry lessons. Students: 40 | Teachers: 2
Sustainable Buildings | Sustainable Mobility	
School	Raul Proença, Caldas da Rainha
Teacher	Carlos Alberto Teixeira Pires
Short Description	Planning a sustainable youth hostel was the challenge a group of pre university students has devoted to. The main focus was on solutions that make use of renewable energy and involve recycling materials. The plan that devised by the students was presented to the local community. As an add-on, one of the groups managed to build a game machine by using parts of obsolete computers. Students: 30 | Teachers: 3

Pilots during the school year 2014-15 (14 pilots, 24 teachers)

Energy Conservation (housing)	
School	Cerco, Porto
Teacher	Alexandra Vaz and Isabel Pelicano
Short Description	After having identified people's bad habits in what concerns energy saving, through interviews answered by the school populations, students from two classes created a video to work as a campaign to change the situation. The video can be seen on: www.youtube.com/watch?v=NUz3A24N6AU&feature=you

	tu.be Students: 40 | Teachers: 2
Air Pollution	
School	Francisco Manuel de Melo, Amadora
Teacher	Helena Moita de Deus
Short Description	Same as above (the project ran for two school years)
Noise Pollution	
School	Entroncamento
Teacher	Marta Azevedo
Short Description	A busy train station located in their city center made the students aware of a problem: noise pollution. They considered this deserved to be studied. Identifying the noisiest sites in the city was the first task. They collected data through interviews to the locals. And their findings were the following: the areas around the railway station the noisiest. The students identified a reason that worsened the problem: there were no barriers separating the rails from the street. Therefore, they managed to arrange a meeting with the environmental department of the local council to discuss the problem and to present solutions that could minimize the problem. Students have shown examples implemented in other countries and described the best materials to be used in the barriers. Students: 22
Coastal erosion | Accessibility | Noise Pollution | Water Quality	
School	João de Deus School, Faro
Teacher	Anabella Vaz.
Short Description	The groups of students in the previous school year identified several problems in their city for which they have found solutions that were presented to the local government. The results of this study have been presented by the students in a MARCH session in Lisbon. 40 students.
Waste Management (cigarette butts)	
School	José Augusto Lucas, Linda-a-Velha, Lisbon
Teacher	Ana Maria Ferreira Pinto
Short Description	Same as above (the project ran for two school years)
Biodiversity and Natural Resources	

School	**EB 1,2,3/PE do Porto da Cruz, Machico, Madeira.**
Teacher	**Marisol Andrade and Rita Vieira**
Short Description	**A group of students from this school have set the task to start a project focused on the reforestation of areas in the Island that had been recently devastated by fires and avalanches. The main problem identified by these students was the loss of endemic species from this island (Laurissilva forest). The group had the support of a researcher from the Madeira University, Domingos Henrique, in the identification of the species. The outcomes of the project can be seen on the blog the group has created: http://reflorestarportodacruzblogue.blogspot.pt/ Students: 20 | Teachers: 2**
Sustainable Architecture (green roofs)	
School	**Básica Augusto Gil, Porto**
Teacher	**Manuela Lopes**
Short Description	**Same as above (the project ran for two school years)**
Quality of Water (wells) | Surplus in Agricultural Production	
School	**Almodôvar**
Teacher	**Fátima Castelo, Raquel Forca and Sylvie de Sousa**
Short Description	**These two topics chosen by students from this school located in a rural area have to do with problems faced by the community. Dehydrating fruit to prevent wasting agricultural products was a solution put forward by students and which has led them to build a gadget and carry out tests. Testing the water from local wells was another activity students got involved in, as they suspected it was not good human consumption. The activities have been presented to the community, thus serving as awareness sessions. Students: 100 | Teachers: 4 (Biology and Physics)**
Walkability – Sustainable Mobility in a City	
School	**Luso-Francês, Porto**
Teacher	**Rita Gabriela Rocha**
Short Description	**Coming to conclusions about the "pedestrian quality" in a city (Porto) was the aim of this project focused on sustainable mobility. In order to study the problem different groups analysed the quality of streets in the city centre (qualitative data); transformed this data in quantitative data. Using the data to show the findings (good and bad spots in streets) on a city map was the next**

	step of this study. Putting forward proposals for improving the situation in these streets was the final step of this study. The project had been running in this school for several years before the teacher joined the MARCH project. It has been presented in several seminars. Students: 20
Impact of a Landfill Site on Water and Air Quality	
School	Nogueira , Lousada, Porto.
Teacher	Miguel Viana and Suzana Costa
Short Description	The impact of a landfill site in the quality of the air and water was the problem studied by a group of students from this school located in the north of Portugal. Field visits to a local woodland to make observations and come to conclusions was one of the activities. This group of students was supported by teachers from different subject areas in the different phases of the study. Further information on the blog created by the students: http://controlaroambiente.blogspot.pt/ Students: 5 | Teachers: 2
Biodiversity | Natural Resources	
School	Afonso Duarte, Profissional School, Montemor-o-Velho
Teacher	Florbela Leite and Sara Travassos
Short Description	A group of students from this professional school (agriculture) collaborated with the municipality in the creation of a touristic leaflet with information about the local environmental resources. The students started by doing field visits to identify the sites of interest to be included in the leaflet. Learning about the sites (fauna, flora, geology) was the step which followed. Creating contents was the outcome of this project. Students: 20 | Teachers: 2
Mobility | Air Quality (health issues) | Noise Pollution |	
School	Pedro Jacques de Magalhães, Alverca do Ribatejo.
Teacher	Adelaide Ferreira, Ana Cristina Vaz, Iolanda Farias
Short Description	Same as above (the project ran for two school years)
Enviroment| Noise Pollution	
School	Dr. Manuel Gomes de Almeida, Espinho
Teacher	Rui Polónia, Alberto Caeiro, Fátima Castro, Helena Franco
Short Description	Same as above (the project ran for two school years)

Thermal Insulation (housing)	
School	Almada Profissional School
Teacher	César Marques
Short Description	Same as above (the project ran for two school years)

Highlights

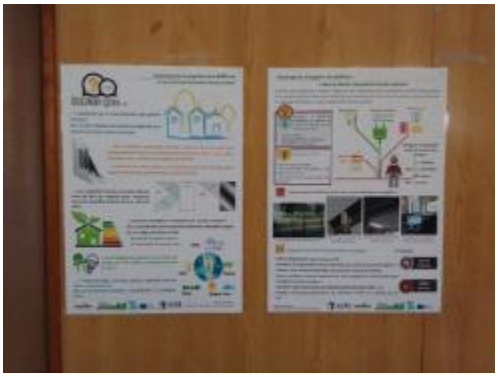
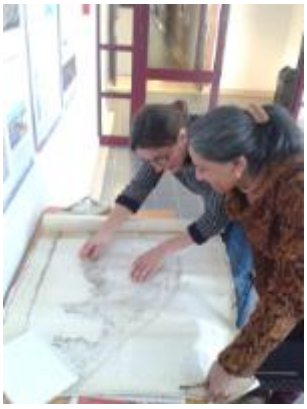
Portugal's unique characteristic was the implementation of pilots for two years instead of one. This happened due to the eagerness of the Portuguese teachers not to miss the school year 2014 – 2015 and also due to the fact that the local innovation swap workshop (WP2) was planned early in Portugal. Having a two year pilots "experiment" helped teachers to develop the activities they carried out at their own rhythm and adequate to their group of students. In addition, the longer term involvement of the schools and the teachers created a lasting and deep impact and helped teachers learn from the first years' experiences and improve the practices, as mentioned in the 3rd MARCH Conference in the Hands-On breakout session.

Exploitation plans:

Several schools continue applying the good practices they tested through the pilots for a third year in a row (2016-17). More information about them will be soon available here: http://www.cienciaviva.pt/march/index.asp?accao=changelang&lang=en

Photos



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PART B: EVALUATION

"The attitude and the impression of students and teachers before and after the piloting into their schools"

Marilena Maragkou, ERDIC LAB, University of Piraeus

Introduction of the analysis

This part constitutes a comprehensive report on results and conclusions from implementation of pilots in all project countries. The current report presents the main findings from the evaluation questionnaires distributed to teachers and students.

This report provides a comprehensive overview of the state-of-play in science education in the EU during this last phase of the project.

The outcomes of this analysis ensure the level of success of the pilot phase and represent the main feedback of the two target groups (teachers and students) regarding the piloting phase which took place in the framework of the project.

The questionnaires composed the main tool so as to ensure the external evaluation of the pilot phase which were circulated in local and international events so as to receive feedback directly from the target groups.

The pilots that were implemented in schools of all partner countries aimed to provide an overview of Science Education in secondary schools through scoping and comparative analysis and promote the development of needs analysis. Furthermore piloting aimed to promote the implementation of innovative methodologies, insights and best practices in science education that allow dynamic interaction between teachers, young people, researchers and other experts in science education and science communication .

Piloting aimed to fulfill the initials goals set according to the proposal:

- **Improve perception of science in secondary schools**
- **Increase numbers of young people who chose a career in science**
- **Increase capacity/skills in teachers for engaging creatively with their students in scientific themes and for delivering innovative methodologies in this field**
- **Improve policies for effective science education**
- **Establish of sustainable links with key European players in Science Education**

Description of the study

The analysis is based on quantitative research, including evaluation questionnaires distributed to teachers and students from the seven participating countries. Each participant had to fulfill one evaluation questionnaire before the pilot and one after the pilot phase. This strategy aimed to check and evaluate the level to which the opinion the participants changed. More specifically, it aimed to compare their opinion, and attitude before participating in the pilot and their opinion and attitude after the pilot taking place within their school. The fieldwork was conducted in the period September – October 2016 and the results are presented in the table below[12].

	SURVEY BEFORE PILOTING	
	Teachers (no of responses)	**Students (no of responses)**
Bulgaria	10	69
Germany	21	26
UK	22	85
Greece	10	51
Lithuania	108	1266
Portugal	0	0
Serbia	38	385
TOTAL	209	1822

Table 1: Number of Teachers and Students participated in the survey before the pilot phase

	SURVEY AFTER PILOTING	
	Teachers (no of responses)	**Students (no of responses)**
Bulgaria	6	72
Germany	21	26
UK	14	76
Greece	10	51

[12] **The zero answers in PT "Before" questionnaires is due to the fact that the Pilots in Portuguese schools started early in the project. Portugal applied two rounds of pilots starting from September 2015, with most of the schools participating in both which would have made answering the "Before" questionnaires in October 2016 biased.**

Lithuania	122	762
Portugal	53	122
Serbia	35	283
TOTAL	261	1392

Table 2: Number of Teachers and Students participated in the survey after the pilot phase

Teachers' and Students' attitude on Science

Students' attitude on Science and their feelings before the pilot phase

The distribution of students in the sample varies across the countries; fields of education, location of the school, age In most of the countries students fulfilled the evaluation questionnaires before and after the pilot phase, except for Portugal where answers from before the pilot phase are missing from the surveys of students. As someone can notice in the following tables most answers of students were from Lithuania and the less one from Greece and Germany and in the majority female students (See Appendix E, Table 3, and Table 4). The following tables represent the attitude of students about science, their thoughts and feelings about the field of science.

A significant percentage of 71% of students are interested in science and only 3% of them are not interested at all. This percentage shows that students are not only interested in this field but they are willing to learn more about this. Moreover they believe that science will help them with their career in the future and it is really important for them to get high grades in science. They firmly believe that what they learn in science is often practically useful for them and they feel confident during science classes.

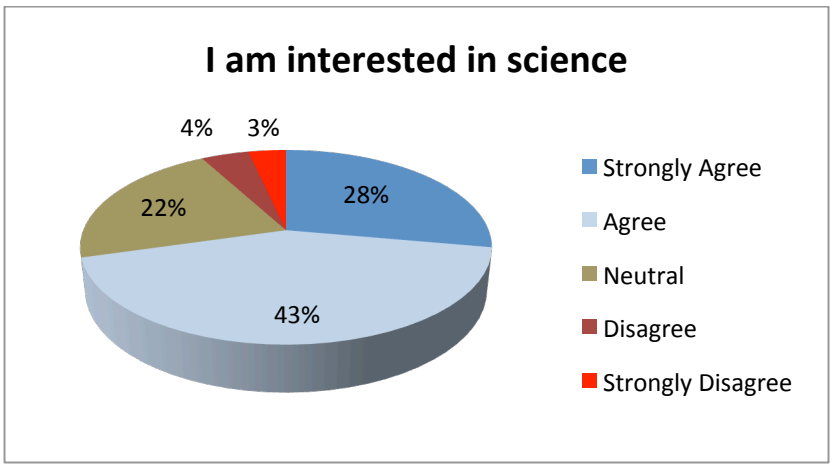
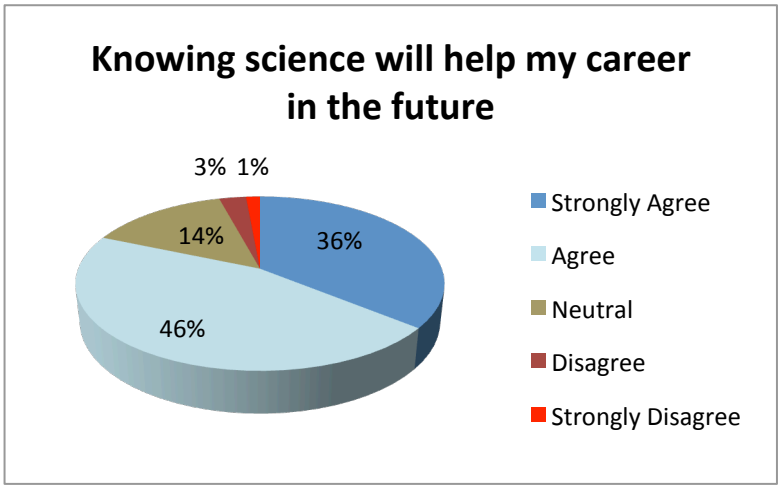


Table 5



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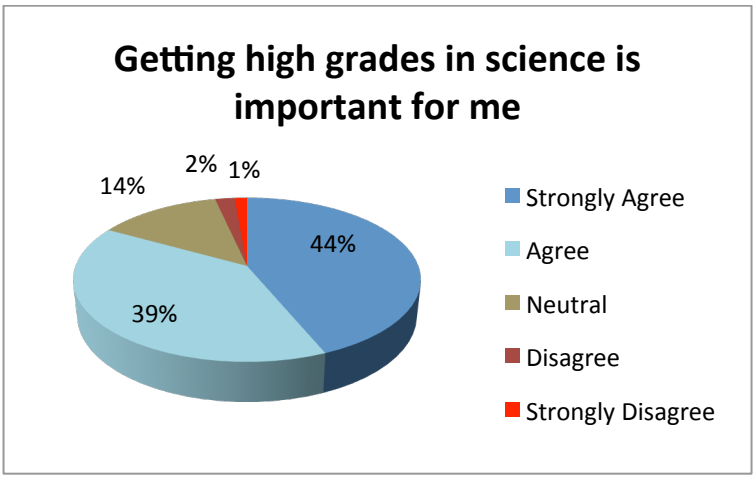

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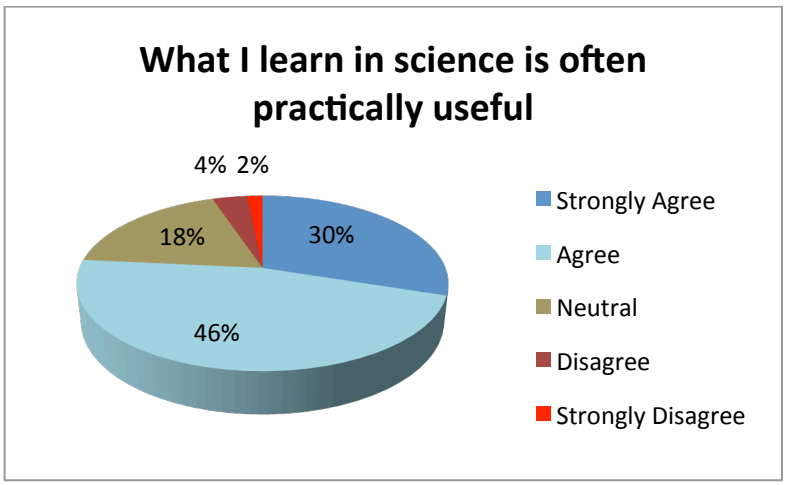


Table 8

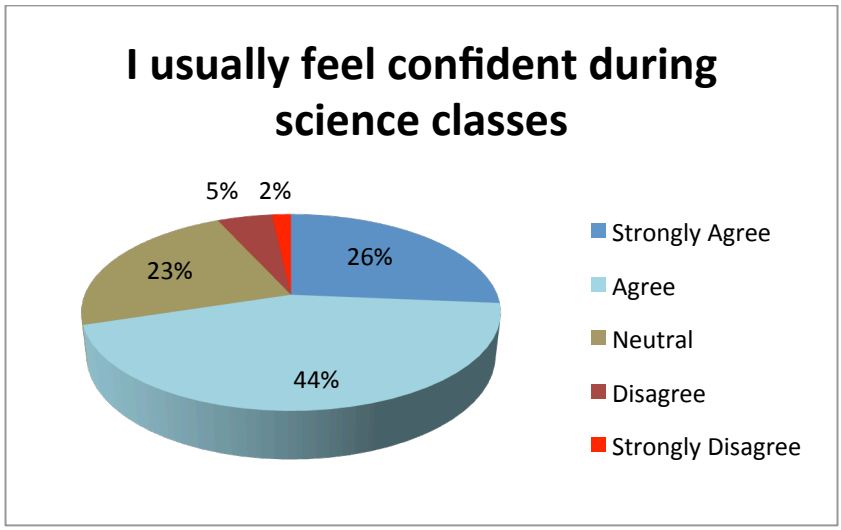


Table 9

Teachers' attitude on Science and their feelings before the pilot phase

The distribution of teachers in the sample varies across the countries, fields of education, location of the school, age. In most of the countries teachers fulfilled the evaluation questionnaires before and after the pilot phase, except for Portugal where answers from before the pilot phase are missing from the survey of teachers. As someone can notice in the following tables most answers of teachers were from Lithuania and the less one from Greece, Germany and Bulgaria and in the majority female teachers (See Appendix F, Table 10 and Table 11).

