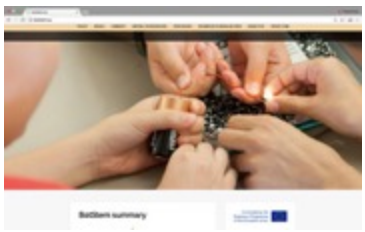
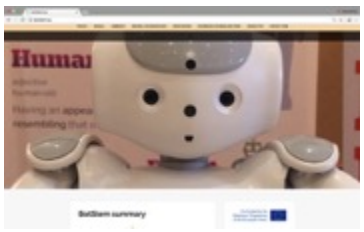
Erasms+ KA2 Project

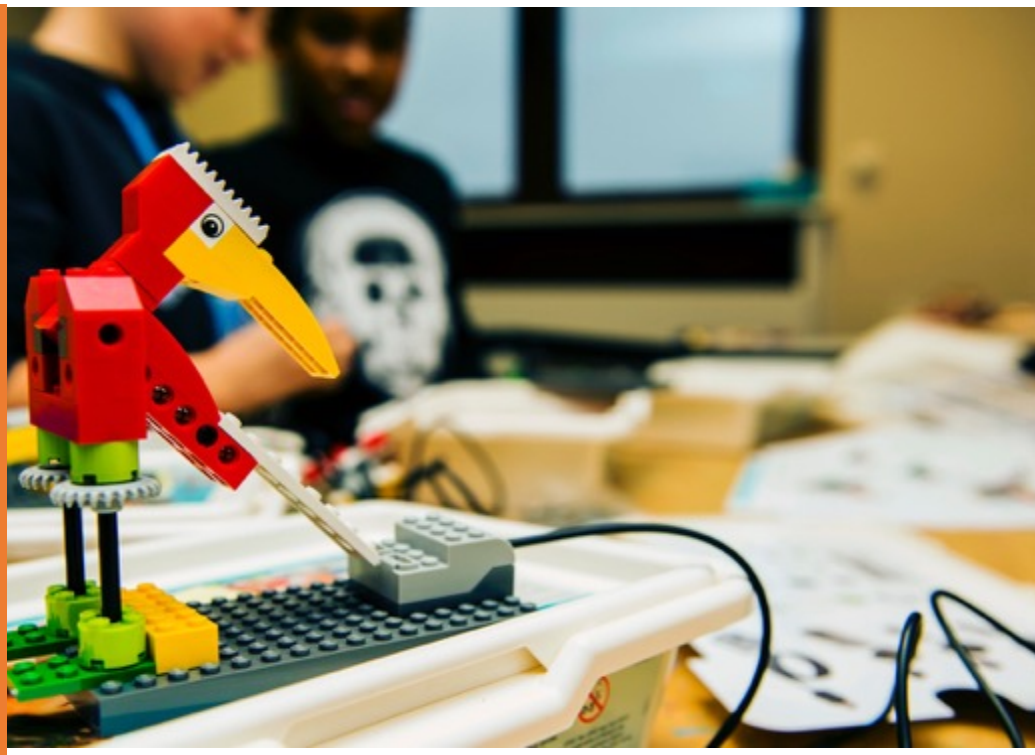
2017-1-ES01-KA201-038204

botSTEM

botSTEM: rBOTics & STEM education for primary schools | http://botstem.eu | Newsletter # 1 | April 2018 |

CONTENTS:



Why STEM?

In a highly specialized and technologized world, a critical and competent citizenship in science and technology is more needed than ever. STEM (Science, Technology, Engineering, and Mathematics) could be addressed since early childhood promoting an active and participative methodology, focused on inquiry-based learning and collaborative projects. Also, Educational Technology – such as robotics and code-learning – brings new opportunities for designing attractive approaches and tools to improve the engagement of kids, enhancing the academic outcomes in Science, Maths and Technology subjects and increase the scientific vocations.

