# ROBOESL project: Report from Valmiera`s Secondary school No 5

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**Abstract**. Robotics these days is a need in every school, especially for those whose grades are weaker, that is one of the main reasons why our school chose to participate in this project. The lack of motivation, boring studies, difficult situations in families – those are the main reasons why children leave studies. Robotic is a real "carrot" with what to make interest about studies, to help them creativity and to widen their interest about technical things. Students in these robotic classes are learning about algorithmic thinking, they learn how to solve problems, develops interest about mathematics, IT, physics and engineering. When presenting his robot, a student uses and presents his work and strengthens his social skills.

## 1 Introduction

This project for us started with our headmaster, who found this interesting project. As we are in the 21 first century which is full of technologies, the teachers of this school wanted to learn more about robots, so we could teach our students about them and this may lead them to get more knowledge in other subjects. Many schools in Latvia already are working with robots and now, thanks to this project, we also have the possibility.

It all started with the first meeting in Genoa where all the partners met – from Greece, Italy and Latvia. It was more about documents, other meetings and how it all should be done. In this project we are focusing on Early School Leaving problem, involving in this project children, in whom we see this problem, hoping that these Robotic lessons will help them stay at school and focus more on studies.

Last year in December in our school we had contest for the Project logo, in which we asked all of Grade 5 to 7 students to participate. At the end we chose 11 best logos, which we sent to the management of this Project. All the partners could vote for the best logo.

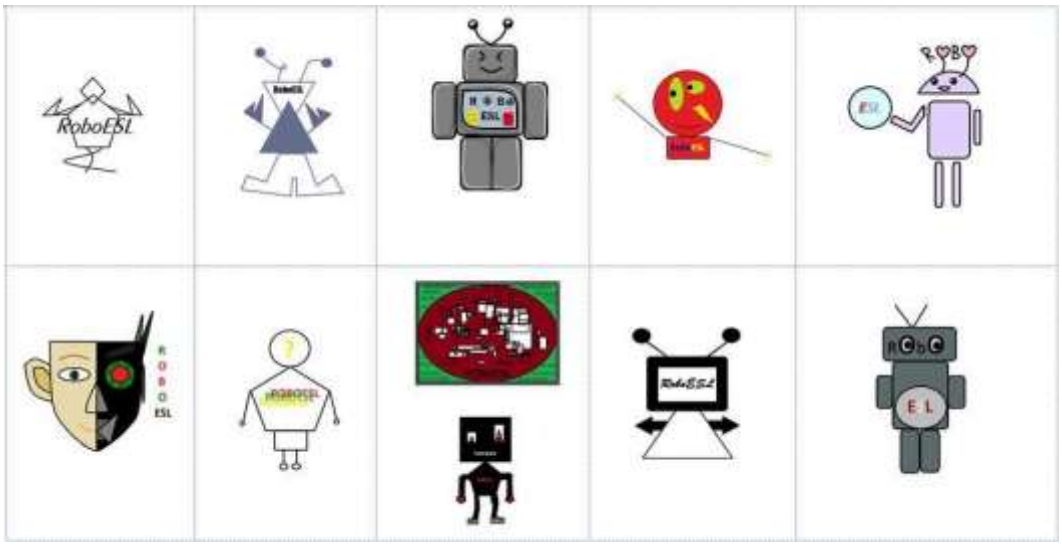


**Fig. 1.** Examples of logo

At the end of February we had a training course in Athens, which helped a lot for teachers to prepare for lessons with students, what kind of tasks to do and learn ourselves.

**Fig. 2.** Our team at Athens

Preparation begins. We had to find out how many companies sell robots in Latvia and try to find for the best one in a competition, which is as a rule, before bying things for school. After purchasing the robots, we had to wait for them to be delivered to our school. By that time, with the help of schools support staff and primary school class teachers, we finally got the list of students, who could be involved in these Robotics lessons, they were 31 in total, children with learning and other problems, also some of them were very talented students who chose this themselves.

Surveys had to be completed by teachers about students before and after all Robotic lessons to find out how their marks and attitude to learning has changed. Also students before beginning the course of Robotics did surveys about themselves. Questions included their favorite subjects, what they like the best about school, if they wake up in time and others.

There were 5 teachers (physics, mathematics and informatics and English teachers) planning, preparing the lessons and leading them. Before meeting students, the program for the robots was installed on computers. These lessons took part mostly in afternoons, after student lessons, twice a week in the computer room. There is a big table in the middle, which was used for making robots and as a working field for robots.

## 2 First lesson. Introductory lecture – robotics and electronics

Beginning connected with a discussion about what is around us, what is the application in life and after that practical activities, were students could show their skills, when making a robot. This lesson also included making robots from a scratch and it took quite a long time for students because they were following the book but of course they liked to do it, they are familiar with Lego. Some students asked if they could make the robots different, but this time teachers asked to build them all the same.