The following tables represent the attitude of teachers about science, their relation with it and their feelings about this project and the results it will bring to their way of teaching science within their schools.

It is obvious that the prepossession about the piloting phase that were about to take place within their school. A percentage of 93 % of teachers are looking up for new ways of science teaching and 65 % of them have already been involved in science projects before. Regarding the piloting phase more than 90% of the teachers believe that the pilot will develop their students; social, co-operative, creativity and communications skills and STEM competences.

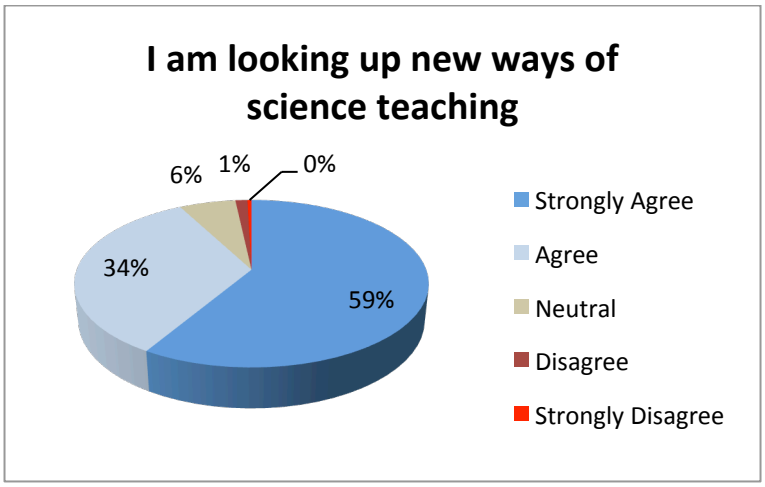


Table 12

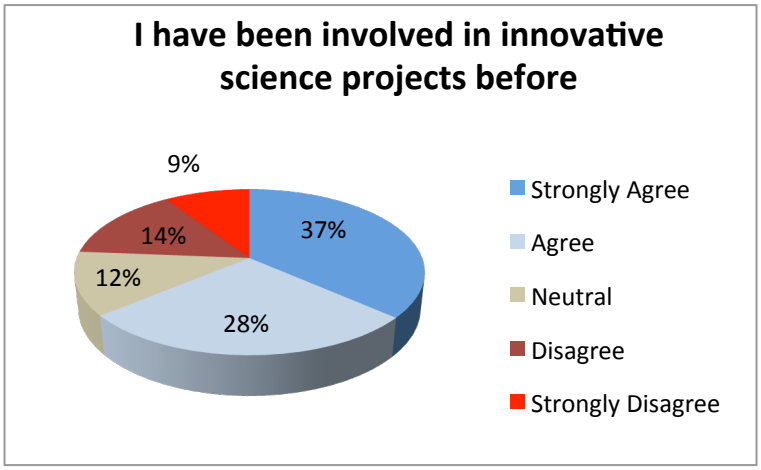


Table 13

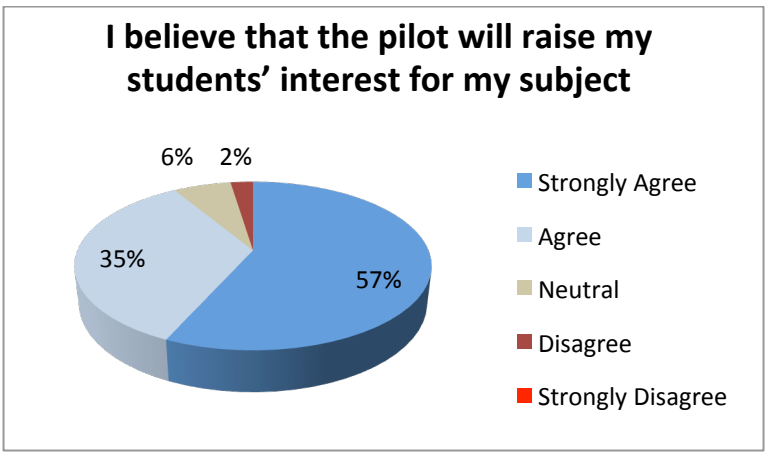
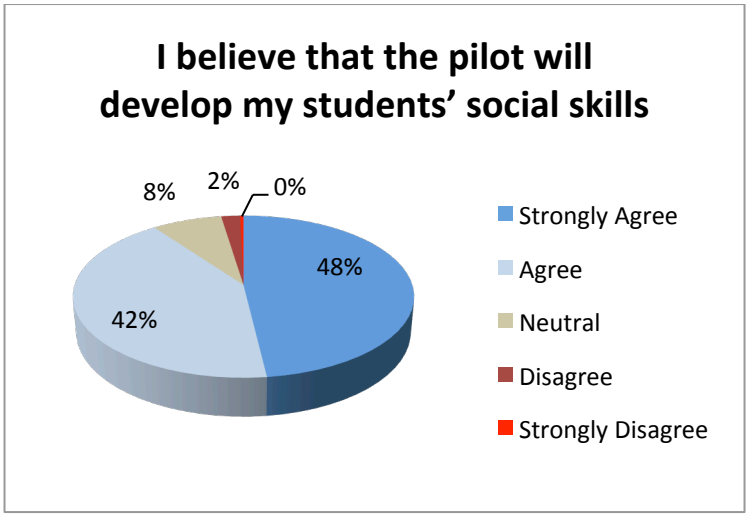


Table 14



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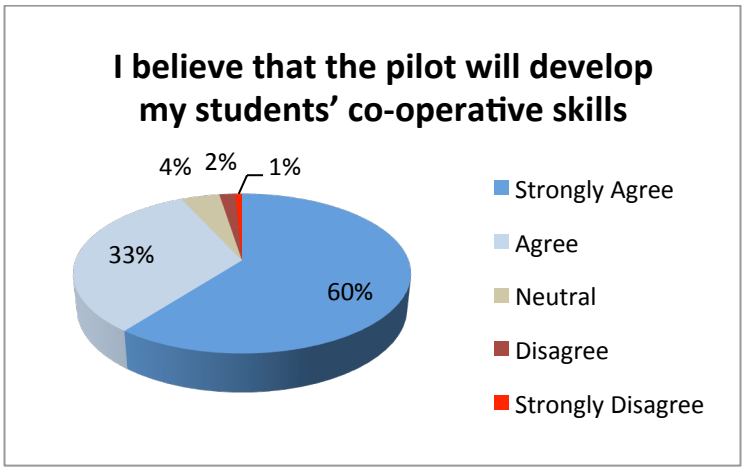

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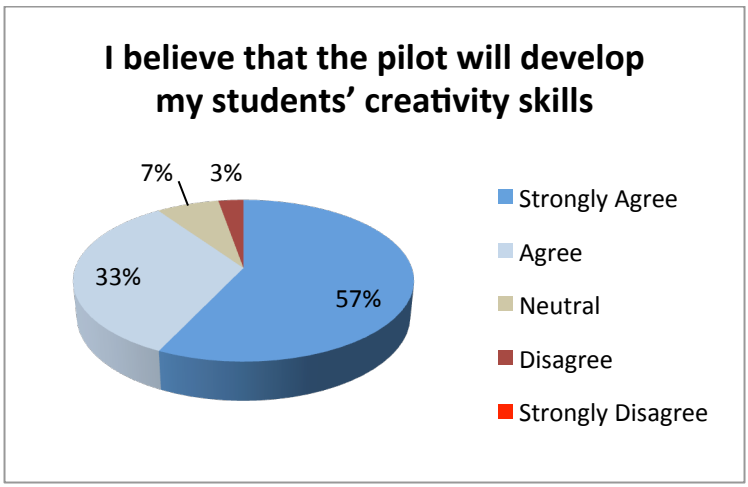

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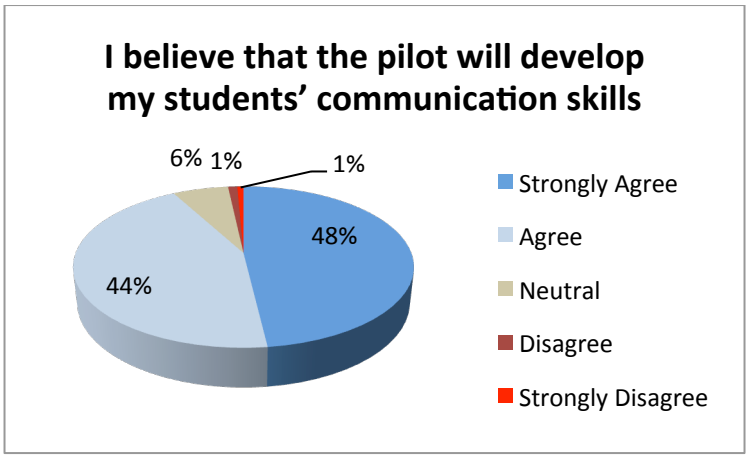

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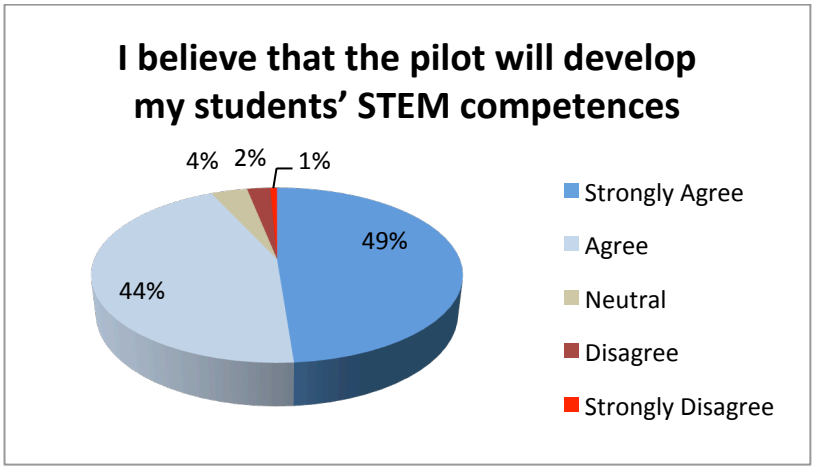


Table 19

Teachers' Opinion on MA.R.CH.

Comparative analysis of teachers' opinion and attitude before and after the pilot phase

The following tables represent a comparative analysis between the views of teachers before and after the project regarding their thoughts and expectations of it.

Most of the teachers initially believed that the pilot will inform their students regarding job options associated with their subject something that was confirmed but with lower percentages as you can see in Table 20 below.

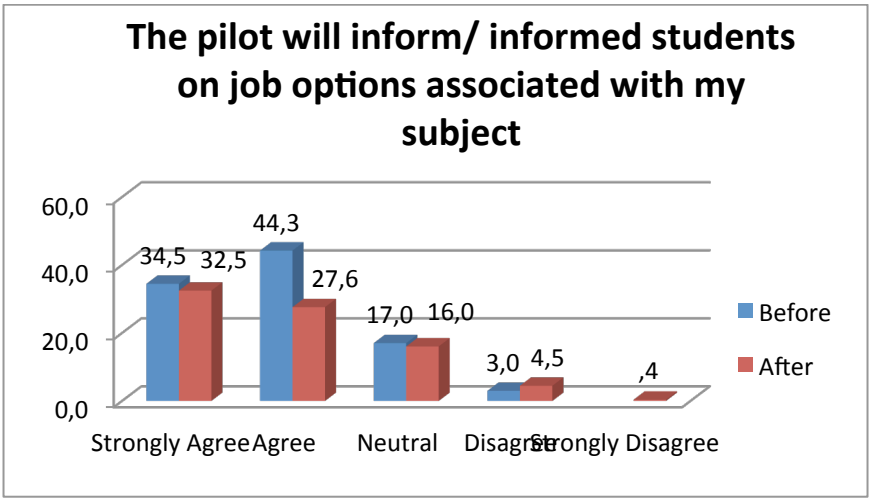


Table 20

Most of the teachers initially believed that the pilot will help them to find out about innovative practices from all over Europe but this was not confirmed in the same high percentages after the pilot has taken place within their school (Table 21)

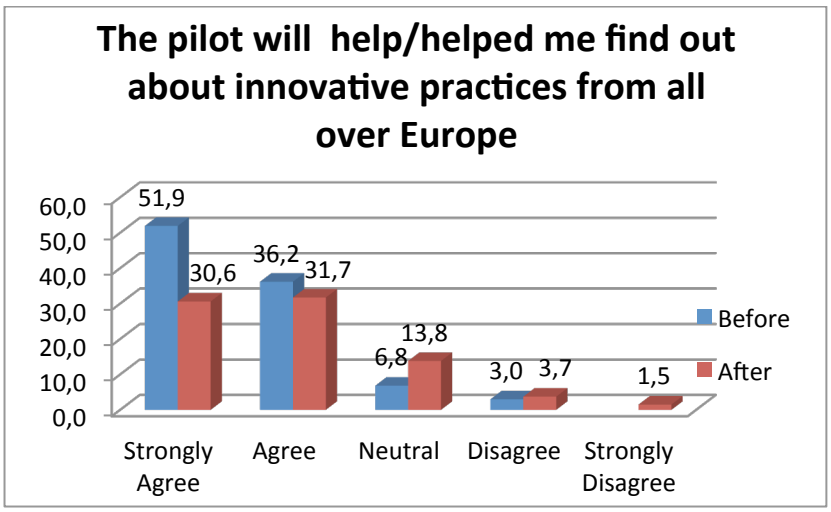


Table 21

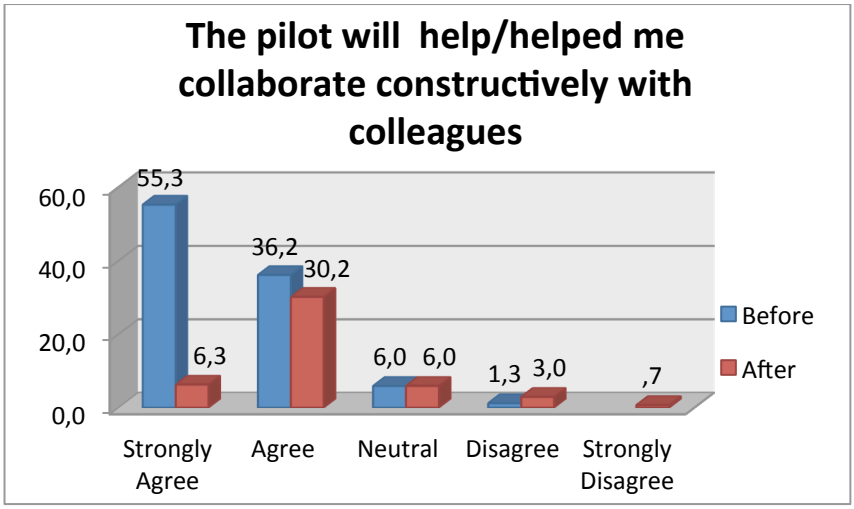


Table 22

According with the results of the survey the pilot helped them to collaborate constructively with their colleagues but no in the level they have expected (Table 22).

It is worthy to notice that before the pilot to take place teachers expected that the pilot will contribute to their professional development (Table 23).

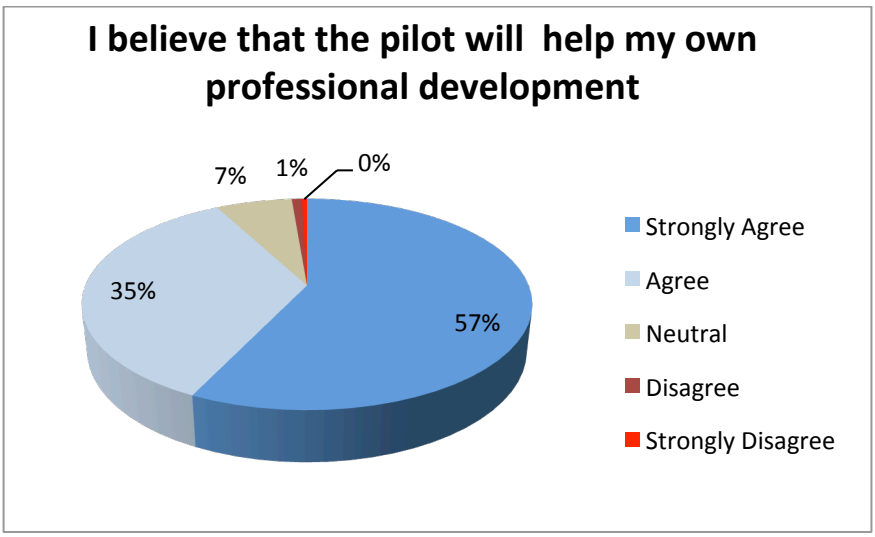


Table 23

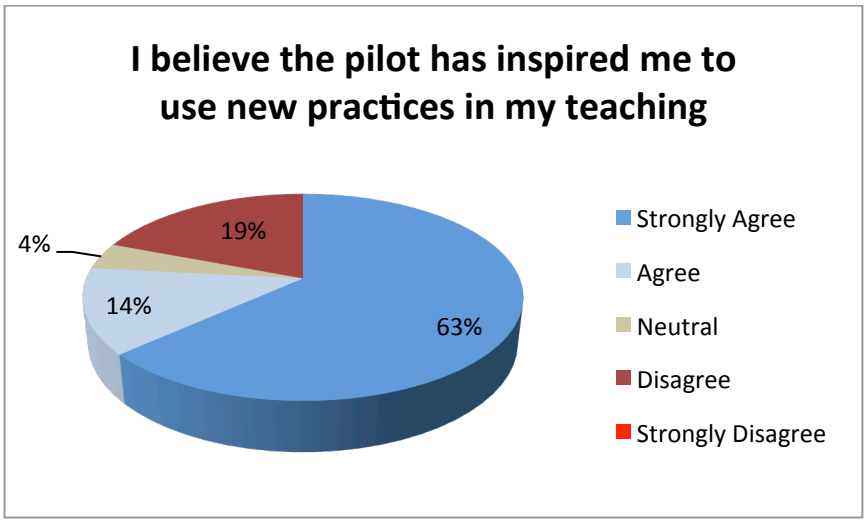
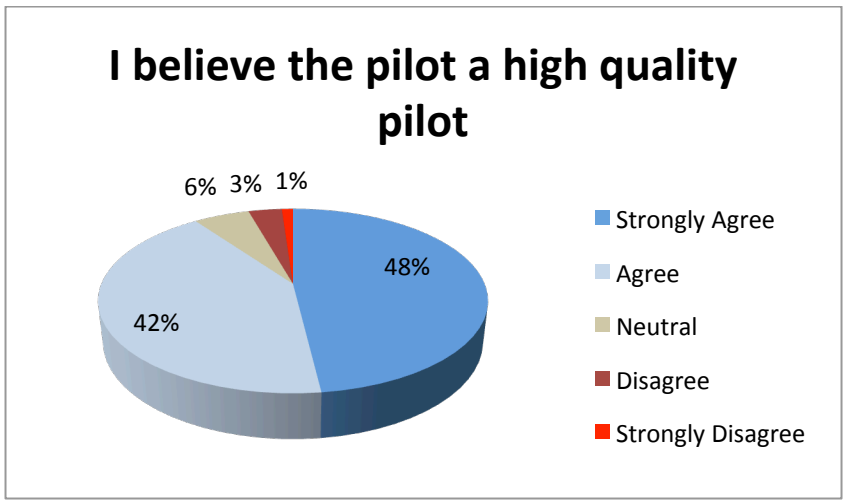


Table 24

According with the results of the survey the pilot inspires a high percentage of teachers to use new practices in their teaching (Table 24).