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The Project

Recent research have demonstrated that early techno-scientific literacy in children as young as 4 years old could improve their long-term achievement in STEM fields and raise the scientific and technological vocations, especially for girls.

Competencies acquired during childhood, including design thinking, inquiry, coding and robotics, are transferable to other areas. These skills are applicable to all areas during their whole academic and labour life.

BOTSTEM aims to develop a new methodology for integrating STEM programmes into the formal education curricula for childhood and primary schools (4-8 y.o.), using inquiry teaching and educative robotics and code-learning

Its main objectives are:

- To improve the potential students' achievement applied to STEM subjects, particularly in Natural Sciences and Mathematics
- To implement innovative methodologies, using inquiry teaching and computational thinking.
- To develop tools, resources and methods specifically developed for teachers, more motivating and appealing from the point of view of students from 4 to 8 years old.

BOTSTEM will implement inquiry teaching units with a robot-based approach, including code-learning, for enhancing the education in STEM fields.

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The Partnership

Applicant Organisation
UNIVERSIDAD DE BURGOS

UNIVERSIDAD DE BURGOS

The University of Burgos (UBU) was founded in 1994 and has assumed its role in the local and regional economy and in the larger scientific development responding to market demands (e.g. new grades in accordance to the needs of the labour market) and developing wide research networks (e.g. integrated research between the university, the private sector, public institutions, and civil society organizations). UBU has experience on delivering successful European Projects

Our group consists in researchers with a broad formation in science and science education. We are teachers in the Faculty of Education of the University of Burgos, being responsible for the training in science contents and science education methodology for future k-12 and secondary teachers. We also teach in doctoral international programs in science education. We have a broad experience in the research in the professional development of pre service and in service teachers of K-12 and secondary levels in science education, in particular in the constitution of communities of practice. We have experience in National, European and International projects. In recent years, we have been studying and improving how to train pre-service teachers for science teaching by inquiry, within an integrative and inclusive perspective. In this line, we develop a successful extra-curricular activity, for pre-service teachers and kids, *Science on Saturdays*, whereby funny scientific problems are solved by inquiry. http://www.ubu.es/divulgacion-cientifica-ucci-ubu/vocaciones-cientificas/sabados-de-ciencia

This year we´ve launched the on-line postgraduate degree *STEAM EDUCATION , with programming & educational robotics*, the first degree of this kind in SPAIN. http://www.ubu.es/noticias/nace-el-titulo-de-experto-en-steam

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ADELE ROBOTS

Spanish Partner
ADL - ADELE ROBOTS SOCIEDAD LIMITADA
LLANERA ASTURIAS

Adele
FEELING ROBOTS

In late 2010, framed under innovation and new technologies, Adele Robots arose from a group of entrepreneurs who seek to improve the people's life making use of robotics. Adele Robots offers robotic solutions to human problems, using the latest trends in technology and human machine interaction identified by the technological surveillance department. The company develops its own products and provides consulting services and advice in the field of social robotics to companies that believe in a new way of interaction and of provisioning services to their clients.
Adele Robots' products and services are targeting the following industries:

- Marketing: creating robots that get people attention and interact with them
- Education: Providing teachers new tools to motivate children and stimulate their interest for STEM
- Healthcare: Therapy robots for dementia and new interfaces for enabling people access to new services at their homes.
- Research interest focus on human-robot interaction and human modelling to provide easier ways to interact with technology.

Relevant publications

- Martínez, C. Á., & Cruz, A. B. (2005, August). Emotion recognition in non-structured utterances for human-robot interaction. In Robot and Human Interactive Communication, 2005. ROMAN 2005. IEEE International Workshop on (pp. 19-23). IEEE.
-

R&D projects coordinated by them, involving several partners of all kinds:

- FED4FIRE FIONA (http://www.fed4fire.eu/fiona/): within an open call launched by FED4FIRE, an Integrating Project under the European Union's Seventh Framework Programme (FP7) addressing the work programme topic Future Internet Research and Experimentation, Adele Robots has been granted to include FIONA as a testbed of FED4FIRE federation.
- FIONA (http://www.sparkingtogether.com/): Led by Adele Robots, Fiona was a R&D project in social robotics that aims to build a collaborative platform to develop a conversational agent. With a budget of over half a million Euros it is funded by the program NEOTEC from the Spanish CDTI (Centre for Industrial Technical Development), for new creation companies.
- ACROSS (http://www.acrosspse.com/): ACROSS is a large public-private-partnership R&D project, with a budget of 6M€, involving 13 organizations cooperating in the field of social robotics. Research and industrial institutions takes part in ACROSS, including end-users from several application domains.

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KRISTIANSTAD UNIVERSITY

Swedish Partner
HKR-KRISTIANSTAD UNIVERSITY

Kristianstad University (HKR) is a Swedish university with around 15 000 students, which started as a teacher college in 1835. HKR, located in a campus 10 minutes outside Kristianstad centre, has over a hundred partner universities in the world and receives around two hundred international students each year. HKR campus houses four faculties situated around a central library. The library provides not only journals, books and digital resources, but also professional support in information evaluation, search strategies and higher education didactics. For a general description of the university, see www.hkr.se.

The active partner in botSTEM is the Department of Mathematics and Science Education at the Faculty of Education, which has an extensive tradition in teaching mathematics and science in pre- and in-service teacher education programmes and courses for preschool, primary, secondary, and upper-secondary levels. The Department houses the research environment LISMA (Learning in Science and Mathematics) with internationally renowned research in the field of mathematics and science education, for further information see www.hkr.se/lisma.

The in botSTEM involved researchers are Dr Andreas Redfors Professor of Physics Education. Andreas is the academic leader of the research group Learning in Science and Mathematics. Among Andreas' research interests are the roles of theoretical models and mathematics in children's and students' learning. He is generally interested in the relation between views on the nature of Science, mathematics and the teaching and learning of Science in connection to uses of ubiquitous technology. Dr Marie Fridberg Senior lecturer in Science Education at Kristianstad University, Sweden. She is a preschool teacher with a PhD in Medical Microbiology. Marie's research focus is ubiquitous computing and uses of computer tablets among young children. Björn Cronquist Lecturer in Science and Technology. He is working on completing a PhD in Informatics and teaches Technology and computing at the Early-Years and primary Teacher Educations. Björn has a research interest in ubiquitous computing, especially in developing teaching activities related to uses of tablet computers, robots and programming in early-years education.

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IDEODROMION

Cypriot Partner

IDEODROMION

IDEODROMION is a non-profit research organisation and has been organising every year more than 100 events and workshops on various scientific areas, inviting guest speakers that specialize in their fields, including Robotics, Artificial Intelligence, Programming and 3D Printing. In the past year alone, IDEODROMION, in collaboration with the Ministry of Education and Culture (Cyprus) and other respected organisations such as the Frederick University, has organized more than 80 workshops that are open for schools, training more than 2000 students (11 – 15) on computer programming and robotics, using various types of educational robots. Workshops are free for schools and teachers, and part of the funding has come from european and other grants.

IDEODROMION has also received the Google RISE Awards Grant, and is organizing workshops for teachers, parents and students to promote collaboration on a bicommunal level (Greek and Turkish Cypriots) in Robotics and Programming.

These series of workshops and trainings, including the summer school (June – July 2017) aim to help the reconciliation efforts between the two communities, that are running at this time, under the good services of the UN Secretary General.

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POLO EUROPEO

Italian Partner
POLO EUROPEO della CONOSCENZA
VERONA

Polo Europeo della Conoscenza – I.C. Lorenzi-europole – National Network of Schools for Pedagogical Research and Innovation is a public body no profit – National network (200 Organizations) of schools of every order and Degree working for the European social and educational integration and for the innovation of the pedagogical research in Europe. Its main fields of activities are to promote the European dimension and integration through European and extra - European workshops, seminars, conferences, partnerships and projects. The Europole is planning "umbrella activities" involving in the projects the greatest possible number of institutions of the consortium. The Europole works in every field of education, from ITC to in-service training courses for teachers , from Kindergartens to adult education in prison and in rural areas. It works also on fighting against xenophobia and racism, helping to break stereotypes around gender among different cultures and religions, training of students , of disable students and drop outs, intercultural learning and vocational training field.

