



















aforementioned schools, the 14th Public School of Stavroupolis and the 3rd Public School of Pefka participated in the Panhellenic Robotics Competition in March 2015, earning individual distinctions.

#### **4.2 Aims and Methods**

Our aim was to use an innovative teaching approach that combines learning and entertainment. We wanted to transform learning in a fun and interesting activity that allows the student to be involved in action and engage them in real-world problems.

- The cultivation of a cooperative spirit among students.
- The engaging of students in a combination of principles from various cognitive areas (technology, art, environment, society, mathematics, natural sciences) with cross-curricular project.
- The creation of positive sentiments for students (self-appreciation, self-confidence), through achieving program goals.
- The development of interest in research. Educational robotics provides children with the ability to act as scientists - inventors and to come up with their own innovative ideas and solutions.
- The active involvement of students with learning, through solving authentic problems.
- The support of exploratory learning, thus further strengthening students' exploratory attitude.
- Providing students with motives to study science and technology.
- To provide students with opportunities to solve problems with a personal meaning for them, through handling and constructing real or virtual objects. The knowledge resulting from problematic situations gives students the opportunity to develop a strong conceptual base for reconstructing their knowledge later on.
- To allow the free expression and development of creativity and imagination.

- To set real problems and provide direct feedback through construction
- To allow the gain of knowledge and skills connected to many cognitive subjects (and therefore the promotion of interdisciplinary and cross-curricular approach).
- To allow for possible intuitive awareness of complex phenomena, such as the relation between velocity, time, and displacement.
- In the context of interdisciplinary educational activities, through it, it's possible to develop motives for learning in other subjects (Mathematics, Physics, etc.).
- To promote thinking through cognitive and socio-cognitive conflicts, through cooperation and interaction among students and teams.
- To help with the cultivation of communication and verbal expression of ideas through group work when students are forced to explain their ideas and thoughts.
- It's strongly stimulating, and therefore a factor of highest importance for teaching
- It favors the trial-and-error strategy, a strategy familiar to elementary school students
- To create a highly positive view of the school environment, since educational robotics is an entertaining and pleasant learning method

### 4.3 Implementation

The program's goal is to improve students' attitude towards the school environment and the learning procedure, in cognitive terms, as well as to improve their interpersonal relations and skills, through cooperation with other students and teachers of various fields, and interaction with other teams.

**Based on these goals, the programs run in the aforementioned schools delivered great results and are considered to have achieved the initial goals to their full extent**

Specifically, a team was created by students from 5th and 6th grade, primarily by students who faced small or large difficulties in their relations with their fellow students and occasionally showed behavioral problems in class, such as problems in cooperating with others, disciplinary problems, low class performance, etc.

The students were using LEGO Education robots (of the Lego Mindstorms type), in conditions of active participation, interaction and creative play, they created the robotic constructions and the programs controlling the robots .

The program initially worked in the framework of the ICT class for the technical part (construction and programming of the robot), while it was soon joined by other activities, which were related to the initial context and spread to other subjects, such as music, dance, and art. The students, depending on their special skills, participated in every activity, with some of them showing exceptional performance in different fields, while they all learned. The groups were working during School time or after school in some cases in voluntary bases. They learned to work as a team, be more social, have a self-confidence and especially they had the opportunity to expand their learning in science (STEM) and gain advanced skills and expertise that might be used in their lives.

- To harmoniously cooperate with the rest in the spirit of teamwork
- To follow the orders they were given
- To obey the team rules at first, and then to establish rules themselves and follow them for the smooth operation of the team
- To successfully process failure

Moreover they participated in the competition of the FIRST LEGO League «FLL World Class 2014», a robotics tournament in a fun atmosphere where children and young people had to solve a " mission" with using LM robots, constructed and programmed by themselves. The Challenge was based on a real-world scientific topic and had three parts: the Robot Game, the Project, and the FLL Core Values.

The team's participation in the Panhellenic Robotics Competition FIRST LEGO LEAGUE constituted a massive challenge, given that the requirements exceeded

those of a single subject and demanded more intensive work on the matter. It was therefore deemed necessary for the students to meet at school on days when it was closed (e.g. on Saturday) so they'd be able to "train" more and without the time limit set by the curriculum. It was observed that students who, before the implementation of the robotics program, had accumulated a high number of absences from school, not only did not miss one single robotics team meeting, but consistently attended every Saturday meeting in order to work on the program.

#### **4.4 Findings**

The most important in our case is that schools participated for the first time in a program of educational robotics and the children accepted the idea with a great enthusiasm. When the pupils learned about their participation in the project they said: "It's really a strong motivation for all of us to participate in this project. Everyone in the class is excited and want to be involved because we have the opportunity to do something new and different from school lessons" .

The results of the first time the robotics program was implemented in the aforementioned schools were much better than initially expected. Before the program implementation (November 2014), participating students were given anonymous questionnaires which would show their attitude towards the school environment, their relations with their fellow students, and their cooperation skills within the context of teamwork.

Similar questionnaires were handed out after the end of the school year and the first phase of the program (June 2015) to the same students, which showed the children's excitement for school, because of this particular program. This attitude is not only established scientifically through the questionnaires, but also through the students' comments and discussions over social networks (Facebook).

Along with the questionnaires, interviews with the participating students were also conducted, based on the general picture shown by the November 2014 questionnaires.

This program has now been integrated in the aforementioned schools' curriculum and is expected to be repeated each year, since the results were positive and greatly helped students improve their skills, abilities, and attitudes towards themselves, their fellow students, and the school environment in general.



## 5. CONCLUSIONS

As it results from the evaluation of the program and the pupils' perceptions the educational robotics is a useful tool for 21st century learners, because it improves skills such as team-working and collaboration skills. Additionally it can improve self-confidence, creativity, motivation of children, ability to solve problems in different ways, and computer handling skills. The student also consider that robotics is a great way to get kids excited about science, technology, engineering, and math (STEM) topics.

The schools which conducted these Programs continue with the implementation even during this school year. The overall experience gained for these schools by the Programs, since their result is deemed positive, must be conveyed to other schools as well, according to the Directorate for Primary Education of Western Thessaloniki. This positive change of students' attitude, both towards the school as a whole and more specifically towards the educational procedure, which was achieved through these programs, is a cornerstone of the improvement of students as subjects of the educational procedure. It's a quality which, through these Programs, the students will always wish to keep until the completion of their general studies, without wishing to abandon their education.