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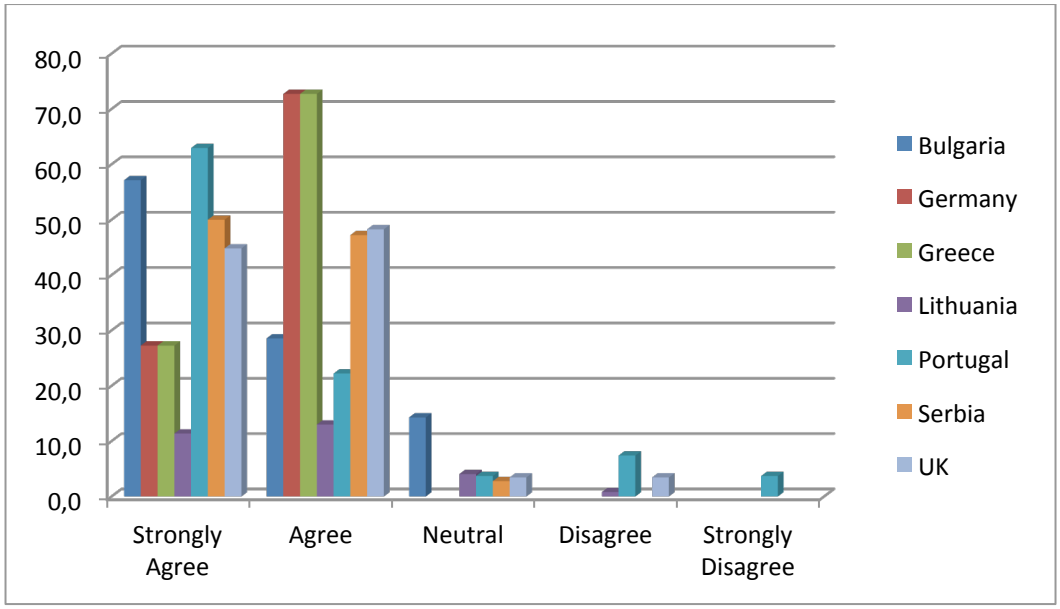


Table 26

According to Table 26 Portugal is the one that believe most that this project was a high quality project. As you can notice in the table, all countries estimated that this was a high quality project.

Students' Opinion on MA.R.CH.

Comparative analysis of teachers' opinion and attitude before and after the piloting in total and per country

The following tables represent a comparative analysis between the views of students before and after the project regarding their thoughts and expectations of it. The first tables represent the opinion of all students in total before and after the pilot and the second ones the opinion of female students before and after the pilot taking place within their schools.

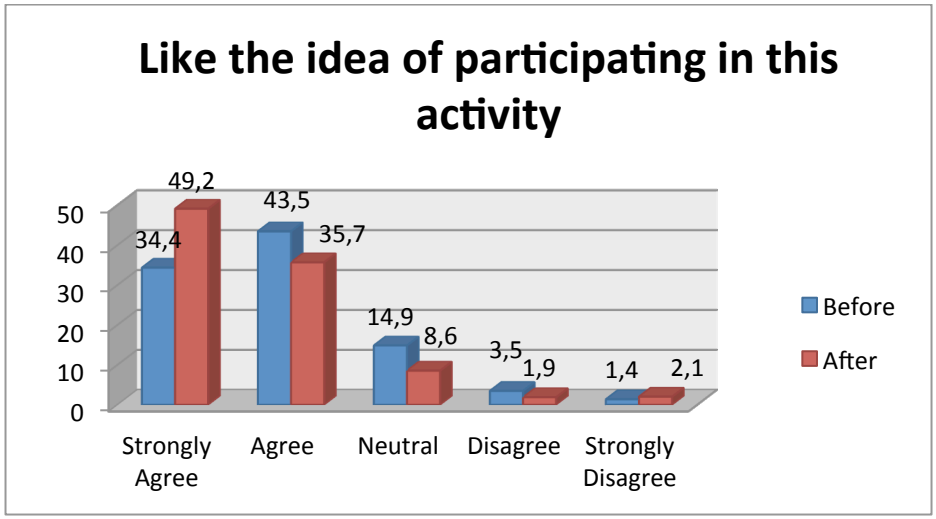


Table 27

Female

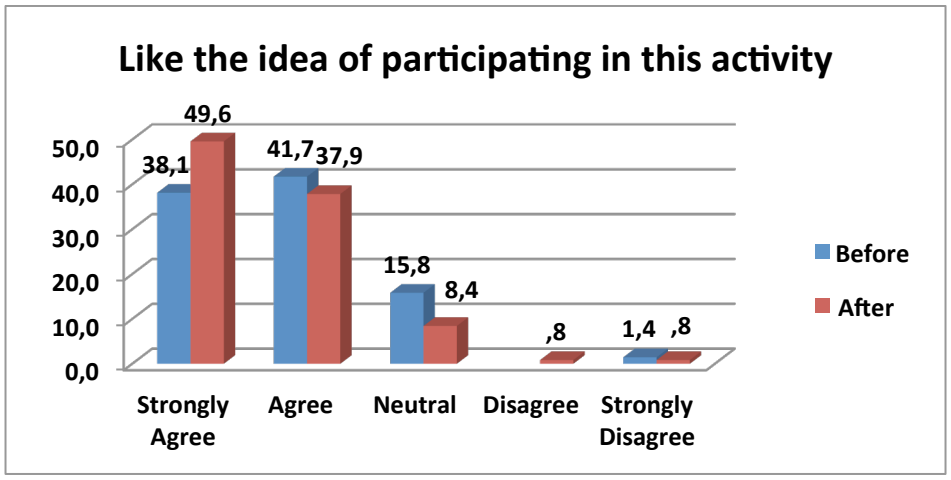


Table 46

According to the results of the survey, all students liked participating in this activity. The percentage of 34,4 before the pilot phase increased to 49,2 after the pilot phase. This means that all students enjoyed participating in this activity (Table 27). Female students represented by almost 90% really enjoyed participating in this activity (Table 46).

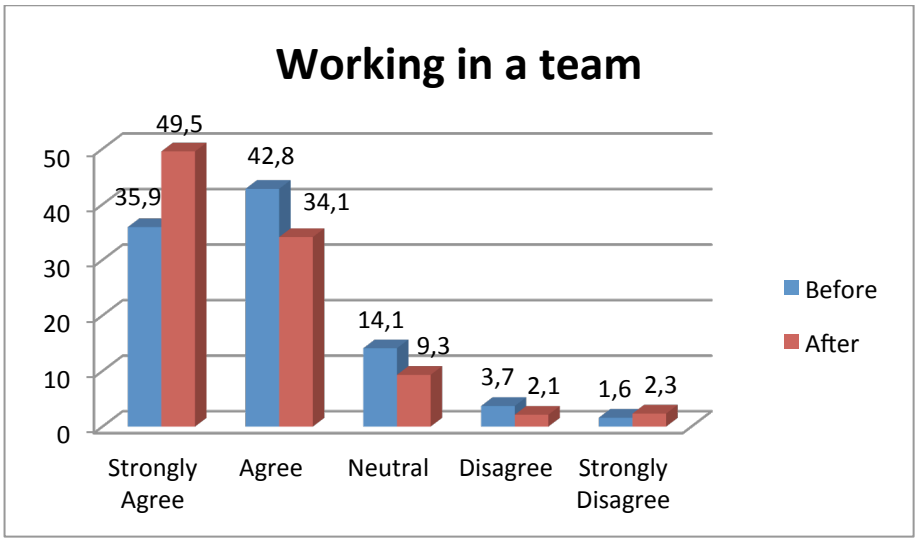


Table 28

Female

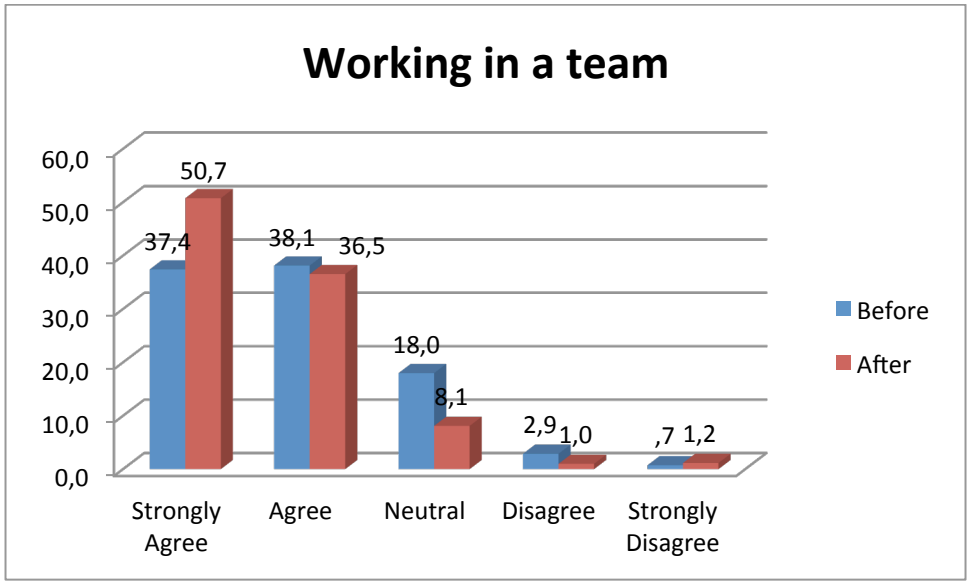


Table 47: Female students opinion

According to Table 28, the project helped the students to be more cooperative and work in teams. Even though the percentages were initially high in the question if the like to work in teams, after the pilot phase, students seem to enjoy more working in teams (Table 28). Female students after the pilot strongly agreed by 13% more than before that they like working in teams (Table 47).

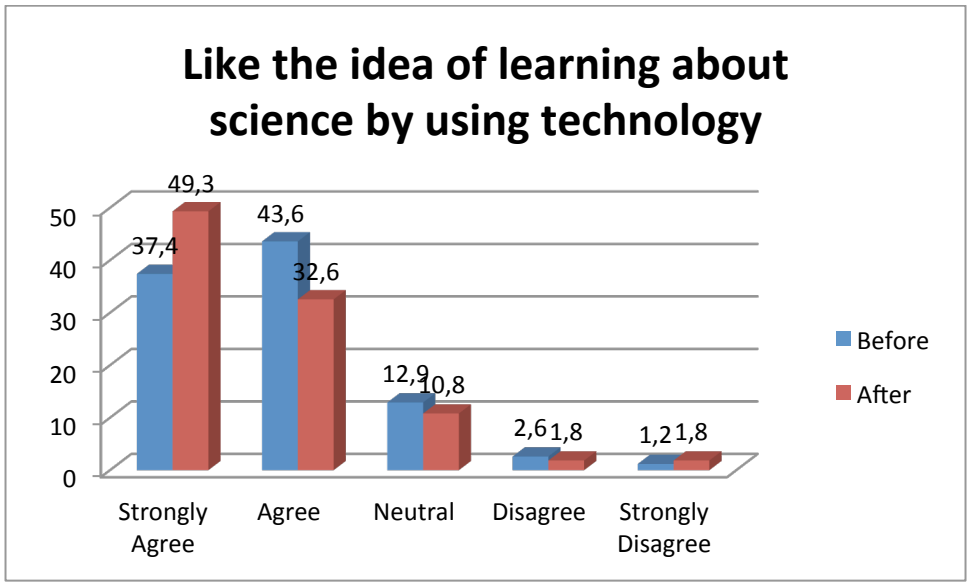


Table 29

Female

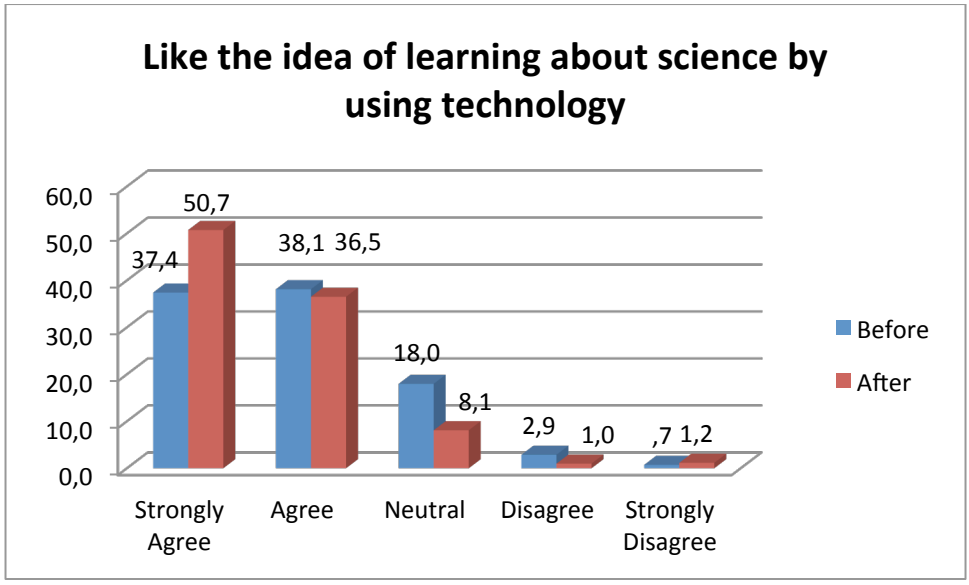


Table 48: Female students opinion

Students before the pilot liked the idea of learning about science by using technology, this attitude was even more positive after the pilot phase within their schools (Table 29). It is worthy to note that female students liked the idea learning in science by using technology, represented by a percentage of almost 90% (Table 48).

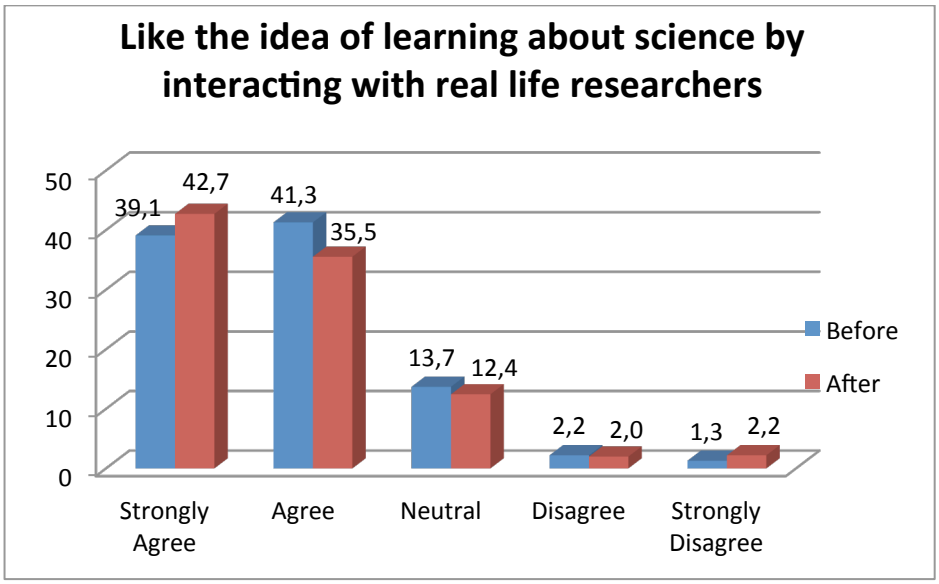


Table 30

Female

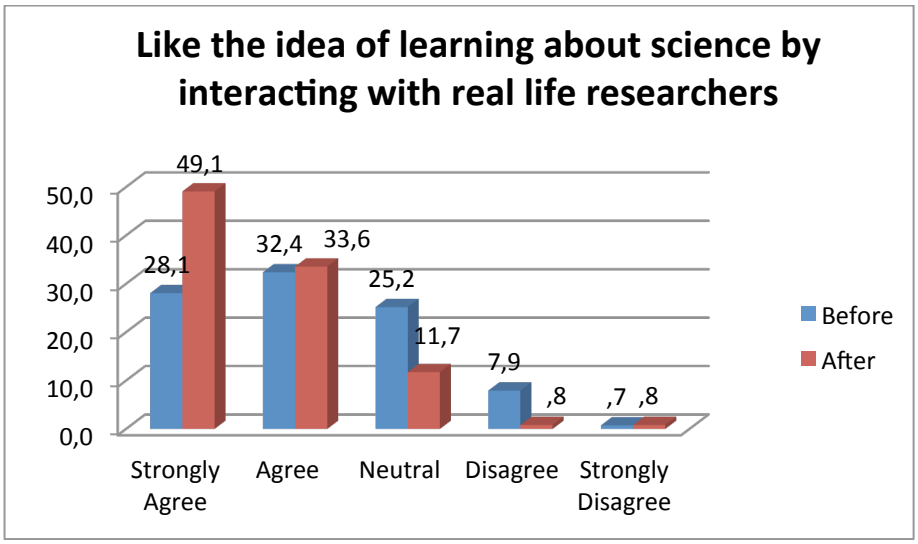


Table 49: Female students opinion

According to the results of the survey, all students and especially female ones liked the idea of learning about science by interacting with real life researchers. After the pilot phase and their interaction with the whole project students liked even more to learn about science by interacting with real life researchers (Table 30 and Table 49).