The 4000 members of the network are working with learners at risk of social and cultural exclusion: immigrants, refugees, disable, drop-out and learners with separated parents, social psychological borderline situations, bullish, learners with

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KVELOCE

Spanish Partner

K-VELOCE I+d+i (SENIOR EUROPA S.L) is an SME specialized in the development, implementation and exploitation of R&D projects and their funding with over 10 years of experience. K-veloce research lines are focused on the field of social policies, and specifically citizen social participation, socio-economic analysis of policies, initiatives and action plans, and accessibility, and nowadays, they are opening new lines in human behaviour, research in evaluation of the socio-economic impact of technology, new business models, social innovation, participatory processes, co-creation and new governance models.

The geographic outreach of Kveloce I+D+i covers the European and international scope, being located in three Spanish regions: Valencia, Asturias and Cataluña.

The company cooperates with several national and regional authorities and Research centres, among them the University of Valencia, Regional Health Ministry, Regional Ministry of Environment, Water and Building, the Valencia Business Confederation, the Chamber of Commerce of Alicante, Valencia, Navarra and Cantabria, among others. Furthermore, the company has strong expertise in knowledge management for innovative companies and develops strategic plans to manage the innovation and transfer it to market. Besides, the company is also involved in academic initiatives, and has joined several programmes (H2020, FP7, Erasmus+) in projects related with development of ICT platforms, gamification and game-based education, social inclusion, accessibility, healthcare and other social impacts.

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Good Practice: UNA GRUTA MISTERIOSA

UNA GRUTA MISTERIOSA (A MYSTERIOUS CAVERN) - by Ileana María Greca Dufranc University of Burgos, in the baccalaureate Degree in primary Education.- Age of the students 6-8

Students discover simple machines and experiment with the application and utility of the inclined plane to build roads. The following steps are followed:

1. Present the problematic situation and ask the students to elaborate group hypotheses about it. Eg: "If the road is dirt, when it rains it will be slippery".

2. Present the "Student Card 1" and explain the data record box. (the card appears in the link below)

3. Following the instructions of the "Student Card 1", allow time for students to build the inclined plane.

4. As a group, students have to establish hypotheses that will later be tested through experimentation. In the first section, the influence of the type of surface of the inclined plane is studied, and in the second, the inclination of the same.

5. Students should place a LEGOTM block on the base of the inclined plane, and tie it to a bag that is placed on the pulley.

6. Next, insert coins into the bag until the cube has climbed the inclined plane.

7. Using the aid of the dynamometer, check the force that the coins have exerted in each case (smooth, normal or rough surface, or little and much inclination) to transport the LEGOTM cube**.**

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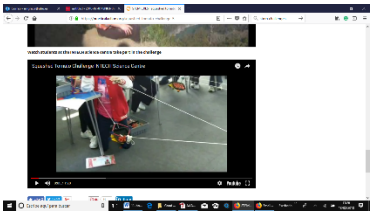
Good Practice: SQUASHED TOMATOES



URL:
https://www.stem.org.uk/rxuh3
this ptactice was first published by Practical Action Stem challenges
https://practicalaction.org/stem

Introduce the challenge by discussing the various ways in which food is transported from where it is produced to the local market or shop.

The problem: Many farmers in Nepal grow their crops (including tomatoes) on the mountainside. To sell them at the local market they need to transport them to the bottom of the mountain, BUT it's a long and hazardous journey and they need to cross a river. Tomatoes are quite easily squashed so need to be transported with care

The challenge: . The students work in small groups to design and build a model that can transport as many cherry tomatoes at the same time without squashing them.

