

SOS PLANET  
A ROBOTICS PROJECT



Erasmus+

E book

## Introduction

SOS Planet – A Robotics project is an Erasmus+ project that started in September of 2015. Five schools from five different European countries participated in this project: Greece, Poland, Slovakia, Spain and Turkey. Our objective was to develop basic and transversal competences (entrepreneurial, ICT, linguistic and logical-mathematical) in our schools, using innovating methodology through the use of multiple intelligences and PBL. We aimed to carry out innovating activities that foster the use of CLIL. We wanted to achieve a high quality standard by sharing and cooperating with our schools. We intended to raise awareness of the European dimension of our schools by creating synergies between partners. And that's what we did.

This book is a guide for teachers and students, as educators, implementing a robotics unit in the classroom in order to teach them about robotics. It is aimed at middle years schooling (ages 9 - 15) but the wide range of activities can be adapted to suit older or younger students. The e-book is based around the basic robot (Lego Mindstorms education Ev3 core set) which is used in all activities (instruction for building the robot in: [http://robotsquare.com/wp-content/uploads/2013/10/45544\\_educator.pdf](http://robotsquare.com/wp-content/uploads/2013/10/45544_educator.pdf)). This approach is valuable in resource limited classrooms, as it allows the educator to work with a 'standard' robot, with some modifications, rather than using valuable classroom time building and breaking down robots each lesson.

The e-book contains information about robotics, the explanation of missions and challenges, tutorials, recommendations, troubleshooting, glossary of technical terms, diagrams, and photos.

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## Information about robotics

As we told before the robot that we are going to use for these series of lessons is the basic robot (Lego Mindstorms education Ev3 core set). If you have never built a LEGO MINDSTORMS robot before, you will see that it is quite easy if you follow the instructions. We will also provide some programming tutorials about our missions and you can also find some Robot Missions inside the EV3 programming software and tablet-based Programmer App. This robot has been created by LEGO MINDSTORMS designers to demonstrate some of the ways you can build and program with the LEGO MINDSTORMS EV3 robotics system. Before you know it, you'll be turning your own LEGO creations into live robots of every type and with many different kinds of behavior! With LEGO MINDSTORMS EV3, building and programming your own robot has never been easier. Think of a robot and then build it. Use the motors and sensors to add behavior and movement. The software and our instructions will guide you in bringing your robot to life.

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## Parts of the robot

### 1. Brick (Brain of the robot)

#### Brick Buttons

1. **Back:** This button is used to reverse actions, to abort a running program, and to shut down the Ev3 Brick.
2. **Center:** Pressing the Center button says “OK” to various questions-to shut down, to select desired settings, or to select blocks in the Brick Program App. You would, for example, press the button to select a checkbox.
3. **Left, Right, Up, Down:** These four buttons are used to navigate through the contents of the Ev3 Brick.



**Input ports:** Input ports 1, 2, 3 and 4 are used to connect sensors to the Ev3 Brick.

**Pc Port:** The Mini-USB PC Port, located next to the D port, is used to connect the Ev3 Brick to a computer.

**Output Ports:** Output Ports A, B, C and D are used to connect motors to the Ev3 Brick.



**Speaker:** All sounds from the Ev3 Brick come through this speaker, including any sound effects used in programming your robots. When the quality of the sound is important to you, try to leave the speaker uncovered while designing your robot.

**USB Host Port:** The USB Host Port can be used to add a USB Wi-Fi dongle for connecting to a wireless network, or to connect up to four Ev3 Bricks together.

**SD Card Port:** The SD Card Port increases the available memory for your Ev3 Brick with an SD card.

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## 2. Motors

**Large Motor:** the Large Motor is a powerful “smart” motor. It has a built-in Rotation Sensor with 1 degree resolution for precise control. The Large Motor is optimized to be the driving base on your robots.



**Medium Motor:** The Medium Motor also includes a built-in Rotation Sensor with 1 degree resolution, but it is smaller and lighter than the Large Motor. That means it is able to respond more quickly than the large motor.



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### 3. Sensors

#### Color sensor

The color sensor is a digital sensor that can detect the color or intensity of light that enters the small window on the face of the sensor. This sensor can be used in three different modes: Color Mode, Reflected Light Intensity Mode, and Ambient Light Intensity Mode.

**Color Mode:** The Color Sensor recognizes seven colors-black, blue, green, yellow, red, white and brown- plus No Color. This ability to differentiate between colors means your robot might be programmed to sort colored balls or blocks, speak the names of colors as they are detected, or stop action when it sees red.

**Reflected Light Intensity Mode:** The Color Sensor measures the intensity of light reflected back from a red light-emitting lamp. The sensor uses a scale of 0 (very dark) to 100 (very light). This means your robot might be programmed to move around on a white surface until a black line is detected, or to interpret a color-coded identification card.



**Ambient Light Intensity Mode:** The Color Sensor measures the strength of light that enters the window from its environment, such as sunlight or the beam of a flashlight. The sensor uses a scale of 0 (very dark) to 100 (very light). This means your robot might be programmed to set off an alarm when the sun rises in the morning, or stop action if the lights go out.

**Hint:** For the best accuracy in two first modes, the sensor must be held at a right angle, close to-but not touching- the surface it is examining.