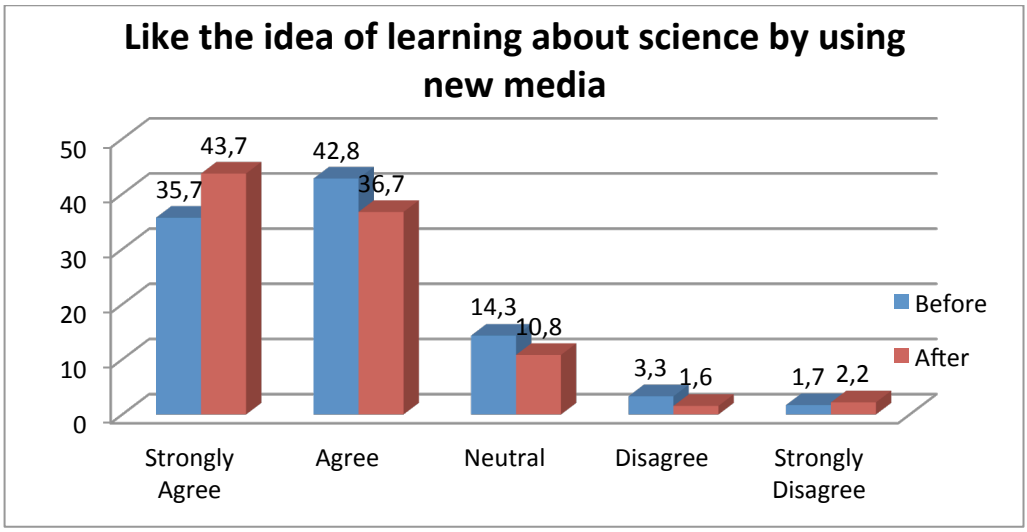


Table 31

Female

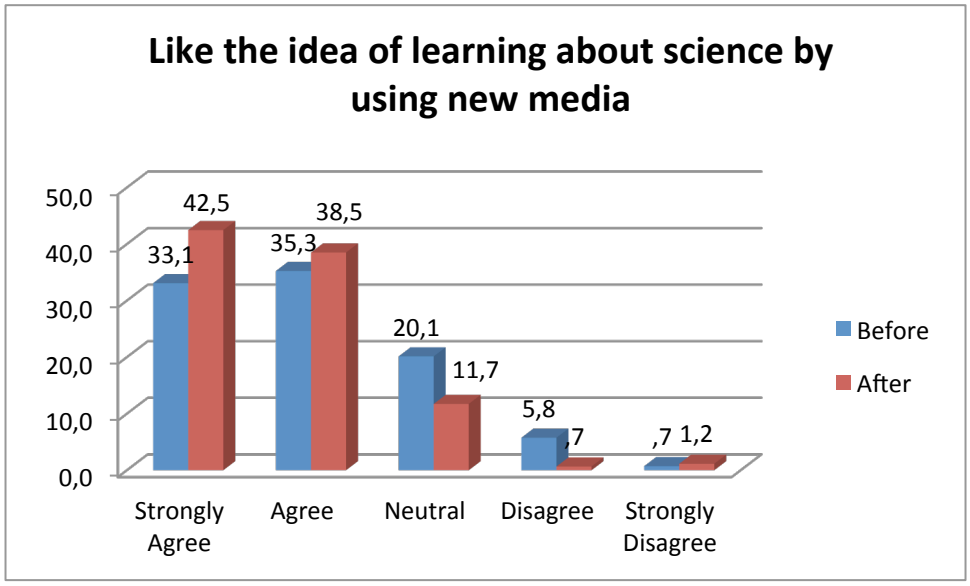


Table 50: Female students opinion

Moreover, students after the project tend to like more the idea of learning about science by using new media like social media (Table 31).

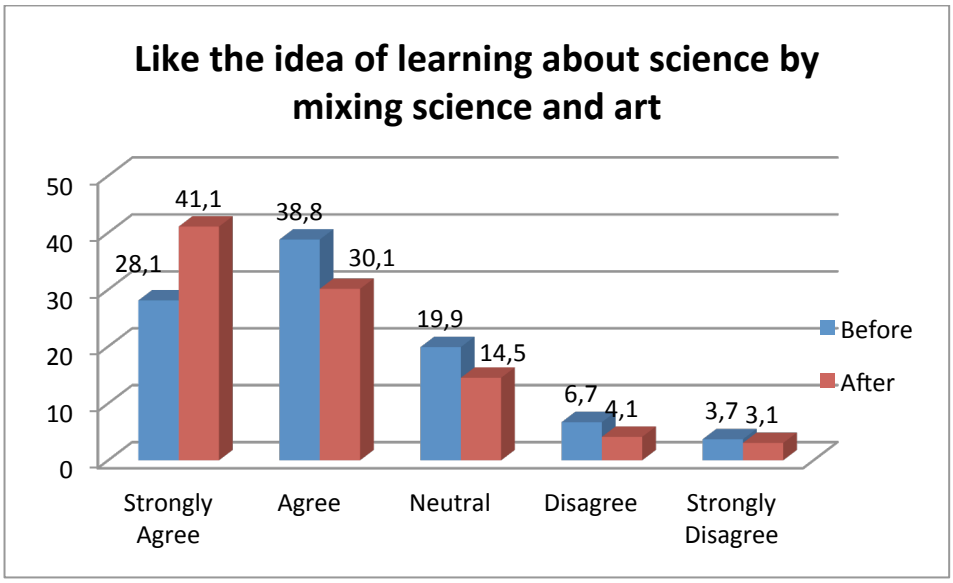


Table 32

Female

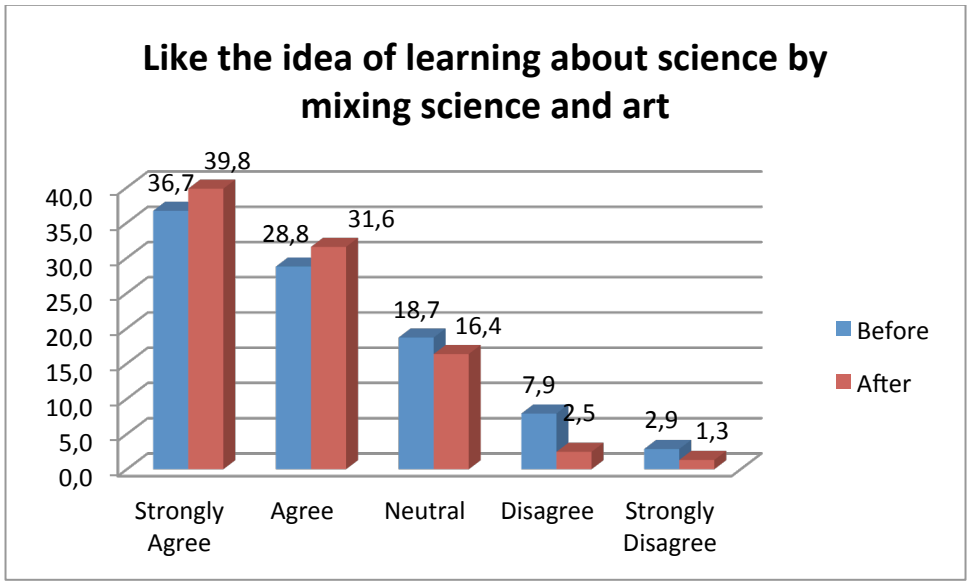


Table 51: Female students opinion

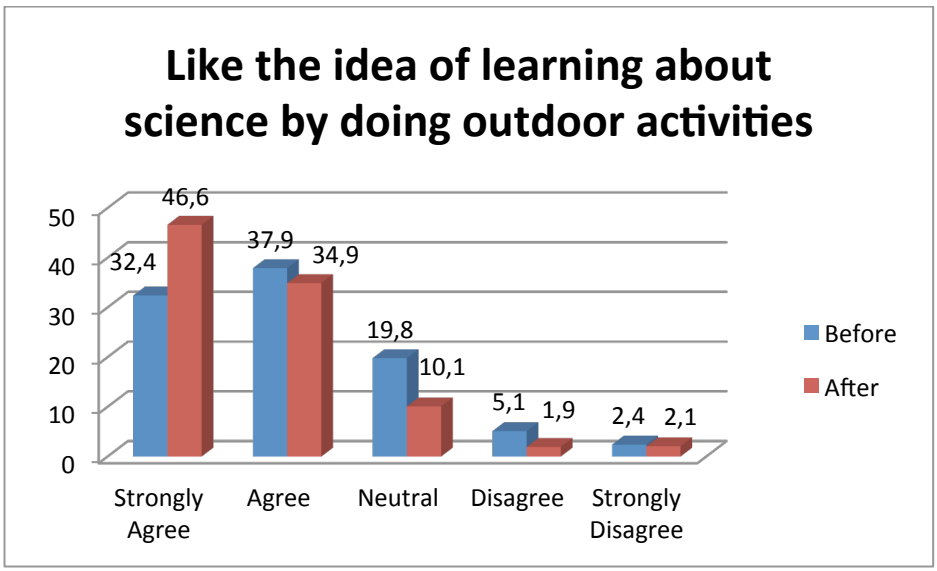


Table 33

Female

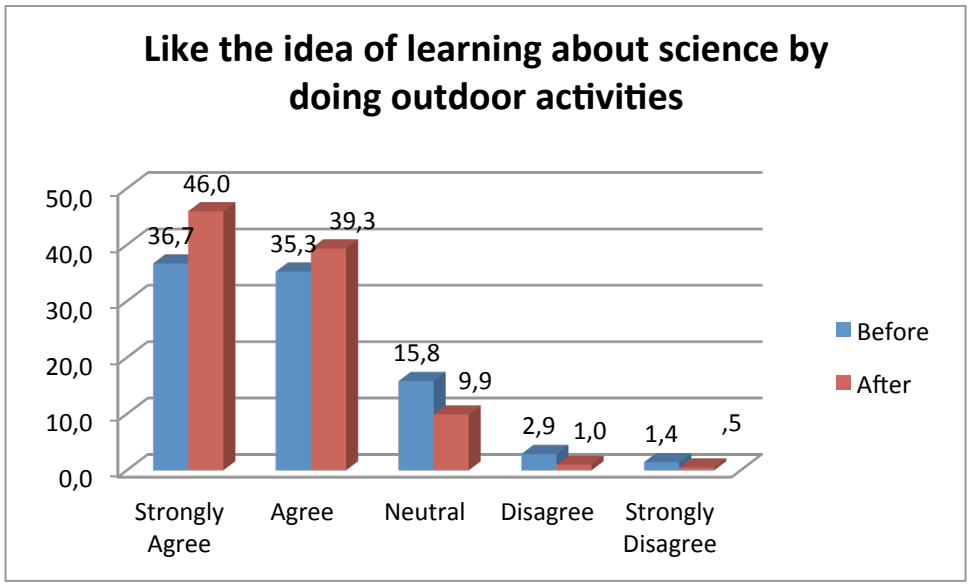


Table 52: Female students opinion

According to table 33, students enjoyed learning science by doing outdoor activities and got inspired from the project.

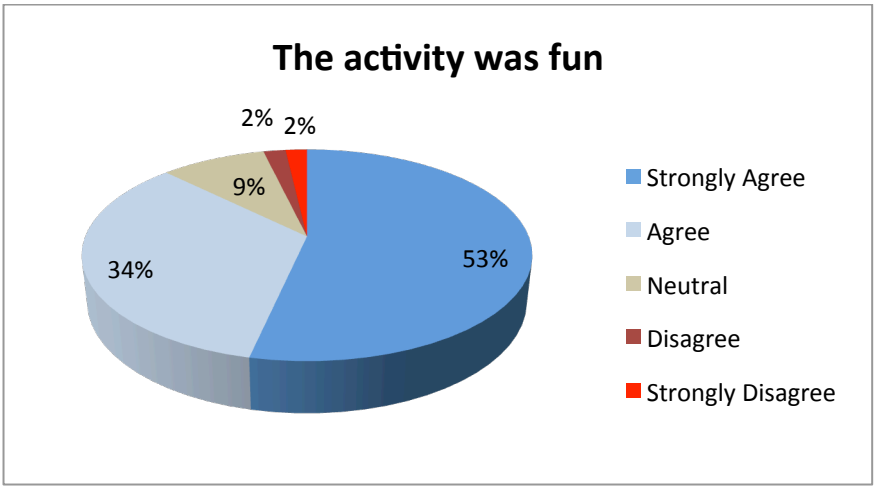


Table 34

According to the results of the survey, it was a fun and useful activity for all the students as they all rated it with percentages (Table 34 and Table 35). Only 2% of all the students stated that they did not find this activity fun or useful.

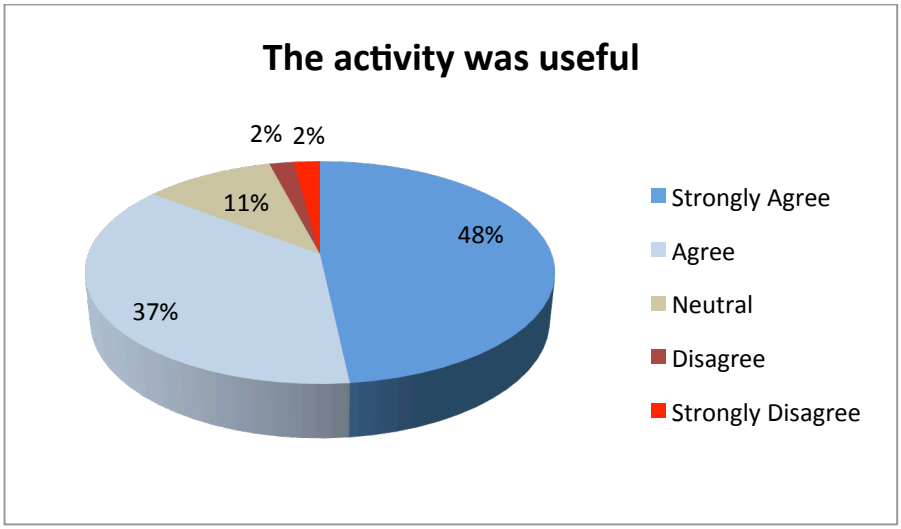


Table 35

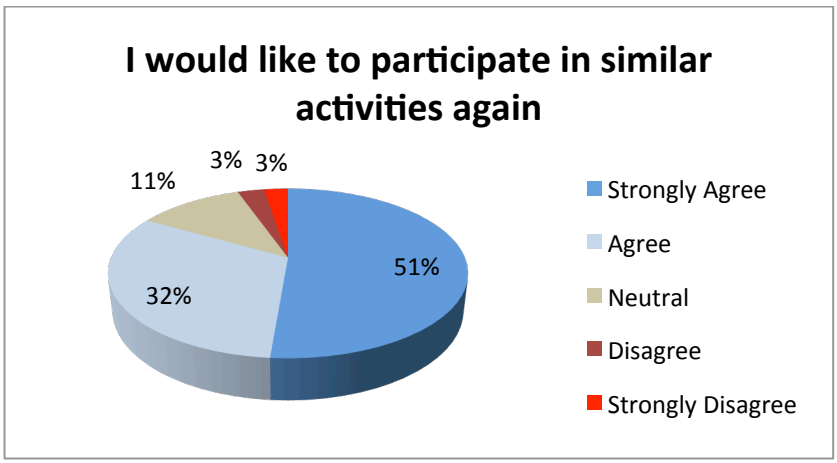


Table 36

Female

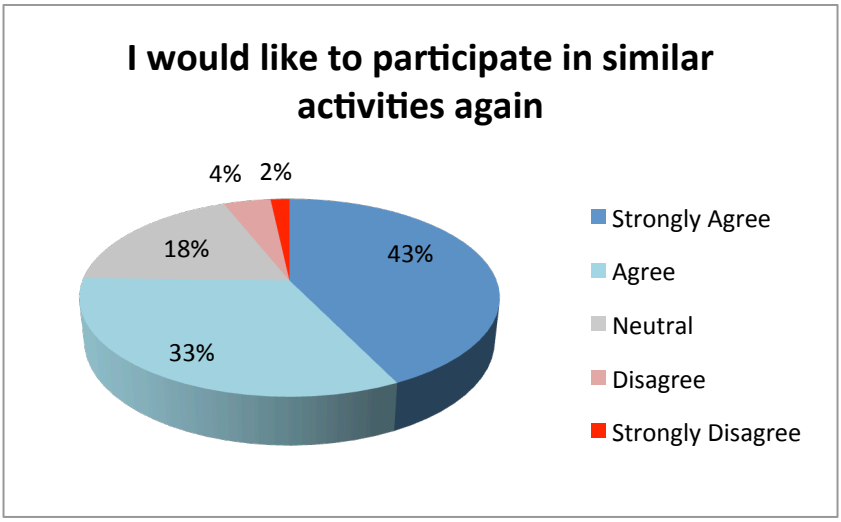


Table 53: Female students opinion

Students expressed their interest to participate in similar activities again as they seemed not only to enjoy the activity but also to get inspired of all this activity as they stated that this activity increased their interest in the field of science (Table 36 and Table 37)