The tomatoes need to be transported a minimum of one metre along the ground starting from desk height. However, the challenge is more spectacular, and you are more likely to get squashed tomatoes if you set a height of more than two metres, and a horizontal distance of 1.5 - 2 metres. The tomatoes cannot be touched whilst they are moving, catapulted or 'flown' in any way. They must be moved in a controlled way so they don't just crash into the ground and get squashed.

Use the record sheet to calculate the best or average weight of tomatoes each group transported. From this deduce the class average. Maybe extend into a competition between classes within a year group. Use the information to discuss averages, produce graphs etc.

If you reset the parameters of the challenge, so that students aim to transport the maximum weight of tomatoes with in a set time limit (e.g. 5 minutes) how would this affect the results? Can students work out how much they could move in 1, 5 or 10 hours (not forgetting the time needed to refill the containers and transport them back up the mountain)?

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by Eva a grade 1-7 teacher (for the last 20 years she has been working with grade 1-3, in primary school).

Age of the students: 7-9

Materials/Resources/technical requirements: Bluebots, stop-watch, ruler measuring tape, different ground material such as a rug, a cloth, the bare floor

The children work in groups of three. The aim of the exercise is for the children to measure and compare how far the bluebot can move forward in a certain time and on different materials. For this, they use a stop-watch and the bare floor, a rug, a ribbed cloth, etc, and a ruler or a measuring tape. They program the bluebot to move forward on different materials and use the stop-watch to measure the desired time for it to move, such as for instance 30 seconds. After the 30 seconds and the stop, the children use the ruler or measuring tape to measure the distance the robot walked. They compare the distance for different materials used and discuss the outcome in relation to the materials. The textures are examined hands-on. How can they make the robot move faster on a certain material? Slower?

PROCESSES OF INQUIRY IN PRE-PRIMARY'S STUDENTS: CRYSTALLOGRAPHY

Espiciencia born in 2010 by PhD. Bárbara de Aymerich, fruit of her inquest in the rural world. Performed in Espinosa de los Monteros (Burgos)

Age of the students: 4-11

Educational goals of the practice:

1. Introduce the student in the scientific method from the inquiry: study of the problem, hypothesis setting, experimentation and obtaining results, verification of the hypotheses proposed and discussion and elaboration of conclusions.
2. Encourage the curiosity of the child for the world of science, stimulating their critical sense and logical-rational spirit.
3. Stimulate the participation of the family in the knowledge and practice of science as a driving vehicle for new vocations.
4. Introduce children to the elements of scientific experimentation such as materials, safety standards and protocols.
5. Know the geology of the area, specifying if there are mineral deposits and their crystallography.

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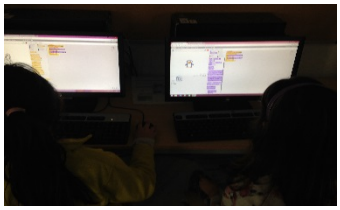
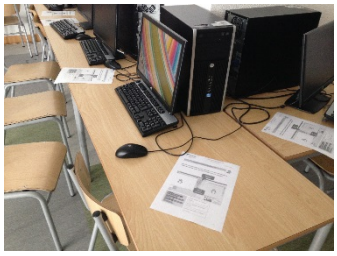
Good Practice: TRANSFORMING FAMILY PROPS INTO A SCRATCH GAME



Caption:



Caption:

By Tito Lívio Filipe teacher of Informatics and Programming in secondary education since 1991.