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### Touch sensor

The touch sensor is an analog sensor that can detect when the sensor's red button has been pressed and when it is released. That means the Touch Sensor can be programmed to action using three conditions-pressed, released or bumped.

Using input from the Touch Sensor, a robot can be programmed to see the world as a blind person might, reaching a hand out and responding when it touches something (pressed)

You might build a robot with a Touch Sensor pressed against the surface beneath it. You might then program the robot to respond (stop!) when it is about to drive off the edge of a table (when the sensor is released).

A fighting robot might be programmed to keep pushing forward against its challenger until the challenger retreats. That pair of actions-pressed, then released- would constitute bumped.



### Ultrasonic Sensor

The Ultrasonic Sensor is a digital sensor that generates sound waves and reads their echoes to detect and measure distance from objects. It can also send single sound waves to work as sonar or listen for a sound wave that triggers the start of a program. You could design a traffic-monitoring system and measure distances between vehicles, for instance.



### Gyro sensor

The Gyro Sensor is a digital sensor that measures the robot's rotational motion and changes in its orientation. Students can measure angles, create balancing robots and explore the technology that powers a variety of real-world tools like Segway®, navigation systems and game controllers.



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#### 4. Connections

##### Connecting Motors and Sensors with the Brick

There are cables in order to connect the motors and sensors with the brick. You connect the motors with the letter ports of the brick and the sensors with the number ports of the brick.



##### Connecting the Ev3 Brick to your PC

There are three ways of connecting the Ev3 Brick to your Pc as long as you have downloaded the Ev3 Programming Software for free from the Official Lego Site:

<https://www.lego.com/en-us/mindstorms/downloads/download-software>

- through Wi-Fi by connecting your Ev3 Brick to a network
- through Bluetooth
- through cable (pc port from your Ev3 to a USB port on your pc)

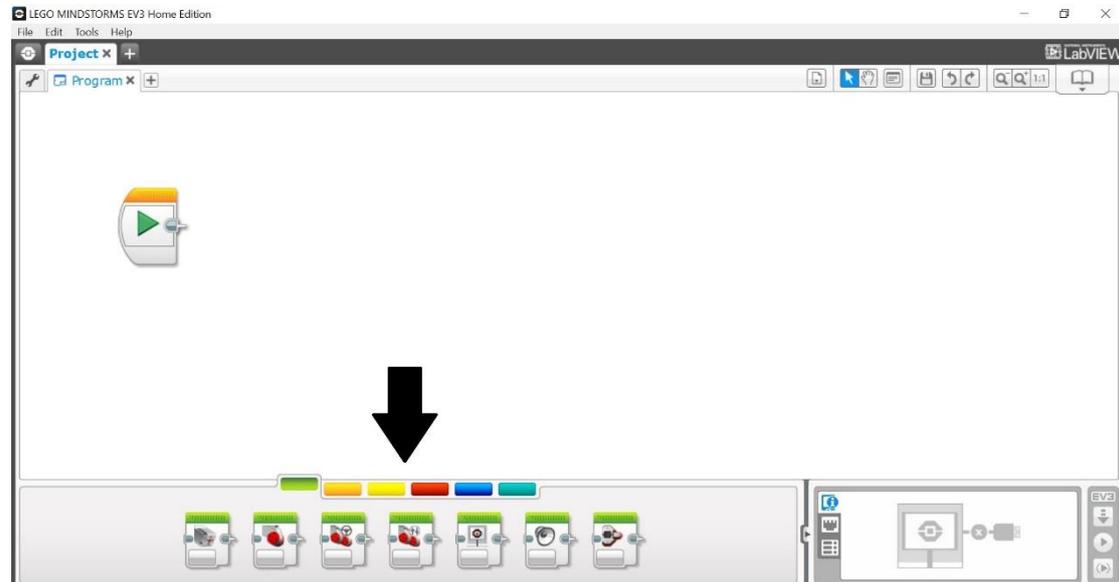
##### Connecting the Ev3 Brick to your tablet

You can also connect your Ev3 Brick to your Android tablet wirelessly by downloading the Ev3 Programmer App from the Play store or your i-Pad by downloading the Ev3 Programmer App from the App Store.

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## Software. Programming Blocks and Palettes

All the programming blocks that are used for controlling your robot are located in Programming Palettes at the bottom of the Programming interface underneath the Programming Canvas. The Programming blocks are divided into categories according to type and nature, making it easy to find the block you need.



### ACTION BLOCKS (Green)



1. Medium motor
2. Large Motor
3. Move steering
4. Move Tank
5. Display
6. Sound
7. Brick Status Light

### FLOW BLOCKS (Orange)



1. Start
2. Wait
3. Loop
4. Switch
5. Loop Interrupt

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SENSOR BLOCKS (Yellow)



1. Brick Buttons
2. Color Sensor
3. Gyro Sensor
4. Infrared Sensor
5. Motor Rotation
6. Timer
7. Touch Sensor
8. Ultrasonic Sensor

DATA OPERATION BLOCKS (Red)



1. Variable
2. Constant
3. Array Operations
4. Logic Operations
5. Math
6. Round
7. Compare
8. Range
9. Text
10. Random

ADVANCED BLOCKS (Dark blue)