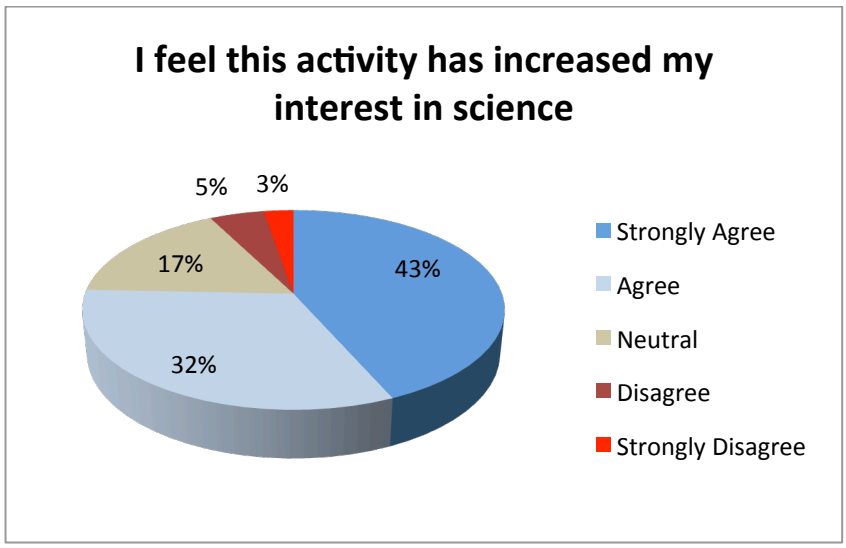


Table 37

Female

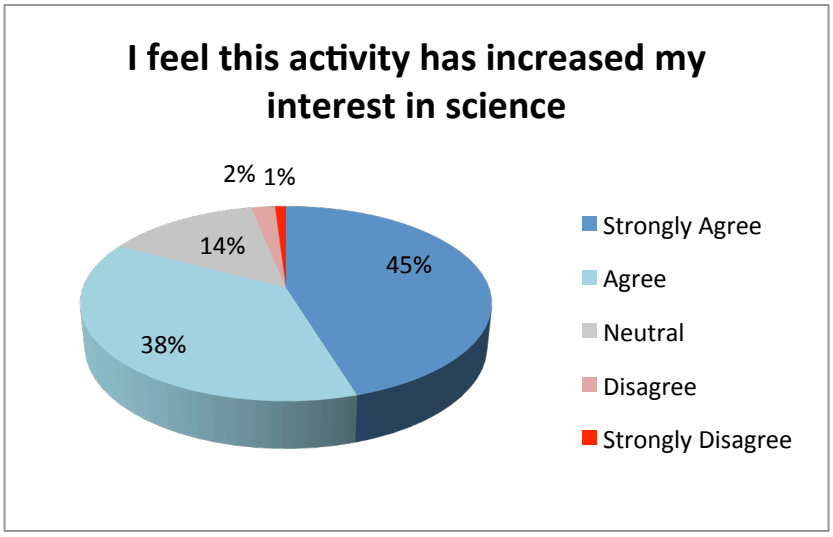


Table 54: Female students opinion

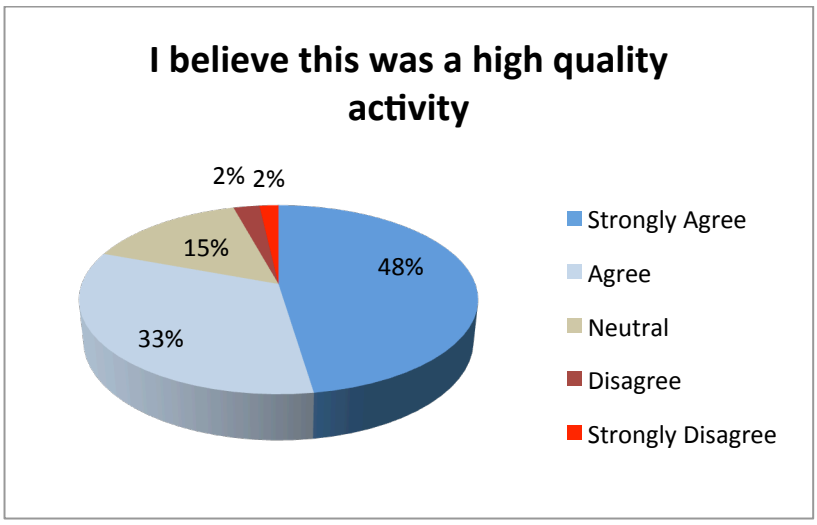


Table 38

Female

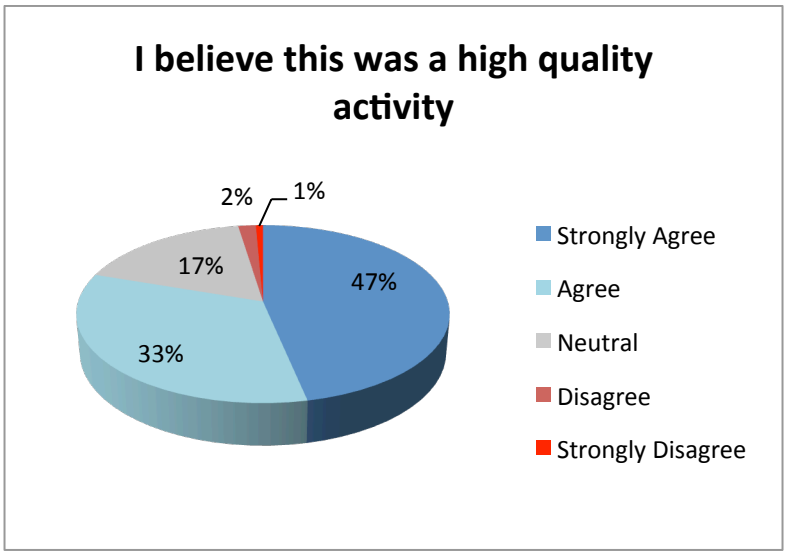


Table 55: Female students opinion

81% of the students rated the project as a high quality activity and would like to participate again in this type of activities (Table 38).

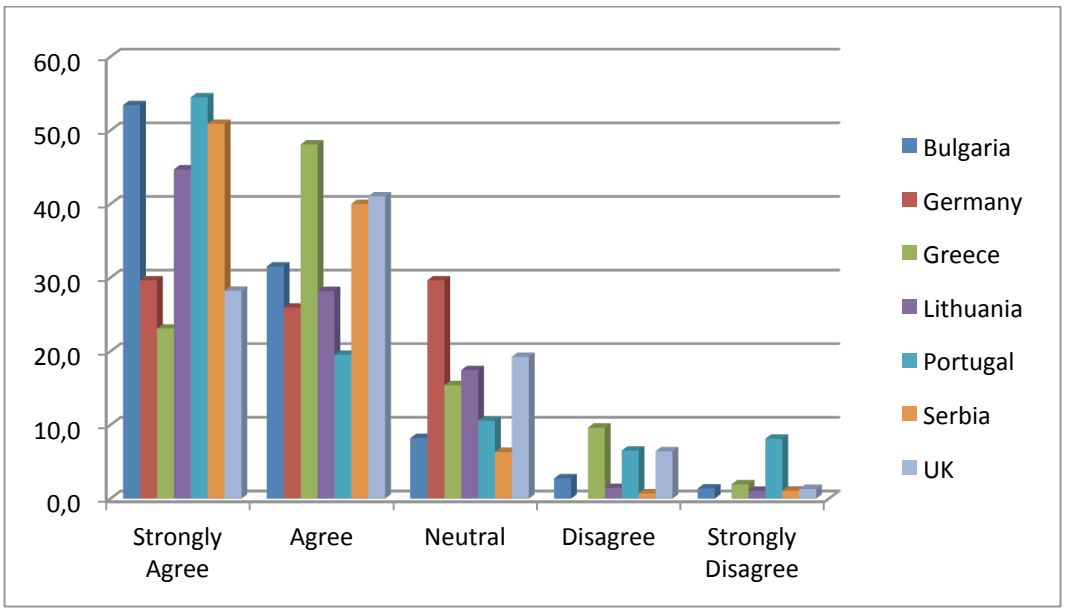


Table 39

According to Table 39 students from Portugal are the one that believe most that this project was a high quality activity. As you can notice in the table all countries estimated that this was a high quality activity.

Conclusions

Teachers stated that they need to show to their students more realistic job opportunities. The collaboration according to them between different subjects is great but difficult to organise. The project far exceeded their expectations and they claimed that this was a pioneering project. This Project allowed students to contact other ways of making science of other students from other schools. Furthermore, they stated that the quality of the resources really impressed them and they are going to use it within their schools. One of the most notable results of this project was that the less motivated students, were really interested and now are more willing to continue being involved in similar projects and activities. One teacher from Germany stated "MARCH pilot helped me to create a brand new teaching practice which enables creativity in students, and have a positive influence on team

work. Our focus was to create a functional and applicable knowledge firm the area of physics. Also, we have developed the interesting homework tasks and had a positive reactions and high productivity".

It is obvious that the prepossession about the piloting phase that were about to take place within their school. A percentage of 93 % of teachers are looking up for new ways of science teaching and 65 % of them have already been involved in science projects before. Regarding the piloting phase more than 90% of the teachers believe that the pilot will develop their students; social, co-operative, creativity and communications skills and STEM competences. Most of the teachers initially believed that the pilot will inform their students regarding job options associated with their subject something that was confirmed but with lower percentages.

Furthermore, most of the teachers initially believed that the pilot will help them to find out about innovative practices from all over Europe but this was not confirmed in the same high percentages after the pilot has taken place within their school. According with the results of the survey the pilot helped them to collaborate constructively with their colleagues but no in the level they have expected. Portugal is the one that believe most that this project was a high quality project.

All students liked participating in this activity. The project helped the students to be more cooperative and work in teams. Even though the percentages were initially high in the question if the like to work in teams, after the pilot phase, students seem to enjoy more working in teams after the pilot phase. Students before the pilot liked the idea of learning about science by using technology, this attitude was even more positive after the pilot phase within their schools.

All students liked the idea of learning about science by interacting with real life researchers. After the pilot phase and their interaction with the whole project students liked even more to learn about science by interacting with real life researchers.

Students expressed their interest to participate in similar activities again as they seemed not only to enjoy the activity but also to get inspired of all this activity as they stated that this activity increased their interest in the field of science.

Female students seem to be even more interested to occupy with projects related with science. They got inspired and motivated to get involved in this pilot and they firmly believe that they this was a high quality project.

As students stated they should use their smart phones for learning more, this activity was much more better than regular classes. One student from Greece stated "More projects, less books!". This activity was actually a way for them to learn in a more interactive, fun and useful way. Students confessed that they felt proud of themselves because they actively participated in an activity like this, they felt that they achieved something new and different. All students were reluctant in the beginning with the whole process but they just needed some time to adapt to this activity and to concept of the project.

According to the results, the pilots made a significant difference in stem education in all participating countries and are statistical significant. This happened to all the participating countries.

Pilots influenced students in a positive way and changed their opinion about Science; they would like to have more interactive workshops in the framework of their Sciences courses. According to the results there is a significant difference between students opinion before and after

the results. Although students had positive attitude regarding the pilot before the pilot, they maintained and improved their attitude regarding Science and the influence of the pilots to them.

Students enjoyed all kind of activities that took place in the framework of the pilots because comparing to their classic way of teaching they were far more interesting. Students prefer interactive way of teaching, exactly like the activities of the pilots.

It is obvious from the analysis that female tend to prefer more courses related with Science and were delighted to participate in these activities. There is no significant difference when we analyze the age and the student preference to science. Student of all ages enjoyed science in the same level and got influenced the same.

On the other hand, teachers got influenced by the pilot. There is a statistically significant difference between teachers' opinion before and after the analysis. Teachers expected to learn more about European opportunities than they finally learnt. But they were delighted participating in this activity and they concluded that students should learn in a more interactive way and not only in a theoretical way from their books. This was the most significant benefit from this activity: the introduction of new innovative methodologies in their curricula. In that way we can state that teachers need training and taking parts in activities like this so as to enhance not only their knowledge but also their way of teaching. This was the case for all participating countries.

APPENDIX

FAQs

Q: Who can participate in the pilots?

A: Secondary and high school teachers serving in a school in one of the project countries, namely: UK, Portugal, Germany, Lithuania, Serbia, Bulgaria and Greece.

Q: I live in a country other than the consortium countries. Can I participate in the pilots?

A: We are very glad for your interest in MARCH. Please contact us directly and we will try to include your school in the pilots.

Q: What theme should my pilot have?

A: The main objective of the pilots is to spread good practices in science teaching under the theme of sustainable cities. However, this theme is not exclusive. If your theme is a scientific one your pilot is eligible.

Q: How much time should I devote to the pilots?

A: This depends on your own timeline. Pilots need to be implemented between February and October 2016 and their time span can be from 2 school hours to a full semester.

Q: Can I join the international conference in London?

A: You are very welcome to join us at the 3rd MARCH International Conference in London. Find out more here. Please note that your participation will be under your own expenses. Organisers will support financially a small number of participants who stand out for the quality of their work and the impact of their pilots.

Q: How should I present my final results?

A: There is a deliverable template for teachers participating in the pilots. You can find it here or contact MARCH pilots national contact point.

Q: How do I post my results online?

A: You sent the template to your MARCH national contact point and they will take it from there.

Q: Do I have to do the evaluation with the questionnaires?

A: We are doing the evaluation questionnaires to measure the pilots' success and take into consideration your opinion on the project.

Replying to them will help us understand your needs better and improve. However, filling the questionnaires is not obligatory for your participation in the pilots, so you can skip them if you wish.

Q: Where can I find more info about MARCH?

A: In the MARCH website and Facebook page.

Q: What language should I use for MARCH deliverables and pilots?

You can do the pilots in your local language. The deliverable template (one page) would be preferably submitted in English, but if this is not possible, it is ok to submit it in your local language, letting your national contact point know.

Q: How can I participate in MARCH after the pilot ends?

A: You can stay tuned in our website and social media, contact us to get a copy of the publications we have made, present your work in pilots in conferences and science events and share your ideas with your national contact point.

Q: I am working on a relevant project with the ones you are presenting in MARCH. Can I adjust it and participate in the pilots?

A: We want to encourage as much flexibility as possible in the pilots' stage, to serve educators and students' needs. If your project is inside the pilots' timeline, aligned with the good practices and relevant with the theme, you are welcome to participate.

Q: Can I choose to apply as a pilot a good practice tested in another country?

A: Yes, absolutely. Our aim is to share and spread the good practices and the ideal scenario is to inspire teachers apply something developed in a different context and measure its success. So please feel free to browse all the good practices in the toolkit and choose the one that suits you best.

Q: How can I participate in the coaching sessions?

A: Contact your national contact point or visit our website to find out about the sessions schedule and make a registration.

Q: Will the coaching sessions be streamed online?

A: The presentations and information material will be uploaded in the website. Live streaming announcements will be made in the local pages if available.

USEFUL LINKS & RESOURCES

To get a full picture of MARCH Activities and the state of the art in science education in the participating countries keep in mind that this report is complemented by the following MARCH reports/ resources available at www.sciencemarch.eu :

Galev T. (2015) "The State of the Art in Science Education: Results of MA.R.CH. Empirical studies", Sofia: Bulgarian Academy of Sciences.

Statauskiene L., Mazgelyte R. (2015) "Defining a good practice in STEM education within a framework of MARCH Project", Vilnius: Education Development Centre

Papadimitriou, S. (2016) "MAKE SCIENCE REAL IN SCHOOLS (MA.R.CH.) WEBINARS – FINAL REPORT", Athens: Educational Radiotelevesion, Ministry of Education, Research and Religious Affairs, Greece

Christodoulou, A. (2016) "MAke science Real in sCHools (M.A.R.C.H.) TEACHERS GUIDE

The papers produced on Flipping Classrooms by the Greek teachers in the City of Patras:

Gariou A., Papadakis S., Manousou G., Geroriadou I. (2017 accepted) MPLEMENTING A FLIPPED CLASSROOM: A CASE STUDY OF BIOLOGY TEACHING IN A GREEK HIGH SCHOOL, *Turkish Online Journal of Distance Education-TOJDE* ISSN 1302-6488 v18 n1

Makrodimos N., Papadakis S., Koutsouba, M. (2017 accepted) K-12 Distance Education: a Case Study with the method of Flipped Classroom for Mathematics in 5th Class SCHOOL, *Open Education*: *The Journal for Open and Distance Education and Educational Technology,* ISSN 1791-9312 v*13 n1*

http://lamscommunity.org/lamscentral/sequence?seq_id=1986326

More about the Lithuanian pilots in the local language:
http://www.upc.smm.lt/projektai/march

More about the Portuguese pilots in the local language:
www.cienciaviva.pt/march/index.asp?accao=changelang&lang=en

More about the Bulgarian pilots in the local language:
http://democrit.com/

QUESTIONNAIRE TEMPLATES

- ***Students before***

Identification Code:

Create your own code by putting the following elements together: initial of mother, initial of father, street number, day of birthday. E.g. MJ7019 for Mary (mother), Jake (father), 70 (street number), 19 (day of birthday).

	About You	
1	Gender	F ☐ M ☐ Other ☐
2	Age	
3	Grade	
4	City/ Country	

	About Science	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
5	I am interested in science	☐	☐	☐	☐	☐	☐
6	Knowing science will help my career in the future	☐	☐	☐	☐	☐	☐
7	Getting high grades in science is important for me	☐	☐	☐	☐	☐	☐
8	What I learn in science is often practically useful	☐	☐	☐	☐	☐	☐
9	I usually feel confident during science classes	☐	☐	☐	☐	☐	☐

	About the activity you will do in class	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
10	I like the idea of participating in the activity	☐	☐	☐	☐	☐	☐
11	I like the idea of learning about science by working in a team	☐	☐	☐	☐	☐	☐
12	I like the idea of learning about science by using technology (software and hardware)	☐	☐	☐	☐	☐	☐
13	I like the idea of learning about science by interacting with real life researchers	☐	☐	☐	☐	☐	☐
14	I like the idea of learning about science by using new media (video, social media, etc.)	☐	☐	☐	☐	☐	☐
15	I like the idea of learning about science by mixing science and art (e.g. on a theatre play about science)	☐	☐	☐	☐	☐	☐
16	I like the idea of learning about science by doing outdoor activities	☐	☐	☐	☐	☐	☐
17	I like the idea of learning about science by doing experiments and crafts	☐	☐	☐	☐	☐	☐
18	I like the idea of learning about science by using new methods to learn science	☐	☐	☐	☐	☐	☐
19	I think the activity will be fun	☐	☐	☐	☐	☐	☐
20	I think the activity will be useful	☐	☐	☐	☐	☐	☐
21	I think the activity will help me understand a science topic better	☐	☐	☐	☐	☐	☐

Dissemination		
22	How did you find out about the activity?	