Age of the students: from 6 onwards

The class is divided in small groups

1. Each group of two students takes a homework assignment, which consists in asking the parents or grandparents to tell them a popular proverb, each member of the group should bring the proverb written on a sheet of paper where you should also put an illustrative drawing. All proverbs collected should be written in an individual word document, which should leave in the working environment of the computer with the identification name of the proverb trace the first last name of the student (20 mins).
2. The teacher should take a picture of each sheet that the students took home with the drawing, then put the photos in Google Photos. The students should then put in a Padlet all the sayings "Text written on the computer" and the teacher should share the photo with the text and drawing. Then the students go online to create the story in Scratch. Alternatively if time is running out we can always give a list of proverbs for them to choose one. Recording in audacity the students' proverbs converting them to mp3 and then putting them in Scratch can also be a different way of using one more resource. (40 mins)
3. Motivation for the teacher: the teacher will have the possibility to see his students develop their stories independently and animate them in Scratch.
   As soon as they are finished, they will put the Scratch share link created in the padlet. (50 mins)
4. Motivation for students: the students will see their work voted on in an application to choose and they will see the evolution of the voting of their works (15 mins)
5. Preparation of activity: to prepare this activity the teacher must organize a script or worksheet with the indication of the basis of work for the character who will give voice to the proverb that the student recorded (40 mins)
6. The teacher should give the indication that the continuation of this activity could be that they create their own history giving their voice to the characters they create thus exposing their creativity and computational thinking

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Good Practice: MICROPLASTICS: SMALL BUT DEADLY

Caption:

While sailing in the Arctic as a 'Teacher at sea' in 2014w1, Giulia Realdon first heard about the problem of microplastics – fragments of different polymers, all smaller than 5 millimetres in diameter, that are now found in nearly every environment. Worryingly, due to their small size, marine microplastics are eaten by zooplankton and so enter food chains, producing a new type of marine pollution. Back at home, she shared her experiences with colleagues at the association Scienza under 18 Isontinaw2 and together, they developed new teaching activities on microplastics to be presented in Italian schools during UNESCO's sustainability week in 2014.

Age of the students: 3-16

The article describes several activities to introduce students to microplastics, tiny plastic particles,and their impact on the marine environment. One is a drama activity for very young pupils about how microplastics find their way into the food chain. Role-playing can help children to better understand the processes that these plastics
are involved in and why they are so dangerous. Other practical activities described in the article involve materials (e.g. sand, cosmetics, personalcare
products, bottles, and plastic bags) that students are familiar with, which can help to raise interest in microplastics and the effect they can have in ecosystems. All the materials required for the experiments are readily available and the instructions are easy to follow, making the activities suitable for students to perform in small groups.
Finally, the text could be used as a starting point for discussing the consequences that the consumption of certain products can have on our environment. The discussion can help students to be aware that simple actions can make our lives greener and reduce our impact on the planet.

Source URL: www.scienceinschool.org I Science in School I Issue 34 : Winter 2015

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Good Practice: FROM POETRY TO ROBOTICS

Caption:

Caption:

By Irene Zorzi; Teacher Primary School Beni Montresor Bussolengo VR -Italy

Cross- curricular activity and interdisciplinary (Italian, Maths, English)

Topic: solving games with the four operations and two games on Italian and English words by moving robots 6 (Clementoni - Science and game) on a grid of plywood 75cmx75cm.The robots are provided in the box so We must also discover and mount them together following the instructions.

Reading and commentary of "Notturno" poetry and discussion.

1- formation of groups: all students stand face to the wall and arms behind the back to form a "saucer" which is put a piece of a puzzle that depicts re robot and its message in for example: addition, subtraction ...., discover the word, colors.

2- DEFINING ROLES of the group: Muffler, writer, responsible for material, speaker

3- pupils turn and start to look for their teammates and form the complete puzzle die red robot, yellow, green ...

4- They sit on the floor where there are 6 plywood boardswith 6 different activities, everyone in the place indicated by the message on the robot puzzle.
5- Penalties: will be delivered red chips if you get confused at work. After having received 3, the robot will be switched off for 3 minutes.
6- Prize: who will play the most deserving work green chips for the partnership will be awarded using the Blue robot that can be controlled by tablet via blue tooth.