1. File Access
2. Messaging
3. Bluetooth connection
4. Keep Awake
5. Raw Sensor Value
6. Unregulated Motor
7. Invert motor
8. Stop Program
9. Comment

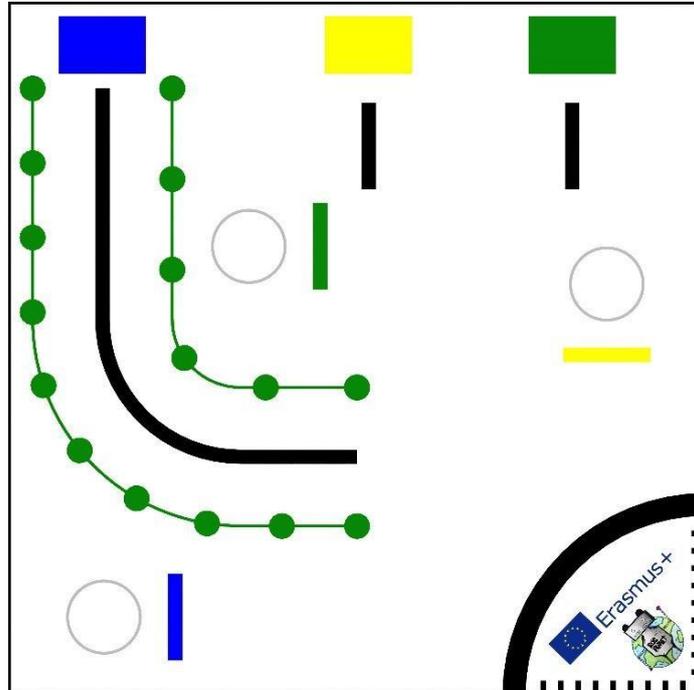
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And now you are ready to create (build your robot using the LEGO elements, motors, and intelligent sensors included in the set), command (program your robot in the intuitive icon-based programming interface by dragging and drop the actions that you want into the programming window and adjust them to suit your robot's behavior) and go (once you have built and programmed your robot, it's time to play).

## Explanation of missions and challenges

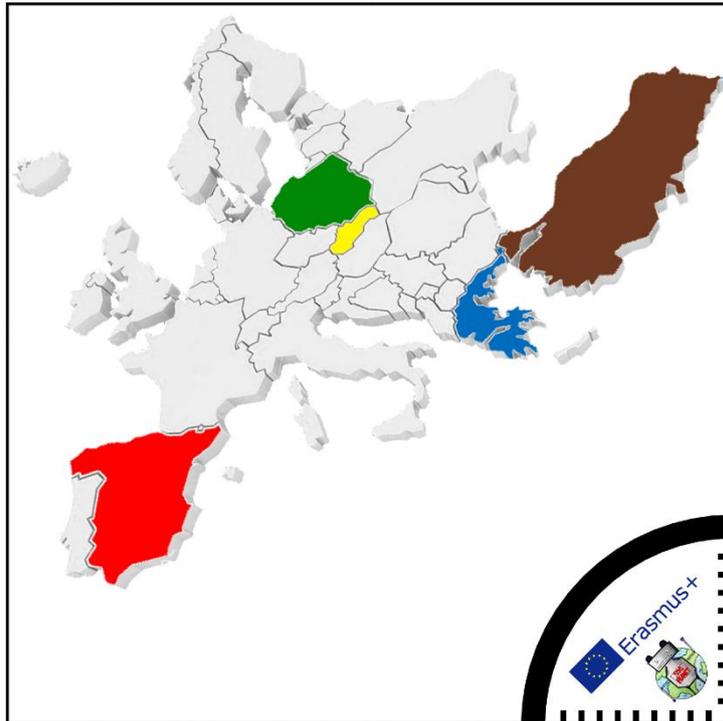
During these two years of our Erasmus+ project, we have created seven different mats (2 missions and 5 challenges) and many different tasks. The missions and the first challenge mats were provided by the coordinator in order for the students to get acquainted with robot and programming design. All of the participant countries worked on two missions the first year.

### FIRST MISSION



The FIRST mission has to do with recycling. As you can see in this mat, there is the safe zone of the robot in the bottom right-hand corner. This is where the robot starts every time. The garbage are inside the GREY circles. The robot has to take the garbage from the circle to the correct factory (colored squares) for recycling (yellow garbage to yellow factory etc.). So there are three missions in this challenge). You can start from the “yellow” mission, the easiest one, then the “green mission” and finally the “blue mission” which is the toughest one. There are tutorials explaining how you can program your robot in order to complete these mission.

## SECOND MISSION: MAP OF EUROPE



The mission related to this map of Europe consists of 3 different tasks.

1. The robot has to reach each country following a route, beginning and finishing in the safe area. We use the move-steering block and the degrees function to program the route.
2. The robot is shown a color and then, it must go to a certain country. We use the color sensor in the switch block. If the robot “sees” a color, it will go to a certain country on the map.
3. The robot carries a flag to each country using a wooden block and an arm. You need to use the medium motor to move the arm. The robot pushes the flag (a wooden cube) to each country at a time.

Evaluation of Missions and Challenges. You can use this rubric to evaluate your mission/ challenge.

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This rubric can be used to assess classwork and keep you focused on the task.