Comments
Please let us know of any comments you would like to share on MARCH pilots and activities

➢ ***Students after***

Identification Code:

Create your own code by putting the following elements together: initial of mother, initial of father, street number, day of birthday. E.g. MJ7019 for Mary (mother), Jake (father), 70 (street number), 19 (day of birthday).

	About the activity you did in the class	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
1	I liked participating in the activity	☐	☐	☐	☐	☐	☐
2	I liked working in a team	☐	☐	☐	☐	☐	☐
3	I liked using technology (software and hardware)	☐	☐	☐	☐	☐	☐
4	I liked interacting with real life researchers	☐	☐	☐	☐	☐	☐
5	I liked using new media (video, social media, etc.)	☐	☐	☐	☐	☐	☐
6	I liked mixing science and art	☐	☐	☐	☐	☐	☐
7	I liked going outdoors	☐	☐	☐	☐	☐	☐
8	I liked doing experiments and crafts	☐	☐	☐	☐	☐	☐
9	I liked using new and innovative methods to learn science	☐	☐	☐	☐	☐	☐
10	The activity was fun	☐	☐	☐	☐	☐	☐
11	The activity was useful	☐	☐	☐	☐	☐	☐
12	The pilot helped me understand a science topic better	☐	☐	☐	☐	☐	☐
13	I would like to participate in similar activities again	☐	☐	☐	☐	☐	☐
14	I feel this activity has increased my interest in science	☐	☐	☐	☐	☐	☐
15	I believe this was a high quality activity	☐	☐	☐	☐	☐	☐

Comments *Please let us know of any comments you would like to share on MARCH pilots and activities*

- ***Teachers before***

Identification Code:

Create your own code by putting the following elements together: initial of mother, initial of father, street number, day of birthday. E.g. MJ7019 for Mary (mother), Jake (father), 70 (street number), 19 (day of birthday).

	About You	
1	Gender	F ☐ M ☐ Other ☐
2	Age	
3	Years of teaching experience	
4	Expertise (what subject do you teach?)	
5	Grade (where the activity took place)	
6	City/ Country	

	About Science	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
7	I am looking up new ways of science teaching	☐	☐	☐	☐	☐	☐

8	I have been involved in innovative science projects before	☐	☐	☐	☐	☐	☐

	About the pilot: I believe the pilot will	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
9	Raise my students' interest for my subject	☐	☐	☐	☐	☐	☐
10	Develop my students' social skills	☐	☐	☐	☐	☐	☐
11	Develop my students' co-operative skills	☐	☐	☐	☐	☐	☐
12	Develop my students' creativity skills	☐	☐	☐	☐	☐	☐
13	Develop my students' communication skills	☐	☐	☐	☐	☐	☐
14	Develop my students' STEM competences	☐	☐	☐	☐	☐	☐
15	Inform students on job options associated with my subject	☐	☐	☐	☐	☐	☐
16	Help me find out about innovative practices from all over Europe	☐	☐	☐	☐	☐	☐
17	Help my own professional development	☐	☐	☐	☐	☐	☐
18	Help me collaborate constructively with colleagues	☐	☐	☐	☐	☐	☐

Dissemination		
19	How did you find out about MARCH?	

Comments *Please let us know of any comments you would like to share on MARCH pilots and activities*

- ***Teachers after***

Identification Code:

Create your own code by putting the following elements together: initial of mother, initial of father, street number, day of birthday. E.g. MJ7019 for Mary (mother), Jake (father), 70 (street number), 19 (day of birthday).

	About the pilot: I believe the pilot has	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
1	Inform students on job options associated with my subject	☐	☐	☐	☐	☐	☐
2	Helped me find out innovative practices from all over Europe	☐	☐	☐	☐	☐	☐
3	Helped my own professional development	☐	☐	☐	☐	☐	☐
4	Helped me collaborate constructively with colleagues	☐	☐	☐	☐	☐	☐
5	Inspired me to use new practices in my teaching	☐	☐	☐	☐	☐	☐
6	I believe this was a high quality pilot	☐	☐	☐	☐	☐	☐

Comments ***Please let us know of any comments you would like to share on MARCH pilots and activities***

STATISTICAL ANALYSIS

Students' demographics

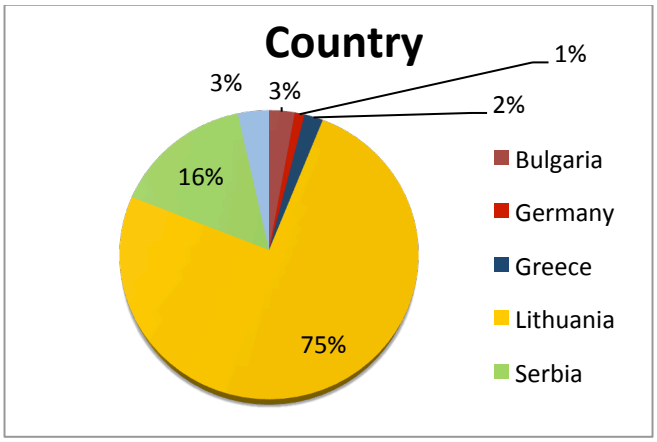


Table 3: Students responses across 7 participating countries

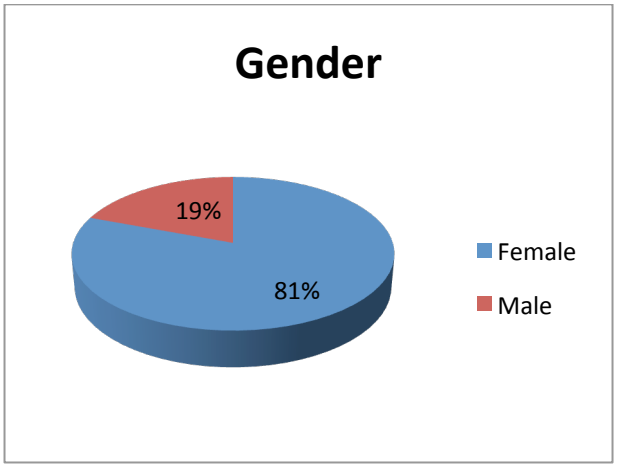


Table 4: Gender of Students

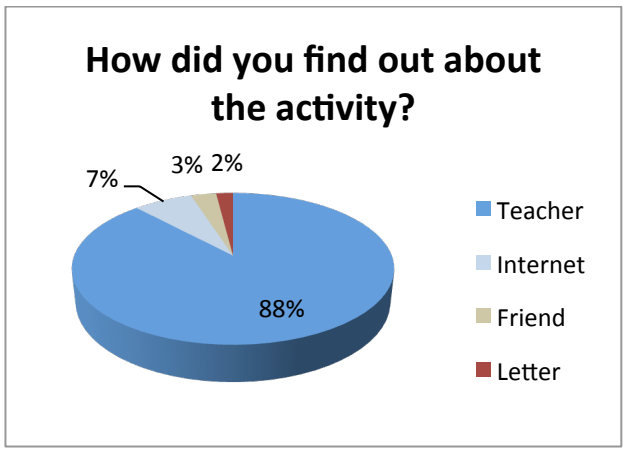


Table 40

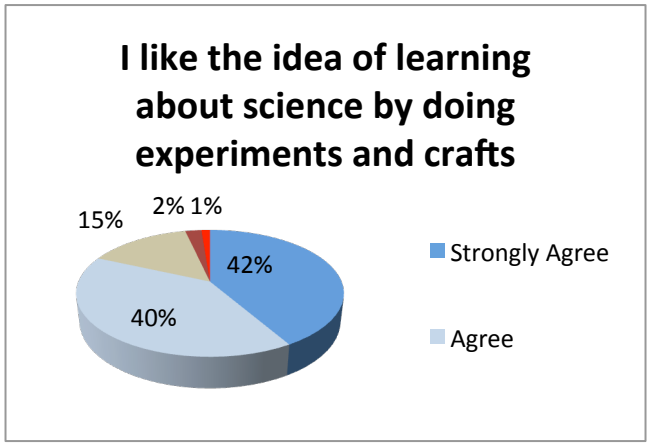


Table 41

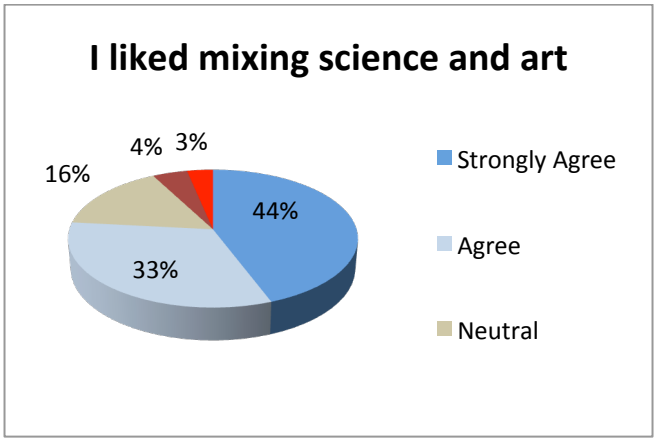


Table 42

Teachers' results (demographics)

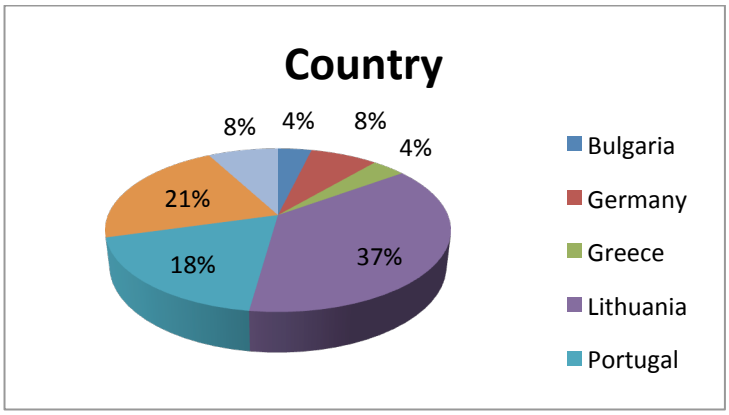


Table 10

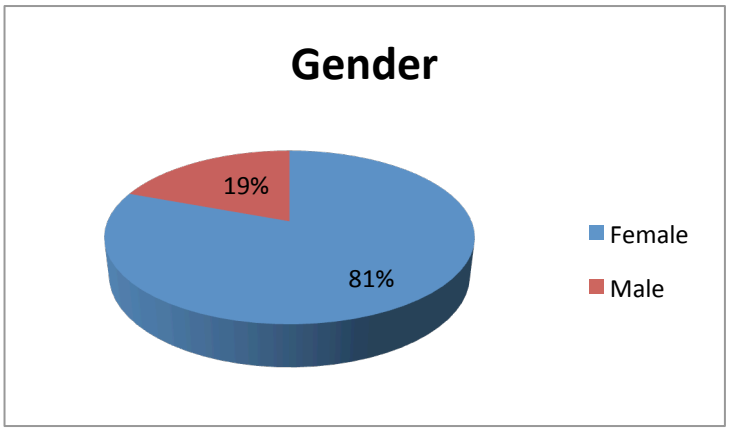


Table 11

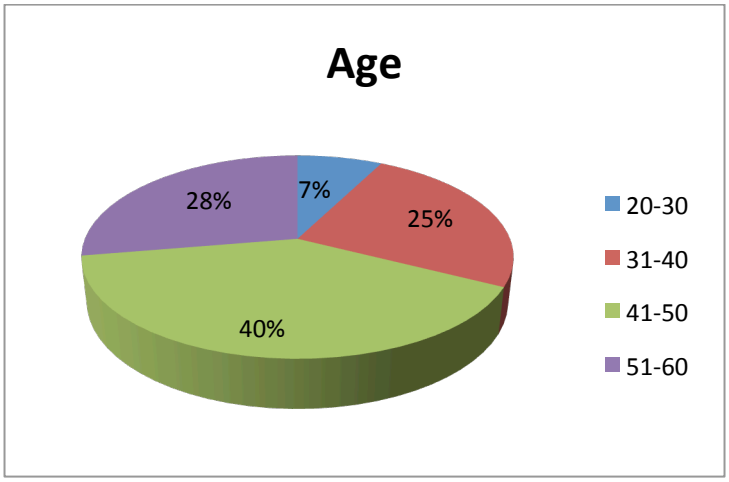


Table 43

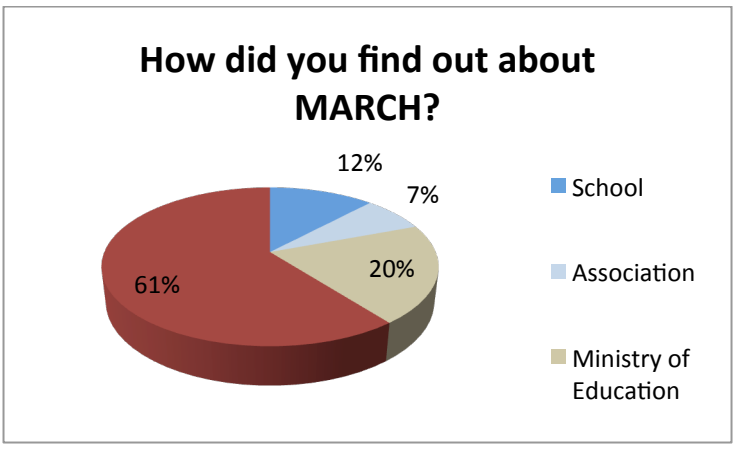


Table 44

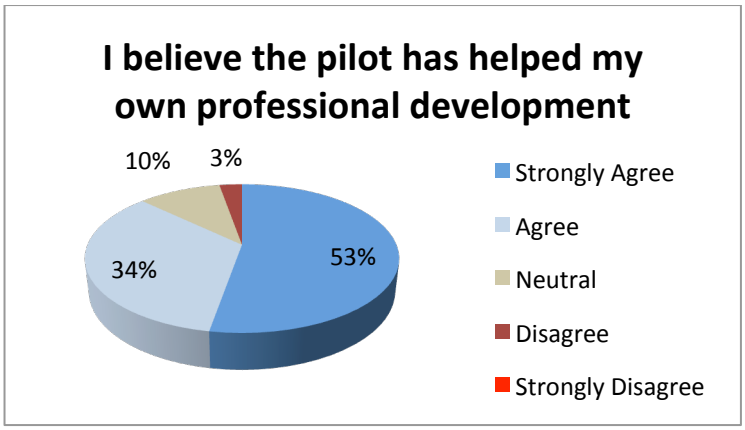


Table 45

Methodologies used for the statistical analysis

Before Analysis for Students

I like the idea of participating in the activity

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
I like the idea of participating in the activity	1774	1,8923	,89696	,02130

One-Sample Test

	Test Value = 5					
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
I like the idea of participating in the activity	-145,928	1773	,000	-3,10767	-3,1494	-3,0659

We can notice that the mean is 1,89 which represents that most of the students like the idea of participating in this activity before the activities to take place within their schools. The p-value equals less than 0.01 which means that it is statistical significant.

I like the idea of learning about science by working in a team

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Working in a team	1755	1,90	,891	,021

One-Sample Test

	Test Value = 5

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Working in a team	-145,774	1754	,000	-3,100	-3,14	-3,06

We can notice that the mean is 1,90 which represents that most of the students like the idea of learning about science by working in a team. The p-value equals less than 0.01 which means that it is statistical significant.

I like the idea of learning about science by using technology (software and hardware)

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
UseTechnology	1756	1,83	,826	,020

One-Sample Test

	Test Value = 5					
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
UseTechnology	-160,527	1755	,000	-3,165	-3,20	-3,13

We can notice that the mean is 1,83 which represents that most of the students like the idea of learning about science by using technology (software and hardware). The p-value equals less than 0.01 which means that this variable is statistical significant.

I like the idea of learning about science by interacting with real life researchers

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
InteractWithRealLife	1749	1,82	,843	,020

One-Sample Test

	Test Value = 5					
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
InteractWithRealLife	-157,607	1748	,000	-3,176	-3,22	-3,14

We can notice that the mean is 1,82 which represents that most of the students like the idea of interacting with real life researchers. The p-value equals less than 0.01 which means that this variable is statistical significant.

I like the idea of learning about science by using new media (video, social media, etc.)

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
UseNewMedia	1755	1,89	,883	,021

One-Sample Test

	Test Value = 5

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
UseNewMedia	-147,553	1754	,000	-3,109	-3,15	-3,07

We can notice that the mean is 1,89 which represents that most of the students like the idea of learning about science by using new media (video, social media etc.). The p-value equals less than 0.01 which means that this variable is statistical significant.

I like the idea of learning about science by mixing science and art (e.g. on a theatre play about science)

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
MixScience	1748	2,16	1,040	,025

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
MixScience	-114,053	1747	,000	-2,836	-2,88	-2,79

We can notice that the mean is 2,16 which represents that the students tend to like the idea of learning about science by mixing science and

art. The p-value equals less than 0.01 which means that this variable is statistical significant.

I like the idea of learning about science by doing outdoor activities

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Outdoors Activities	1753	2,06	,982	,023

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Outdoors Activities	-125,545	1752	,000	-2,945	-2,99	-2,90

We can notice that the mean is 2,06 which represents that the students tend to like the idea of learning about science by doing outdoor activities. The p-value equals less than 0.01 which means that this variable is statistical significant.

I like the idea of learning about science by doing experiments and crafts

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
ExperimetnsCrafts	1757	1,81	,845	,020

One-Sample Test

	Test Value = 5					
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ExperimetnsCrafts	-158,381	1756	,000	-3,194	-3,23	-3,15

We can notice that the mean is 1.81 which represents that the students tend to like the idea of learning about science by doing experiments and crafts. The p-value equals less than 0.01 which means that this variable is statistical significant.