EVERY 10 minutes every group moves that are doing a new activity:

- To find the robot the right path to find the words that we rigurardano: classroom, school, Beni Montresor ... and reporting on squared paper the words
- find the color words in English between the letters jumbled on the panel. Red, yellow, green ...
- Finding the highest sum between the figures on ADDITION panel giving it a maximum of 4 changes of direction
- find the highest difference between two numbers by making the robot a maximum of three changes of direction on the panel SUBTRACTION
- And Finding the highest product of multiplying a maximum of four numbers

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Good Practice: INSEPERABLES. OR NOT?

Caption:

By Ileana María Greca Dufranc - Baccalaurate Degree in primary Education-University of Burgos.

Age of the students: 6-8

Materials/Resources/technical requirements: Magnets of different sizes and powers; clips; containers with different fluids (water, milk, juice, etc.).

Activity: Students discover how magnets work through different experiments related to real situations in which their use is useful. The following steps are followed:

1. Present the problematic situation and ask the students to elaborate group hypotheses about it. Eg: "A magnet can not attract any metal that is submerged in water".

2. Present the "Students Card 8" and explain the data record box (the card appears in the link below).

3. Following the instructions of the "Students Card 8", students should check their hypothesis by performing different experiments.

http://www.ubu.es/sites/default/files/portal_page/files/uudd_sabados_de_ciencia.pdf

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Good Practice: SCIENCE & MUSIC: THAT VIBRATES!!!

Ciencia Divertida® first provider of interactive programs for children of all ages. Since 1996, they have developed activities adapted to children that promote their interest in science and its effect in today's world. The team of Funny Science Spain is formed by professionals experienced in science. Juanjo Rodríguez is the Managing Director.

Age of the students: 3-6

Educational goals: • Experiment with the body to discover the possibilities of emitting sounds.• Understand which materials produce different sounds / vibrations

Activity: Where does the music come from? We will become great Luthiers to explain, with the help of everyday objects and instruments, what vibration is and how sounds are produced. Then, we will create a musical instrument with recycled material

www.cienciadivertida.es

http://cienciadivertida.es/wp-content/uploads/2016/10/programa-educativo-cienciadivertida.pdf

Within tHis porgram it´s PLANETA EXPLORA,, that perfoms several activities for schools. www.planetaexplora.com

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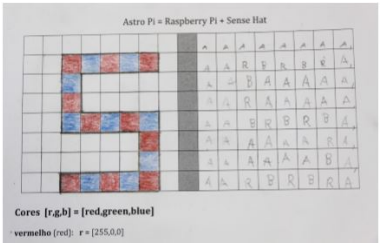
Good Practice: CREATING DIGITAL DRAWINGS WITH PYTHON



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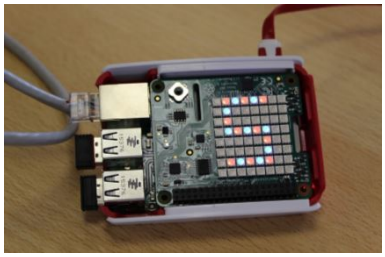

Caption:

by Nelson Correia a high school and middle school Physics and Chemistry teacher, since 1995, and projects' coordinator at Gil Paes Schools Group in Torres Novas, Portugal. Presently is also teacher of Programming and Robotics to fifth grade students.

Age of the students: 8-10

Activity: Create a digital drawing with Python programming language

1. The class is divided in groups of 2 or 3 students.
2. Students make a drawing inside a 8x8 grid in a paper sheet (annex). Each square of the grid must have only one colour, selected from a list.
3. The colours of the drawing will be transformed in a letters code, selected from a list.
4. This letters code will be written in a Python program prepared by the teacher in a Raspberry Pi with a Sense Hat.
5. Run the program and the drawing will appear in the Sense Hat.
6. Students will count the number of pixels of the drawing.

https://projects.raspberrypi.org/en/projects/getting-started-with-thesense-hat
https://raspberrypi.org/magpi-issues/Essentials_SenseHAT_v1.pdf

More photos: https://goo.gl/photos/v5DPoz5Sd5dwKMwz9

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PARTNERSHIP

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