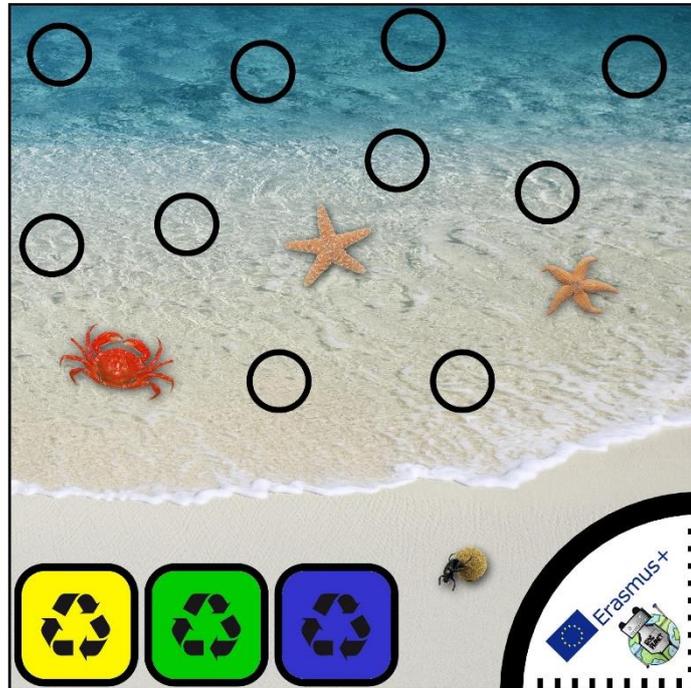
	1 point	2 points	3 points	4 points
<b>SPIRIT</b>				
<b>Identity</b>				
	Very little enthusiasm	Some members are enthusiastic.	Members are enthusiastic and have fun working together.	Members are enthusiastic and have fun working together. The team has a clear identity.
<b>Participation</b>				
	Participation is not well balanced. Some contributions are underestimated.	Participation is well balanced. Although some members do not contribute with ideas.	Participation is well balanced and most members contribute with ideas.	Participation is well balanced and all members contribute with ideas.
<b>Respect</b>				
	There are frequent arguments among members.	There are some disagreements but members can solve their conflicts with little intervention by teachers.	There is an occasional conflict. But they managed to solve it immediately with the help of teachers.	All members are respectful all the time towards their peers, teachers, helpers.
<b>Collaboration</b>				
	Students are individualistic and competitive. They are not capable of helping one another.	There is some cooperation between members.	Most members are helpful.	All members are helpful and there is a clear synergy.
<b>WORK</b>				
<b>Efficiency</b>				
	Poor time management. Roles are not clear.	Poor time management. Some people do not fulfill their role.	Good time management. Clear roles. Students can achieve objectives.	Excellent time management and very clear roles. Students can achieve all their objectives.
<b>Independent work</b>				
	Teachers have to help in excess.	Teachers have to provide help on many occasions.	Good balance between teacher's help and autonomous work.	Team can work on its own with very little intervention from teachers.
<b>DESIGN &amp; PROGRAMMING</b>				
<b>Mechanic efficiency</b>				
	Many problems with robot design and accessories make it difficult to fulfill mission.	Some problems with robot design /accessories during mission.	Good design and good use of accessories.	Excellent use of accessories. The robot design is very appropriate for the mission.
<b>Programmin quality</b>				
	Too many commands. Difficult to understand.	Some commands are difficult to understand.	Appropriate commands.	Easy, clear and precise commands.
<b>Innovation</b>				
	The team does not develop any ideas or strategies. A lot of help from teachers is necessary.	The team managed to develop some original ideas/ strategies with teacher's help.	Some original ideas/ strategies, although teacher's intervention is necessary.	Many original ideas/ strategies to overcome difficulties with little teacher's help.
<b>Autonomation</b>				
	Pilot needs to reset/recover robot very frequently.	Pilot sometimes needs to recover / reset robot.	Pilot occasionally needs to recover/reset robot.	Robot performs tasks without pilot's intervention.

	2 marks	1,5 marks	1 mark	0 marks
<b>HELP</b>	Always ready to help. Very clear explaining to fellow students.	He/ She often helps others to understand.	He/She can't help but makes the effort to understand.	Very passive. He/she doesn't cooperate or ask for help.
<b>INTEREST</b>	Shows interest and takes the initiative.	Shows interest.	Sometimes is not attentive.	Doesn't show interest.
<b>PERFORMANCE</b>	He/ she does all tasks with enthusiasm, and asks for more.	He/ she fulfills all tasks willingly.	Only performs tasks when he/ she is asked to do it.	He/ she does not fulfill tasks.
<b>RESPECT</b>	Very respectful to everybody. Helps to keep a good working atmosphere.	He / She is respectful to everyone.	Sometimes talks about personal things with helpers or fellow students.	Lack of respect. Interrupts. Does things like: stand up, walk away, play, talk about personal things.
<b>ROLE</b>	He/ She plays his/her role very well and offers to do extra things.	He / She fulfills his / her role.	Fulfills his/ her role but is not very efficient.	Doesn't fulfill his/ her role. Complains about it.

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For the second year of the project, teachers and students worked together in order to design these challenges and they were completed by the international teams created in each mobility transfer.

First challenge (SPAIN)



On this mat, students were supposed to collect the rubbish placed in the circles and take it to the recycling containers using an arm. They were penalised if they disturbed sea animals. They were asked to start and finish in the safe area.