I like the idea of learning about science by using new methods to learn science

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
New methods to learn science	1756	1,84	,813	,019

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper

New methods to learn science	-163,030	1755	,000	-3,164	-3,20	-3,13

We can notice that the mean is 1.84 which represents that most students like the idea of learning about science by using new methods to learn science. The p-value equals less than 0.01 which means that this variable is statistical significant.

I think the activity will be fun

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
ActivityFun	1758	1,80	,812	,019

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ActivityFun	-165,199	1757	,000	-3,199	-3,24	-3,16

We can notice that the mean is 1.80 which represents that most students were thinking that this activity would be fun. The p-value equals less than 0.01 which means that this variable is statistical significant.

I think the activity will be useful

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
ActivityUseful	1758	1,79	,785	,019

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ActivityUseful	-171,175	1757	,000	-3,206	-3,24	-3,17

We can notice that the mean is 1.79 which represents that most students were thinking that this activity would be fun. The p-value equals less than 0.01 which means that this variable is statistical significant.

I think the activity will help me understand a science topic better

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
BetterUnderstanding	1759	1,82	,825	,020

One-Sample Test

	Test Value = 5				
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference

					Lower	Upper
Better Understanding	-161,444	1758	,000	-3,175	-3,21	-3,14

We can notice that the mean is 1.79 which represents that most students think that this activity will help them to understand a science topic better. The p-value equals less than 0.01 which means that this variable is statistical significant.

Correlation with Interest in participating in the activity (3) with the rest variables and check if there is positive or negative correlation between them

Correlations

		LikeIdeaParticipating	WorkTeam
Like Idea Participating	Pearson Correlation	1	,755**
	Sig. (2-tailed)		,000
	N	1774	1755
WorkTeam	Pearson Correlation	,755**	1
	Sig. (2-tailed)	,000	
	N	1755	1755

There is a significant positive correlation between their interest in participating in this activity activity and their interest in working in teams r(1357)= 0.72, p < 0.1.

Students that like the idea of participating in this activity are those one who also like to work in a team.

Correlations

		LikeIdeaParticipating	UseTechnology
LikeIdeaParticipating	Pearson Correlation	1	,380**
	Sig. (2-tailed)		,000
	N	1774	1756
UseTechnology	Pearson Correlation	,380**	1
	Sig. (2-tailed)	,000	
	N	1756	1756

There is a significant positive correlation between their interest in participating in this activity activity and the idea of learning about science by using technology r(1754)= 0.38, p < 0.1.

Students that like the idea of participating in this activity are those one who also like the idea of learning about science by using technology.

Correlations

		UseTechnology	UseNewMedia
UseTechnology	Pearson Correlation	1	,511**
	Sig. (2-tailed)		,000

UseNewMedia	N	1756	1749
	Pearson Correlation	,511**	1
	Sig. (2-tailed)	,000	
	N	1749	1755

**. Correlation is significant at the 0.01 level (2-tailed).

There is a significant positive correlation between students who like the idea of learning about science by using technology and students who like the idea of learning about science by using new media $r(1753)= 0.51, p < 0.1$

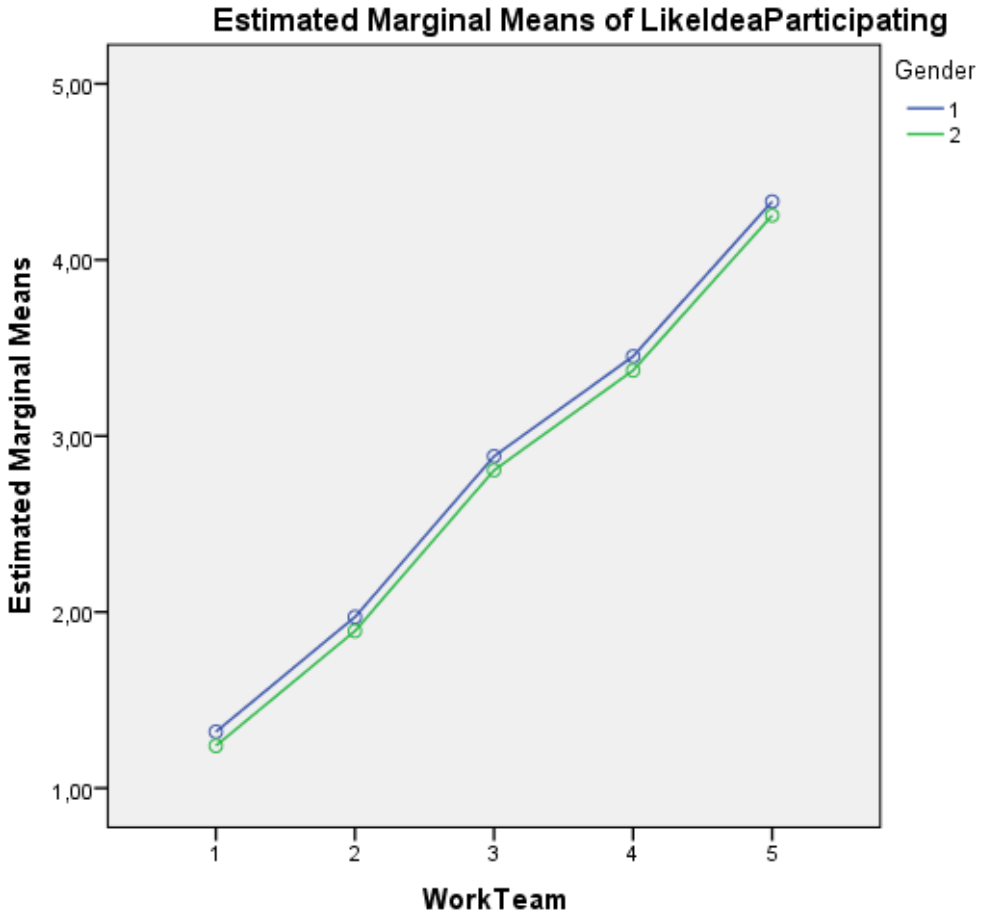
Students like to use not only technology but also the new media so as to learn science.

Correlations

		ActivityFun	ActivityUseful
ActivityFun	Pearson Correlation	1	,743**
	Sig. (2-tailed)		,000
	N	1758	1754
ActivityUseful	Pearson Correlation	,743**	1
	Sig. (2-tailed)	,000	
	N	1754	1758

**. Correlation is significant at the 0.01 level (2-tailed).

There is a significant positive correlation between students who were thinking that this activity would be fun and those who were thinking that this activity would be useful r(1756)= 0.74, p 0.1 Students were thinking that this activity would be fun and useful for them.



Tests of Between-Subjects Effects

Dependent Variable: LikeIdeaParticipating

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	783,312[a]	5	156,662	477,066	,000
Intercept	3238,518	1	3238,518	9861,885	,000
Gender	2,724	1	2,724	8,295	,004
WorkTeam	781,154	4	195,288	594,689	,000
Error	574,349	1749	,328		
Total	7779,000	1755			
Corrected Total	1357,662	1754			

a. R Squared = ,577 (Adjusted R Squared = ,576)

According to the 3way ANOVA analysis there is no significant difference between the preferences of the male and female in their answers. In the plot above, number 1 represents female and number 2 represents male. The dependent variable in this analysis is the interest of students to participate in this activity and the independent ones are the gender and their interest in working in teams. According to the analysis, the both independent variables are statistically significant with a p value equals less than 0.1.

Test of Homogeneity of Variances

LikeIdeaParticipating

Levene Statistic	df1	df2	Sig.

65,017	4	1750	,000

ANOVA

LikeIdeaParticipating

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	780,588	4	195,147	591,792	,000
Within Groups	577,073	1750	,330		
Total	1357,662	1754			

The F between groups is 591, 792 and it is statistically significant as it equals 0.000

The variances between within groups are statistically different from each other.

After Analysis for Students

I liked participating in the activity

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
LikeParticipating	1372	1,69	,874	,024

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
LikeParticipating	-140,427	1371	,000	-3,313	-3,36	-3,27

We can notice that the mean is 1,69 which represents that the students liked participating in this activity. The p-value equals less than 0.01 which means that this variable is statistical significant.

I liked working in a team

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
WorkingTeam	1371	1,70	,906	,024

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
WorkingTeam	-134,761	1370	,000	-3,297	-3,34	-3,25

We can notice that the mean is 1,70 which represents that the students liked working in a team. The p-value equals less than 0.01 which means that this variable is statistical significant.

I liked using technology (software and hardware)

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
UseTechnology	1356	1,70	,884	,024

One-Sample Test

	Test Value = 5				
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference

					Lower	Upper
UseTechnology	-137,628	1355	,000	-3,304	-3,35	-3,26

We can notice that the mean is 1,70 which represents that the students liked using technology (software and hardware) so as to learn the science better. The p-value equals less than 0.01 which means that this variable is statistical significant.

I liked interacting with real life researchers

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
InteractResearchers	1336	1,79	,916	,025

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
InteractResearchers	-127,912	1335	,000	-3,205	-3,25	-3,16

We can notice that the mean is 1,79 which represents that the students liked interacting with real life researchers. The p-value equals less than 0.01 which means that this variable is statistical significant.

I liked using new media (video, social media, etc.)

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
UseNewMedia	1337	1,76	,888	,024

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
UseNewMedia	-133,506	1336	,000	-3,244	-3,29	-3,20

We can notice that the mean is 1,76 which represents that the students liked using new media (video, social media etc.). The p-value equals less than 0.01 which means that this variable is statistical significant.

I liked mixing science and art

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
MixScienceArt	1307	1,90	1,031	,029

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
MixScienceArt	-108,656	1306	,000	-3,099	-3,15	-3,04

We can notice that the mean is 1,90 which represents that the students liked mixing science and art. The p-value equals less than 0.01 which means that this variable is statistical significant.

I liked going outdoors

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
GoOutdoors	1345	1,72	,890	,024

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GoOutdoors	-135,114	1344	,000	-3,277	-3,32	-3,23

We can notice that the mean is 1,72 which represents that the students liked going outdoors. The p-value equals less than 0.01 which means that this variable is statistical significant.

I liked doing experiments and crafts

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
ExperimentsCrafts	1354	1,68	,867	,024

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ExperimentsCrafts	-140,938	1353	,000	-3,321	-3,37	-3,27

We can notice that the mean is 1,68 which represents that the students liked doing experiments and crafts. The p-value equals less than 0.01 which means that this variable is statistical significant.

I liked using new and innovative methods to learn science

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
InnovativeMethods	1365	1,73	,870	,024

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
InnovativeMethods	-138,689	1364	,000	-3,267	-3,31	-3,22

We can notice that the mean is 1,73 which represents that the students liked using new and innovative methods to learn science. The p-value equals less than 0.01 which means that this variable is statistical significant.

The activity was fun

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
FunActivity	1375	1,65	,860	,023

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper

FunActivity	-144,581	1374	,000	-3,353	-3,40	-3,31

We can notice that the mean is 1,65 which represents that the students think that the activity was fun. The p-value equals less than 0.01 which means that this variable is statistical significant.

The activity was useful

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
UsefulActivity	1371	1,73	,884	,024

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
UsefulActivity	-137,128	1370	,000	-3,275	-3,32	-3,23

We can notice that the mean is 1,73 which represents that the students think that the activity was useful. The p-value equals less than 0.01 which means that this variable is statistical significant.

The pilot helped me understand a science topic better

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
UnderstndTopicB	1381	1,82	,917	,025

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
UnderstndTopicB	-128,982	1380	,000	-3,184	-3,23	-3,14

We can notice that the mean is 1,82 which represents that the students think that the pilot helped them to understand a science topic better. The p-value equals less than 0.01 which means that this variable is statistical significant.

I would like to participate in similar activities again

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
ParticipateAgain	1366	1,73	,949	,026

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ParticipateAgain	-127,124	1365	,000	-3,266	-3,32	-3,22

We can notice that the mean is 1,73 which represents that the students would like to participate in a similar activity in the future. The p-value equals less than 0.01 which means that this variable is statistical significant.

I feel this activity has increased my interest in science

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
IncreaseInterestScience	1351	1,91	1,015	,028

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
IncreaseInterestScience	-111,839	1350	,000	-3,088	-3,14	-3,03

We can notice that the mean is 1,91 which represents that the students feel that this activity has increased my interest in science. The p-value equals less than 0.01 which means that this variable is statistical significant.

I believe this was a high quality activity

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
HighQualityActivity	1332	1,78	,916	,025

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
HighQualityActivity	-128,304	1331	,000	-3,221	-3,27	-3,17

We can notice that the mean is 1,78 which represents that the students believe that this was a high quality activity. The p-value equals less than 0.01 which means that this variable is statistical significant.

Correlation with Interest in participating in the activity (3) with the rest variables and check if there is positive or negative correlation between them

Correlations

		LikeParticipating	WorkingTeam
LikeParticipating	Pearson Correlation	1	,724**
	Sig. (2-tailed)		,000
	N	1372	1359
WorkingTeam	Pearson Correlation	,724**	1
	Sig. (2-tailed)	,000	
	N	1359	1371

**. Correlation is significant at the 0.01 level (2-tailed).

There is a significant positive correlation between their interest in having participated in this activity activity and their interest in working in teams r(1357)= 0.72, p < 0.1.

Students not only liked participating in the activity but they also enjoyed working in teams.

Correlations

		UseTechnology	UseNewMedia
UseTechnology	Pearson Correlation	1	,711**
	Sig. (2-tailed)		,000
	N	1356	1329
UseNewMedia	Pearson Correlation	,711**	1
	Sig. (2-tailed)	,000	
	N	1329	1337

**. Correlation is significant at the 0.01 level (2-tailed).

There is a significant positive correlation between using technology to learn science and using new media to learn science r(1327)= 0.71, p < 0.1.

Students not only enjoyed using technology but also enjoyed using new media so as to learn science topics better.

Correlations

		FunActivity	UsefulActivity
FunActivity	Pearson Correlation	1	,791**
	Sig. (2-tailed)		,000
	N	1375	1361
UsefulActivity	Pearson Correlation	,791**	1
	Sig. (2-tailed)	,000	
	N	1361	1371

**. Correlation is significant at the 0.01 level (2-tailed).

There is a significant positive correlation between the idea that this was a fun and a useful activity activity r(1359)= 0.79, p < 0.1.

Correlations

		ParticipateAgain	LikeParticipating
ParticipateAgain	Pearson Correlation	1	,701**
	Sig. (2-tailed)		,000
	N	1366	1350
LikeParticipating	Pearson Correlation	,701**	1
	Sig. (2-tailed)	,000	
	N	1350	1372

**. Correlation is significant at the 0.01 level (2-tailed).

There is a significant positive correlation between their opinion that they liked participating in this activity and the idea that they would like to participate again in an activity like this r(1359)= 0.79, p < 0.1.

Correlations

		IncreaseInterestScience	HighQualityActivity
IncreaseInterestScience	Pearson Correlation	1	,739**
	Sig. (2-tailed)		,000
	N	1351	1329
HighQualityActivity	Pearson Correlation	,739**	1
	Sig. (2-tailed)	,000	
	N	1329	1332

**. Correlation is significant at the 0.01 level (2-tailed).

There is a significant positive correlation between their opinion that the activity increased their interest in science and that this was a high quality activity r(1327)= 0.73, p < 0.1.

Test of Homogeneity of Variances

LikeIdeaParticipating

Levene Statistic	df1	df2	Sig.
65,017	4	1750	,000

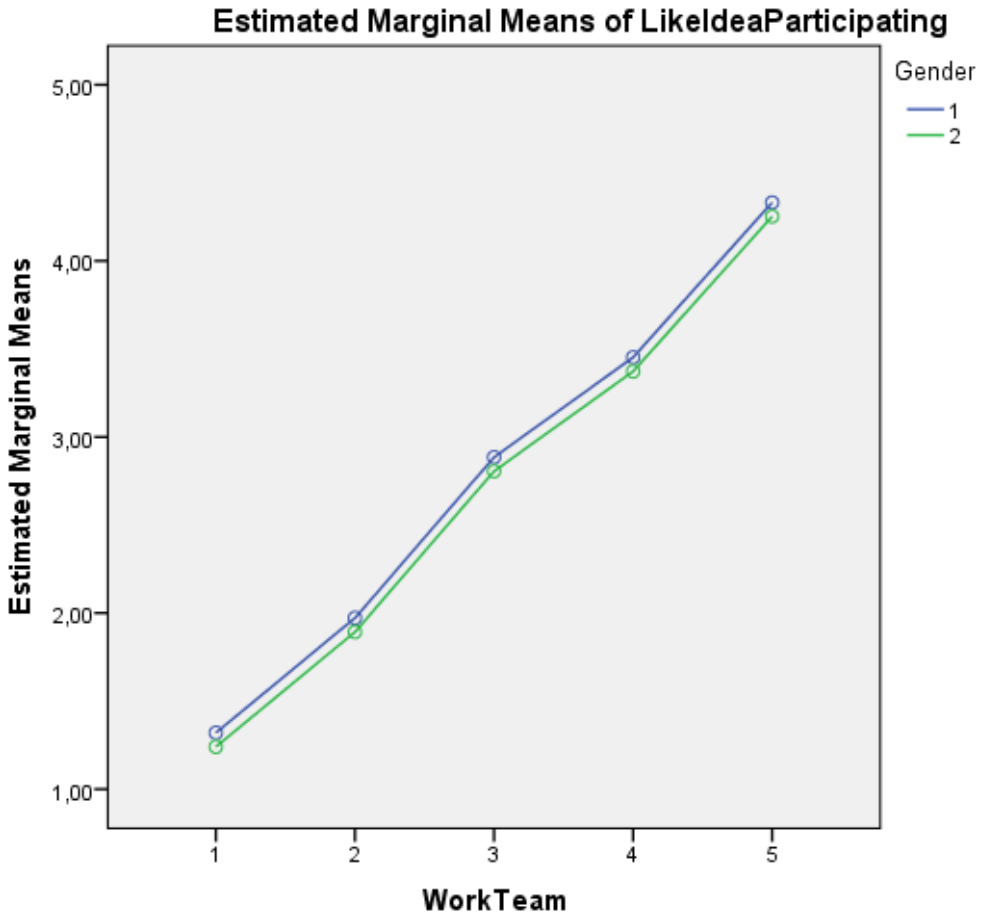
ANOVA

LikeIdeaParticipating

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	780,588	4	195,147	591,792	,000
Within Groups	577,073	1750	,330		
Total	1357,662	1754			

The F between groups is 591, 792 and it is statistically significant as it equals 0.000

The variances between within groups are statistically different from each other.