**Fig. 3. The first workshop**

## 3 Second lesson. Programming blocks and Programming Palettes

Introducing with robot sensor basic programming was another challenging part, as some of our students haven`t learnt yet these things. Teachers started with explaining the program block activities:

- Medium motor

- Large motor
- Move steering
- Move tank
- Display
- Sound
- Brick Status Light

Teachers did not spend much time discussing these things, just added the sensor with the children and went for the first task for the robot. Continuing with Scheme program blocks, such us – Start; Wait; Loop; Switch; Loop interupt and also introducing Sensor program blocks:

- Brick Buttons
- Color Sensor
- Infrared Sensor
- Motor Rotation
- Timer
- Touch Sensor

After introducing children with these program blocks, the first task was given. The robot had to move forward (students chose the time and distance). Next step was to make robot move forward, stop and come back. After that, the robot had to move forward, stop and turn around and come back (choosing one or both wheels). Of course every step led to a practical work by testing which commands the robot is following and which still needs improvement. The younger students mostly followed the readymade program but older ones liked to experiment. Exciting task for students was the touch sensor usage, when the robot is moving forward till touch sensor perceives an obstacle, stops and comes back.

## 4 Third lesson. Color sensor

Introducing students with color sensor was again something new for them, but at the same time, something they could easily understand with an explanation of light intensity measurements, because this time it is not programmed with just typing the name of a color as a command for a robot. Color sensor is a digital sensor, which can define a color or intensity of a light, which gets through the small opening in front of the sensor. This sensor can be used in three regimes:

- Color Mode
- Reflected Light Intensity Mode
- Ambient Light Intensity Mode

After giving children this information, the following task was for the robot to go straight till sensor catches the black color, then stops. For the next step, teacher together with students made the path for the robot – breaking line with a black tape. The robot had to follow the black color line. Experiments were made, by adding another black color line, crossing already the exiting line. This task was the most exciting for students, especially when on the line were more than one robot, to see, what will be robot

reaction. Also presentations about what each student's robot has learned created big fun between students.

https://youtu.be/trnq_hRhLTQ

Next challenging task was with Ultrasonic sensor, when students had to make the robot stop before the wall in a constant distance.

The last task was very interesting for students and it was - Go to park. Also here preparation was made before, by making parking spaces, separating them with a black tape color lines. This task was filled only partly, students made robots go into first free parking space, but also they added the sound effect at the end, that the robot has reached its destination.

https://youtu.be/NyXauzmFU6c

https://youtu.be/TF0GBauFdX0

## 5 Conclusions

The most important thing at the end is that the students enjoyed the lessons and many has asked when they will be able to continue these robotic lessons. The sad part is that not all students came to these lessons and it was also problematic because it was the end of the year, when students are already thinking about summer holidays. Maybe it might be different this time, we are planning other robotic lessons this autumn, when they will start to get used to a school time regime. In our primary school we do not have big classes filled with students, that is why we chose different age students from different classes, aiming to get those students who would need more help in staying at school and studying. The age difference was from 11 – 15 and also here sometimes the problem was that students had not learned some things about IT or physics or even some more complex things in mathematics, but that may help them later to understand those topics in these subjects. Children were not very open to cooperating in groups, they liked to do things and explore them by themselves, unless they were close friends. Let's see and hope for the best results for our students in second round with robotic lessons this semester.

Robotics develops important learning character – planning. Students making their robots, go through many planning process:

- What is the robots task?
- What do we need to know, to solve this problem?
- With which algorithmic help and robots construction we can solve this task?
- How we make robots construction and program?
- Does the robot the given task?

The suitable time for this lesson is till 120 minutes, otherwise children cannot pay attention. With experience, if there are more than 2 or 3 children to one kit, then they cannot divide tasks between each other.

Our experience from the ROBOESL project is definitely positive. Not just that finally have our robot kits for students, but also we had the chance to see the good impact it gave to our students, by learning new things this way and finding school as a great place to be. For teachers it's always good to learn new things, especially because this was quite new knowledge for us. One of the problems for the teachers was that the teaching materials about robots were in English, it took a long time to prepare for the lessons, because the teachers had to make materials themselves, not all teachers and students have such high level in English. Great courses in Athens and in Riga where we were in a student's role. A possibility to gain other school experience in working with children and meeting new people and how things are being done in other countries, in our case in Italy and in Greece.

Our future plans include preparing for the next Robotic lessons and our students are already impatient for them. Some questionnaires have to be filled out, lessons planned and students chosen, choosing some other and leaving some the same.