In this challenge we introduced the gyro sensor to allow the robot to make more precise movements and avoid the sea animals.

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Second challenge (SLOVAKIA)



Idea of Slovak challenge:

This challenge is situated in Slovak mountains the High Tatras (main theme of the mat), also a national natural park, where the challenge takes place. On the mat you can see mountain tarn, rocks, recycling area and six positions for the trees. The whole challenge has environmental aspects like planting trees in nature, saving the wild animal and cleaning mountain tarn. Typical nature levels in the High Tatras: forest, alpine meadows with scrub pines, rock level with no plants or trees. Our challenge takes place in the area with damaged coniferous forest. There was a huge whirlwind which definitely changed the face and appearance of our mountain chain in the year 2004. Most of the forest was destroyed and lost forever. It is twelve years after the disaster and we still plant a lot of new trees, which are prepared in special areas called forest plant nursery :)

**So in the first mission** robots will do this instead of human. Robot has to collect trees from plant nursery and move them into the forest to given area.

The aim of mission is to program robot that the robot finds the young tree in the plant nursery by using color sensor, picks it up and carries it to the right place in the forest.

Time for solving the mission: 2 minutes = 50 pts, 10 pts extra plus for solving mission under the time limit

points for carrying each tree: 15 ppt (tree must touch colour place on the stump)

penalty points:

5 pts - dropping the tree

5 pts - lift (pick up) the robot out of the secure zone

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**The goal of the second mission** was to redesign robot arm and create program to clean Mountain Lake. Robots had to collect the garbage from the lake and move it to the recycling area.

Tatras are well known also for its alpine tarns, which are every year visited by thousands of tourists. They are really beautiful, but tourists aren't so nice to nature. Every year they leave thousands of kilograms of rubbish, garbage and other trash all around the national park. So our robots will help clean one area around lake and collect the rubbish into recycling area. During the mobility you will see one of these areas also in vicinity of our school.

The aim is to design the robot that, it cleans the mountain lake from garbage and carries it into marked recycle place as quickly as possible

time for solving mission: 1 minute = 50 ppt

penalty points:

5 ppt for each non gathered piece of garbage

5 ppt for each piece of garbage out of the recycling zone (green points, places)

**The third mission** was the most difficult for precise coding and movement of robotics arm. Robot had to “save” wild animal from the hardly accessible area high in mountain. In order to simulate hardly accessible area, we put the rock on the top right corner of the mat. It is made by polystyrene. Students had to redesign the robotics arm once again. It had to be designed to pick the animal and transport it into starting position.

The aim of mission is to design an arm for the robot so that it pick up the animal and carries it to the starting position. The robot has to get to the rock avoiding sinking into the mountain lake, crashing into the rock or destroying the planted forest

Time for solving this mission: 2 minutes = 50 pts, 10 extra pts for resolving the mission before the time limit.

### Third challenge (GREECE)



This challenge has also to do with environment and it is divided in three missions. In the first mission the robot has to take a yellow tree (picture 1)(constructed by Lego bricks) or a red tree (picture 2), “by chance” to the right colored square in the left bottom of the mat (picture 3) in order to create a new forest there. The robot should be programmed in a way that when the color sensor “sees” yellow, the robot should choose the yellow tree first and when it “sees” red, it should choose the red tree first.



Picture 2

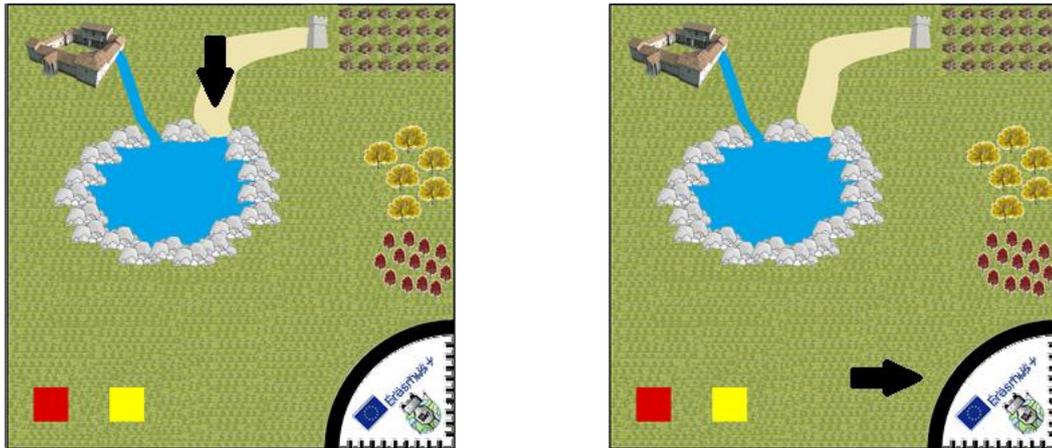


Picture 3



In the second mission the robot has to remove some rocks (picture 4) (constructed by Lego bricks) blocking the water from the lake to reach the village. Then the rocks should be transferred back to the safe zone (picture 5).

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In the third and last mission of this challenge, the robot must draw a line from the river to the water reservoir (picture 6).



The students are responsible to decide the changes they have to make in the design of the robot in order to complete the missions.