Tests of Between-Subjects Effects

Dependent Variable: LikeIdeaParticipating

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	783,312[a]	5	156,662	477,066	,000
Intercept	3238,518	1	3238,518	9861,885	,000

Gender	2,724	1	2,724	8,295	,004
WorkTeam	781,154	4	195,288	594,689	,000
Error	574,349	1749	,328		
Total	7779,000	1755			
Corrected Total	1357,662	1754			

a. R Squared = ,577 (Adjusted R Squared = ,576)

According to the 3way ANOVA analysis there is no significant difference between the preferences of the male and female in their answers. In the plot above, number 1 represents female and number 2 represents male. The dependent variable in this analysis is the interest of students of having participated in this activity and the independent ones are the gender and their interest in working in teams. According to the analysis, the both independent variables are statistically significant with a p value equals less than 0.1.

Before Analysis Teachers

I believe that the pilot will inform students on job options associated with my subject

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
InformStudents	235	1,8596	,81745	,05332

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
InformStudents	-58,892	234	,000	-3,14043	-3,2455	-3,0354

We can notice that the mean is 1,85 which represents that most of the teachers believed that the pilot would inform students on job options associated with their subject. The p-value equals less than 0.01 which means that it is statistical significant.

I believe that the pilot will help me find out about innovative practices from all over Europe

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
FindInnovativePractices	235	1,5660	,77825	,05077

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
FindInnovativePractices	-67,643	234	,000	-3,43404	-3,5341	-3,3340

We can notice that the mean is 1,56 which represents that most of the teachers believed that the pilot would help them to find out about innovative practices from all over Europe. The p-value equals less than 0.01 which means that it is statistical significant.

I believe that the pilot will help my own professional development

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
ProfessionalDevelopment	235	1,4979	,71835	,04686

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ProfessionalDevelopment	-74,736	234	,000	-3,50213	-3,5944	-3,4098

We can notice that the mean is 1,49 which represents that most of the teachers believes that the pilot would help their own professional development. The p-value equals less than 0.01 which means that it is statistical significant.

I believe that the pilot will help me collaborate constructively with colleagues

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
CollaborateWithColleagues	235	1,5064	,68793	,04488

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
CollaborateWithColleagues	-77,851	234	,000	-3,49362	-3,5820	-3,4052

We can notice that the mean is 1,50 which represents that most of the teachers believed that the pilot would help them to collaborate constructively with their colleagues. The p-value equals less than 0.01 which means that it is statistical significant.

Correlation between the variables so as to check if there is positive or negative correlation between them

Correlations

		ProfessionalDevelopment	Gender
ProfessionalDevelopment	Pearson Correlation	1	,041
	Sig. (2-tailed)		,536

	N	235	234
	Pearson Correlation	,041	1
Gender	Sig. (2-tailed)	,536	
	N	234	238

There is a significant positive correlation between their belief that this pilot would help their professional development and the gender r(232)= 0.04, p > 0.1.

Gender is not statistically significant.

Correlations

		Gender	FindInnovativePractices
Gender	Pearson Correlation	1	,243**
	Sig. (2-tailed)		,000
	N	238	234
FindInnovativePractices	Pearson Correlation	,243**	1
	Sig. (2-tailed)	,000	
	N	234	235

**. Correlation is significant at the 0.01 level (2-tailed).

There is a significant positive correlation between their belief that through this pilot they would find innovative practices and the gender r(232)= 0.24, p <0.1.

Correlations

		Gender	CollaborateWithColleagues
Gender	Pearson Correlation	1	,163*
	Sig. (2-tailed)		,013
	N	238	234
CollaborateWithColleagues	Pearson Correlation	,163*	1
	Sig. (2-tailed)	,013	
	N	234	235

*. Correlation is significant at the 0.05 level (2-tailed).

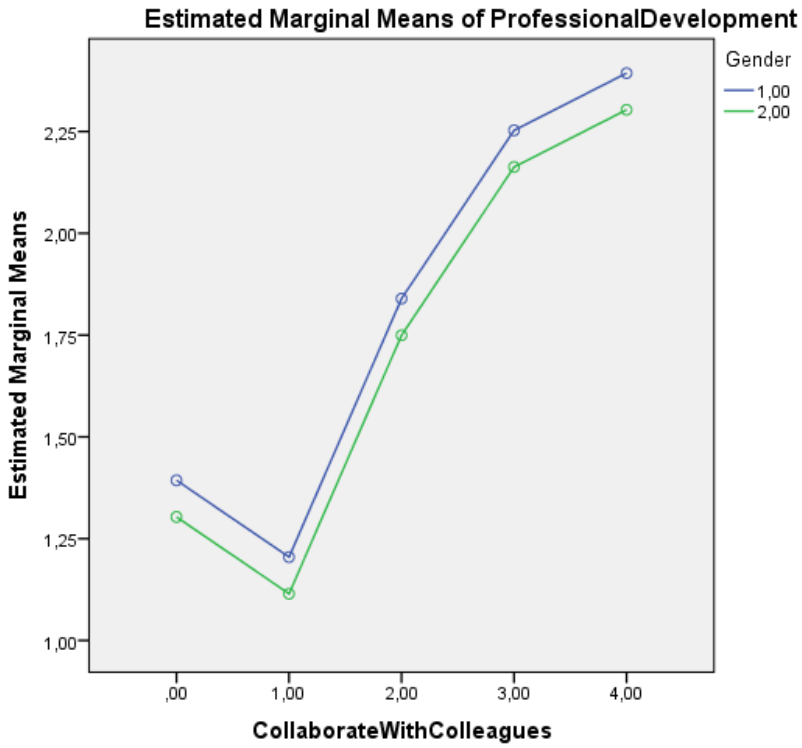
There is a significant positive correlation between their belief that through this pilot they ccould collaborate constructively with their colleagues and the gender r(232)= 0.16, p <0.1.

Correlations

		InformStudents	FindInnovativePractices
InformStudents	Pearson Correlation	1	,394**
	Sig. (2-tailed)		,000
	N	235	235
FindInnovativePractices	Pearson Correlation	,394**	1
	Sig. (2-tailed)	,000	
	N	235	235

**. Correlation is significant at the 0.01 level (2-tailed).

There is a significant positive correlation between their belief that this pilot would inform students on job opportunities related with their subject and their belief that this pilot would help them to find innovative practices r(233)= 0.39, p <0.1.



Tests of Between-Subjects Effects

Dependent Variable: ProfessionalDevelopment

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	30,566[a]	5	6,113	15,499	,000
Intercept	102,945	1	102,945	260,996	,000
Gender	,274	1	,274	,695	,405
CollaborateWithColleagues	30,366	4	7,592	19,247	,000
Error	89,930	228	,394		
Total	644,000	234			
Corrected Total	120,496	233			

a. R Squared = ,254 (Adjusted R Squared = ,237)

According to the 3way ANOVA analysis there is no significant difference between the preferences of the male and female in their answers. In the plot above, number 1 represents female and number 2 represents male. The dependent variable in this analysis is the belief of the teachers that this pilot would help them to improve their professional development and the independent ones are the gender and their belief that through this pilot they could collaborate constructively with their colleagues. According to the analysis, the gender is not statistically significant with a p value equals more than 0.1.

Test of Homogeneity of Variances

ProfessionalDevelopment

Levene Statistic	df1	df2	Sig.
22,933	4	230	,000

ANOVA

ProfessionalDevelopment

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	30,513	4	7,628	19,444	,000
Within Groups	90,236	230	,392		
Total	120,749	234			

The F between groups is 19,444 and it is statistically significant as it equals 0.000

The variances between within groups are statistically different from each other.

After Analysis Teachers

I believe the pilot has informed students on job options associated with my subject

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
InformedStudents	219	1,9041	,94088	,06358

One-Sample Test

	Test Value = 5					
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
InformedStudents	-48,694	218	,000	-3,09589	-3,2212	-2,9706

We can notice that the mean is 1.90 which represents that most teachers believe that the pilot has informed students on job options associated with their subject. The p-value equals less than 0.01 which means that this variable is statistical significant.

I believe the pilot has helped me find out innovative practices from all over Europe

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
FindInnovativePractices	219	1,9315	,95296	,06440

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper

FindInnovativePractices	-47,651	218	,000	-3,06849	-3,1954	-2,9416

We can notice that the mean is 1.93 which represents that most teachers believe that the pilot has helped them to find out innovative practices from all over Europe. The p-value equals less than 0.01 which means that this variable is statistical significant.

I believe the pilot has helped my own professional development

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
HelpedProfessionalDevelopment	217	1,6221	,78473	,05327

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
HelpedProfessionalDevelopment	-63,409	216	,000	-3,37788	-3,4829	-3,2729

We can notice that the mean is 1.62 which represents that most teachers believe that the pilot has helped them to their professional development. The p-value equals less than 0.01 which means that this variable is statistical significant.

I believe the pilot has helped me collaborate constructively with colleagues

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
HelpedCollaborate	219	1,9680	1,20545	,08146

One-Sample Test

	Test Value = 5					
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ollaborateConstructively	-63,409	216	,000	-3,37788	-3,4829	-3,2729

We can notice that the mean is 1.96 which represents that most teachers believe that the pilot had helped them to collaborate constructively with their colleagues. The p-value equals less than 0.01 which means that this variable is statistical significant.

I believe the pilot has inspired me to use new practices in my teaching

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
UseNewPractices	181	2,1878	1,28585	,09558

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
UseNewPractices	-29,423	180	,000	-2,81215	-3,0007	-2,6236

We can notice that the mean is 2,18 which represents that most teachers were inspired to use new practices in their teaching. The p-value equals less than 0.01 which means that this variable is statistical significant.

I believe the pilot a high quality pilot

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
HighQualityPilot	181	1,6740	,81571	,06063

One-Sample Test

	Test Value = 5					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
HighQualityPilot	-54,856	180	,000	-3,32597	-3,4456	-3,2063

We can notice that the mean is 1.67 which represents that for most teachers this was a high quality project. The p-value equals less than 0.01 which means that this variable is statistical significant.

Correlation between the variables to check if there is positive or negative correlation

Correlations

		Gender	InformedStudents
Gender	Pearson Correlation	1	,033
	Sig. (2-tailed)		,734
	N	159	110
InformedStudents	Pearson Correlation	,033	1
	Sig. (2-tailed)	,734	
	N	110	219

There is a significant positive correlation between their belief that this pilot informed students about job opportunities related with their subject and the gender r(109)= 0.03, p > 0.1.

Gender is not statistically significant in correlation with this variable.

Correlations

		Gender	HighQualityPilot
Gender	Pearson Correlation	1	-,015
	Sig. (2-tailed)		,887
	N	159	96
HighQualityPilot	Pearson Correlation	-,015	1
	Sig. (2-tailed)	,887	
	N	96	181

There is a significant negative correlation between their belief that this pilot was of high quality and the gender r(98)= - 0.015, p > 0.1.

Gender is not statistically significant in correlation with this variable.

Correlations

		Gender	ollaborateConstructively
Gender	Pearson Correlation	1	,004
	Sig. (2-tailed)		,962
	N	159	158
HelpedProfessionalDevelopment	Pearson Correlation	,004	1
	Sig. (2-tailed)	,962	
	N	158	217

There is a significant positive correlation between their belief that this pilot helped them improve their professional development and the gender r(156)= 0.04, p > 0.1.

Gender is not statistically significant in correlation with this variable.

Correlations

		HighQualityPilot	InformedStudents
HighQualityPilot	Pearson Correlation	1	,411**
	Sig. (2-tailed)		,000
	N	181	181
InformedStudents	Pearson Correlation	,411**	1
	Sig. (2-tailed)	,000	
	N	181	219

**. Correlation is significant at the 0.01 level (2-tailed).

There is a significant positive correlation between their belief that this pilot was of high quality and that it informed students about job opportunities related with their subject (179)= 0.41, p < 0.1.

Correlations

		UseNewPractices	HelpedCollaborate
UseNewPractices	Pearson Correlation	1	,723**
	Sig. (2-tailed)		,000
	N	181	181
HelpedCollaborate	Pearson Correlation	,723**	1
	Sig. (2-tailed)	,000	
	N	181	219

**. Correlation is significant at the 0.01 level (2-tailed).

There is a significant positive correlation between their belief that this pilot helped them to collaborate constructively with their colleagues and through this pilot they used new practices in their teaching r(179)= 0.72, p < 0.1.

Correlations

		UseNewPractices	FindInnovativePractices
UseNewPractices	Pearson Correlation	1	-,025
	Sig. (2-tailed)		,738
	N	181	181
FindInnovativePractices	Pearson Correlation	-,025	1
	Sig. (2-tailed)	,738	
	N	181	219

There is a significant negative correlation between their belief that through this pilot they used new practices in their teaching and that

they found innovative practices across all Europe r(179)= - 0.025, p > 0.1.

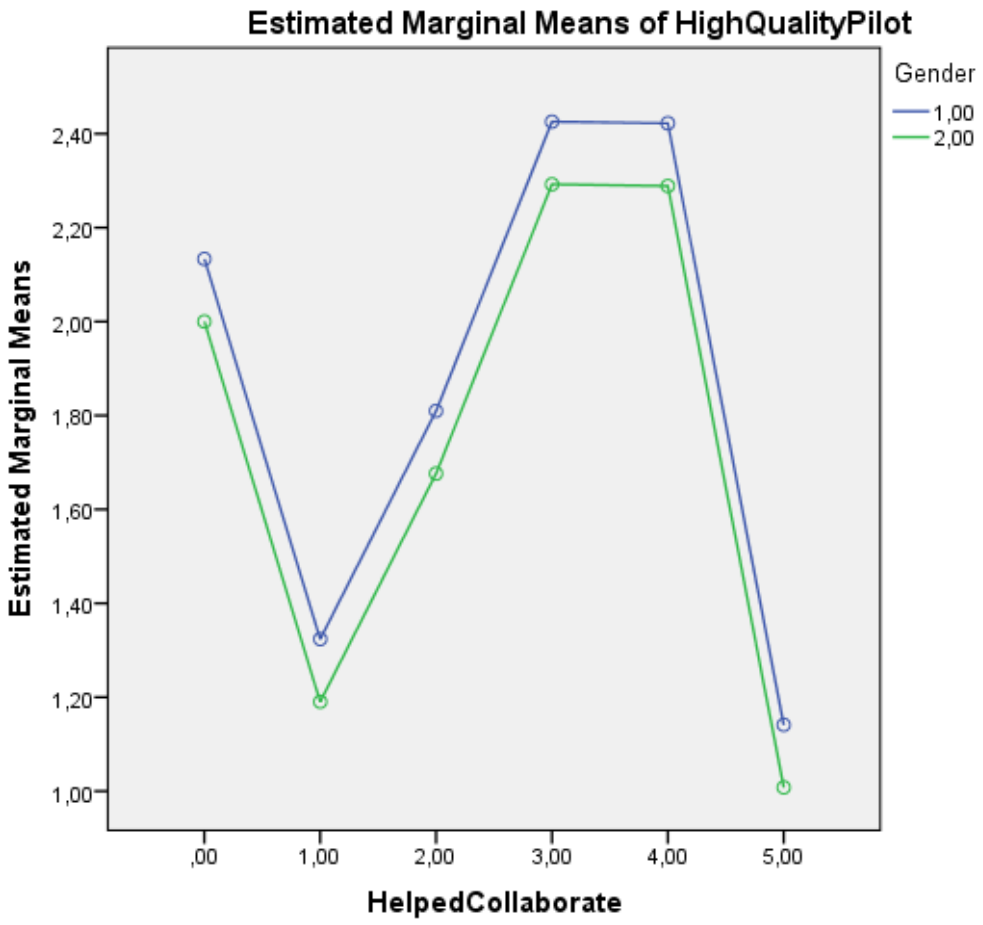
Finding Innovative Practices is not statistically significant in correlation with this variable of use of new practices in their teaching.

Correlations

		UseNewPractices	InformedStudents
UseNewPractices	Pearson Correlation	1	,041
	Sig. (2-tailed)		,588
	N	181	181
InformedStudents	Pearson Correlation	,041	1
	Sig. (2-tailed)	,588	
	N	181	219

There is a positive correlation between their belief that through this pilot they used new practices in their teaching and that this pilot informed students bout job opportunities related to their subject r(179)= 0.041, p > 0.1.

Informing Students for job opportunities related to their subject is not statistically significant in correlation with this variable of use of new practices in their teaching.



Tests of Between-Subjects Effects

Dependent Variable: HighQualityPilot

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	17,144[a]	6	2,857	10,375	,000
Intercept	76,133	1	76,133	276,429	,000
Gender	,306	1	,306	1,112	,294
HelpedCollaborate	17,135	5	3,427	12,443	,000
Error	24,512	89	,275		
Total	305,000	96			

Corrected Total	41,656	95			

a. R Squared = ,412 (Adjusted R Squared = ,372)

According to the 3way ANOVA analysis there is no significant difference between the preferences of the male and female in their answers. In the plot above, number 1 represents female and number 2 represents male. The dependent variable in this analysis is the belief of the teachers that this pilot was of high quality and the independent ones are the gender and their belief that this pilot helped them to collaborate constructively. According to the analysis, the gender is not statistically significant with a p value equals more than 0.1.

Test of Homogeneity of Variances

HighQualityPilot

Levene Statistic	df1	df2	Sig.
2,903	1	94	,092

ANOVA

HighQualityPilot

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,009	1	,009	,020	,887
Within Groups	41,647	94	,443		
Total	41,656	95			

The F between groups is 0,020 and it is not statistically significant as it equals 0.887

The variances between within groups are not statistically different from each other.

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