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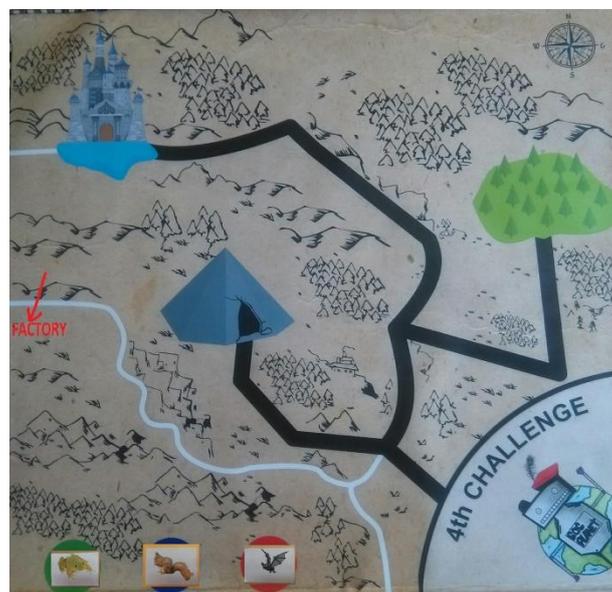
Fourth challenge (POLAND)



The Polish mission consisted of two parts and was directly related to the large air pollution in Cracow and its surroundings.

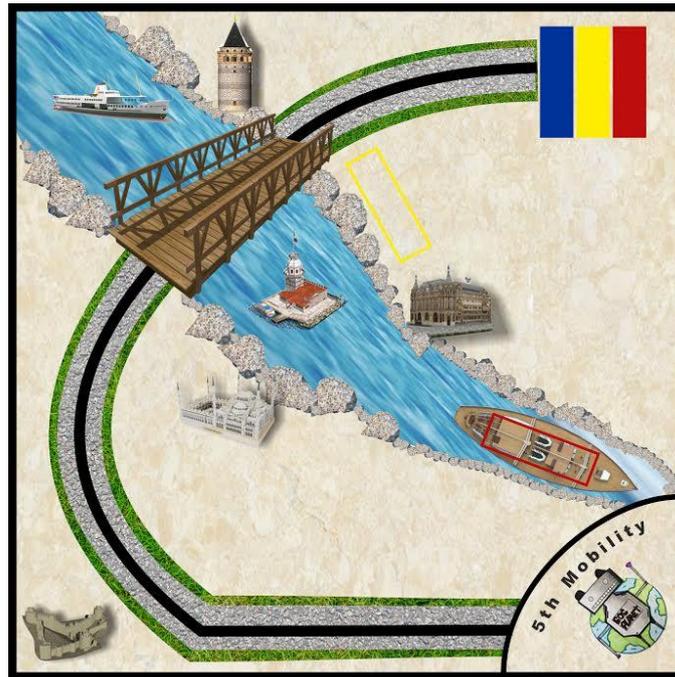
The first task was to relocate endangered animals from the area around Cracow to the Ojcowski National Park. The students had to put the grass frog, bat and squirrel in the right place on the board (forest, cave and pond). During this mission, the robot had to navigate the existing roads in the National Park using a color sensor and a gyroscope. Students could gain additional points for using other sensors, such as touch or distance to stop the robot in the right place.

The second task was related to air pollution emitted by factories. It was necessary to put a filter on the chimney of the factory. In order to do that, the robot had to raise the appropriate structure to a height of 20 cm and place it in a chimney opening of about 5 cm in diameter. The first task was performed without problems; in the second, students found it difficult to place the filter precisely in the hole.



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Fifth challenge (TURKEY)



On this mat, students have 3 tasks to do:

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**1.Task –5 Minutes (Maksimum Score 470)**

- The yellow and red blocks will be put into the container of their own color.
- After you put each block on their place, if the robot goes to the starting position, you will get extra point
- While you are working for the yellow block, other containers will not be on the canvas. In the same way, while you are working for the red block, other containers will not be on the canvas
- Robot should not touch the historical built and Bosphorus

		Yellow	Red
Put blocks into the container	+100		
Return to the starting point	+50		
Finishing before 3 minutes	+ 50		
<b>Using 1/2/3 sensor</b>			
1 sensor	+10		
2 sensors	+30		
3 sensors	+60		
<b>Penalties</b>			
If you touch the historical built and Bosphorus	-50 p		
If you can not cross over the bridge	-50		
<b>Score</b>			

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**Task 2 –3 Minutes (Maksimum Score 200)**

- The robot will take the blue block over the ramp
- You will remove the containers except the blue container.
- If the robot goes to the starting position, you will get extra point.
- Robot should not touch the historical built and Bosphorus
- You should use Gyro and ultrasonic sensor.

Put blocks into the container	+100 puan	<input type="text"/>
Return to the starting point	+ 50 puan	<input type="text"/>
Return to the starting point	+50 puan	<input type="text"/>
<b>Penalties</b>		
If you touch the historical built and Bosphorus	-50 puan	<input type="text"/>
If you can not cross over the bridge	-50 Puan	<input type="text"/>
<b>Score</b>		<input type="text"/>

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**Task 3– 3 Minutes (Maksimum Score 300)**

- You need to design a mission that you think is most beneficial to the environment.
- They can use all of the sensor whatever want in task design

• Usability grade for environment.	0-100 puan	<input type="text"/>
• Effective use for sensors and programming	0-100 puan	<input type="text"/>
• Design	0-100 puan	<input type="text"/>
<b>Score</b>		<input type="text"/>
<b>Group Total Score</b>		<input type="text"/>

|

## Opinion of some of the children participated in these challenges

### Slovakia comments

#### 1st mobility - Spain

Veronika said that she thought that the challenge and its missions were not very difficult but her team was not very successful. Nina said that they succeeded in making the first mission but another two missions they had to repeat.

Kristina B. said that although the cooperation within her team was good the best collaboration was with Polish student and the worse with Turkish student because he almost did not help them.

#### 3rd mobility - Greece

Nina said that she enjoyed whole mobility week and she hoped that she would meet these people once again.

Mira said that she was glad to work in her team because everybody was clever and friendly and collaboration was very good.

Kristina B. said that it was not very important to win the challenge but it was about meeting new friends and learning something new.

#### 4th mobility - Poland

Kristina G. said that she was satisfied with her team although they were last in final competition.

Laura said that they were not very successful in this challenge because they failed in the first mission but on the whole she was very satisfied with her team and hoped that they would see again in Greece.

Katarina said that everybody in her team participated and the international team was better than the previous in Greece. She felt comfortable and very good with those people.

Veronika said that her team was very good but some members did not work.

Anička also said that she worked in a good team although one member did not work at all. They had no leader but everybody knew what to do.

#### 5th mobility - Greece

Veronika again talked up the team but on the other side she said that they had one member of the team who did not want to collaborate and took their advice and she did not like his character.

Hana said that the best collaboration and understanding was only with Spanish girl from the team and nobody else did not do the best that they could.

Anička felt very comfortable in her team because as she said everybody had some experiences from programming.

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### Poland comments

“It was a great experience. We had a lot of work but also a lot of fun”

“The best collaboration was with our Spanish partners. I think we are mentally close to each other”

“I really loved all these countries we visited. For me it was a great opportunity to visit all these wonderful places”

“Now I know what I learn English for.”

### Spain comments

“My experience was unforgettable. The best part was to create a program without having a clue. An objective was set and you had to go for it. It was a real challenge.” Antonio Navas , Spain. Mobility 2.

“I would definitely do it again. I learnt lots of things like working in a team, speaking English and interacting with foreign students.” Sergio Piñero, Spain. Mobility 1

### Greece comments

“It was a great experience working with all those students from different countries. I definitely want to do it again.” Maria Pitsia, Greece. Mobility 1

“I never thought that i could learn so much from a European project. It was a great experience and i had the chance to learn more about robotics and Slovakia.” Luka Tsouk, Greece. Mobility 2.

“It was really nice hosting all these people from different countries in our place. And working with them about robotics was great too.” Kyriaki Papadopoulou, Greece. Mobility 3

“The challenge we had to solve in Krakow was really difficult. It was nice that we could communicate as a team and achieve so much.” Leonidas Amanatidis, Greece. Mobility 4

“What do you mean this is the last challenge. I don’t want this project to end.” Artemis Karakoni, Greece. Mobility 5

### Turkey comments

1st mobility:

It was really great experience for me. We were the winning team. We worked a lot and when we need to show our teachers what we had done, our robot stopped we were nervous, luckily it started again and we had the highest points. It was great experience. Umut Koç

2nd mobility:

We were really tired because it took 5 hour to go Humenne and it was too cold but we had great time together. We have WhatsApp group and still have connections. Hayat Tecer

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3rd mobility:

I am really happy for being chosen for this mobility. I made new friends new and improved my English. Can Taha Demirağ

4th mobility: It was really great to stay at a foreign friends' home. I feel I have my second family. We had great time at the school and around the city. Onur Bozođlu

5th Mobility: I am happy to see how our programing skills have improved and I am really happy to be a member of this great project. Dilara Öztürk

## Tutorials

### GENERAL TUTORIALS

Greece:

How to move forward (part 1) <https://vimeo.com/170435630>

How to move forward (part 2) <https://vimeo.com/170435631>

How to move in a square <https://vimeo.com/170435632>

### FIRST MISSION

Turkey :

Task 1, 2, 3 <https://vimeo.com/170014149>

Spain:

Task 1 <https://vimeo.com/167892534> blue container

Task 2 <https://vimeo.com/167890896> yellow container

Task 3 <https://vimeo.com/168028130> green container

Greece:

Task 1 <https://vimeo.com/170437364>

Task 2 <https://vimeo.com/170437365>

Task 3 <https://vimeo.com/170437362>

### SECOND MISSION

Turkey:

Task 1, 2, 3 <https://vimeo.com/212798345>

<https://vimeo.com/210811638>

Spain:

Task 1 <https://vimeo.com/161295072>

Task 2 <https://vimeo.com/161293051>

Task 3 <https://vimeo.com/161293505>

### FIRST challenge (SPAIN)

Spain:

(Gyro sensor) <https://vimeo.com/218694755>

Turkey:

Task 1 <https://vimeo.com/158398335>

<https://vimeo.com/158407098/settings>

<https://vimeo.com/158407162>

Task 2 <https://vimeo.com/158407481>

<https://vimeo.com/158407801>

<https://vimeo.com/158408068>

### SECOND challenge (SLOVAKIA)

Turkey:

Task 1 <https://vimeo.com/199776885>

Task 2 <https://vimeo.com/199773747>

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Task 3 <https://vimeo.com/199777479>

### THIRD challenge (GREECE)

Turkey:

Task 1 <https://vimeo.com/211890307>  
<https://vimeo.com/209966869>  
<https://vimeo.com/210038561>

Task 2 <https://vimeo.com/219551772>

Task 3 <https://vimeo.com/219477211>

Spain:

Task 3 <https://vimeo.com/227950702>

### FOURTH challenge (POLAND)

Turkey:

Task 1 <https://vimeo.com/220439320>  
<https://vimeo.com/220072736>  
<https://vimeo.com/220039185>  
<https://vimeo.com/220039091>  
<https://vimeo.com/220033052>  
<https://vimeo.com/217276535>

Task 2 <https://vimeo.com/220041626>

Spain:

ventilation system: <https://vimeo.com/226981797>

### FIFTH challenge (TURKEY)

Turkey:

Task 1: <https://vimeo.com/220439320>  
<https://vimeo.com/220646512>  
<https://vimeo.com/220554496>  
<https://vimeo.com/220038956>  
<https://vimeo.com/219963938>  
<https://vimeo.com/219425978>

Task 2: <https://vimeo.com/220783140>

## Glossary of technical terms

English word	Spanish	Greek	Slovak	Turkey	Polish
LEGO :)	lego	lego	lego	lego	lego
programming canvas	programa	Κανβάς προγραμματισμού	programovacia plocha	programlama tuvali	okno programowania
programming palettes	paleta verde, naranja, roja y amarilla	προγραμματιστικές παλέτες	programovacie palety	programlama paletleri	moduły do programowania
move-steering block	bloque de movimiento y dirección	εικονίδιο κινητήρα που στρίβει	blok pre riadenie pohybu	hareket direksiyonu bloğu	bloczek ruchu
wait block	bloque de espera	εικονίδιο περίμενε	blok pre nastavenie čakania	bekleme bloğu	bloczek oczekiwania
loop	bucle	επανάληψη	cyklus	döngü	pętla
programming tool bar	barra de herramientas	προγραμματιστική μπάρα εργαλείων	panel nástrojov pre programovanie	programlama araç çubuğu	pasek narzędzi
hardware page	página de hardware	σελίδα υλικών	stránka hardware	donanim sayfası	strona hardware
switch block	interruptor	επιλογέας	prepínač	değiştirme bloğu	włącznik
medium motor	motor mediano	μεσαίος κινητήρας	stredný motor	orta motor	średni motor
large motor	motor grande	μεγάλος κινητήρας	veľký motor	büyük motor	duży motor

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move tank	tanque de movimiento	κίνηση δύο τροχών		hareket tankı	narząd ruchu
display	pantalla	οθόνη	obrazovka	gösterge	wyświetlacz
sound	sonido	ήχος	zvuk	ses	dźwięk
brick status light	luz de estado del Bloque EV3	χρώμα λυχνίας	kontrolky inteligentnej kocky	Tuğla durum ışığı	światło kontrolne
brick	bloque/ brick	τούβλο	inteligentná kocka	Tuğla	klocek

## Environmental Activities

### SPAIN

- Climate Change Observatory, Valencia, Spain.  
In this activity students visited the Climate Change Observatory. The observatory organizes games to raise awareness of environmental problems.
- Visit to local market, Mercado del Cabañal, Valencia Spain.  
In this visit, students asked shop-assistants where products come from to find out how much energy is used to transport these products.
- Visit to the fields, Godella, Valencia, Spain  
Students found out what crops are grown locally and how they are irrigated.
- Photosynthesis lab activity  
Students made an experiment with iodine to find out how if there was carbon dioxide in leaves.

### POLAND

- Workshops in Ojcowski National Park  
During the workshop called "Water Fever" the students became acquainted with the basic methods of water research and learned the natural values of Prądnik river. For this purpose, during outdoor activities they performed measurements such as flow rate, pH reading and amount of suspension. Students tried to recognize plants and animals living in the river and the determination of water using the "biological tractor".
- Visiting the "Raba II" Water Treatment Plant.  
  
Water Treatment Plant "Raba II" is the main source of water supply in Cracow and several other places.  
During the trip we learned about water treatment methods such as raw water ozonation, coagulation, sedimentation, filtration and disinfection carried out in two steps using UV rays and sodium hypochlorite.

### GREECE

- Visit to Environmental center of Education (ECE) (Old Pantelehmon)  
ECE is located in the east side of mount Olympus. Students had the chance to walk through the forest and learn about the flora and fauna of mount Olympus.
- Virtual lab activity  
Students had a virtual lab in order to understand what pH scale is and how pH changes by mixing different solutions.

### SLOVAKIA

- Rameko Ltd.  
Students visited company Rameko Ltd., which provide complete solutions of Waste management. The main goal of this company is to recycle the waste or waste disposal with ecological manner and eliminate the landfilling of waste.

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TURKEY

- Students visited Recycling factory in Istanbul. They asked questions and about recycling process and prepared videos about it. And they showed them to their classmates.