Guide to best practices on Robotic Coding

Erasmus+

LICEUL TEHNOLOGIC "NICOLAE BĂLCESCU" OLTENIȚA

Generation Coding the Future

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1. Robotics and Coding

The field of robotics has witnessed remarkable advancements in recent years, with robots being increasingly integrated into various industries and sectors. As the demand for efficient and intelligent robots continues to grow, it becomes imperative to establish a guide to best practices on robotic coding. This essay aims to provide an overview of the key principles that should be followed when coding for robots.

Firstly, it is crucial to prioritize safety when developing robotic code. Robots often interact with humans or operate in dynamic environments, making safety a paramount concern. Developers must implement robust error handling mechanisms and thoroughly test their code to minimize the risk of accidents or malfunctions.

Secondly, modular programming is essential for efficient robot coding. Breaking down complex tasks into smaller modules not only simplifies development but also enhances code reusability and maintainability. By creating independent modules that can be easily modified or replaced, developers can adapt their code to different robot platforms or functionalities.

Additionally, documentation plays a vital role in robotic coding best practices. Comprehensive documentation allows for better collaboration among developers and facilitates troubleshooting and debugging processes. It is important to document not only the purpose and

Furthermore, adhering to established coding standards promotes consistency and readability in robotic codebases. Following a consistent naming convention, indentation style, and commenting guidelines ensures that the code is easily understood by other developers who may need to modify or extend it.

In conclusion, as robotics continues its rapid growth trajectory, establishing best practices on robotic coding becomes increasingly important. Prioritizing safety, adopting modular programming techniques, documenting thoroughly, and adhering to coding standards are some of the key principles that should guide developers in this field. By following these best practices diligently, we can ensure that robots are developed efficiently and effectively while minimizing risks associated with their operation.

2.Brief description

CONTEXT / BACKGROUND

Today, coding has become a key competence for students and people working in many fields of activity. Coding and programming skills have become more important than ever for employees in all sectors, in the 21st century. Our project brings together students and teachers from 6 countries, who acquire skills in the field of construction and programming of mini robots. The project aims to be a model for schools that develop competences in the field of information sciences and technologies. It has an approach based on practical skills, active and critical thinking, analysis of situations - "learning by doing" - learning the coding and programming language.

OBJECTIVES

-development of digital and technological competences for the achievement of minirobots, in the conditions of social inclusion of students from disadvantaged backgrounds;

- increasing the level of achievement and interest for robotics based on Arduino programming, the exchange of good practices at school level;

- improvement of foreign language skills through international cooperation, ability to work in multinational groups, development of active European citizenship for training competitive young people on the European labor market;

-developing language skills, IT programming of teachers and using new teaching methods based on the active learning of students through practical applications for building mini-roms;

- creation of an international network of partner schools that will last after the project period.

NUMBER AND PROFILE OF PARTICIPANTS

-6 vocational high schools from: Romania, Italy, Turkey, Greece, Hungary and Macedonia, all having curricular programs on information technology and professional specializations in different fields of activity, such as: electronics, automation, robotics, tourism, IT, mechanics, accounting, economics, aesthetics, dental technique, tailoring.

-60 teachers from partner schools (10 from each school)

-139 students between 14 and 18 years, from the 6 schools (23 from 5 schools +24 from Turkey)

DESCRIPTION OF THE ACTIVITIES

I.Preparation

1. The realization of the project management, the selection of the participants; creating the project website

2.Preparation of learning / teaching / training activities and student exchanges

II.Implementation

1. Organization of workshops in each school to prepare activities

2. Short-term student exchanges for the construction and programming activities of Arduino minibuses

3. Creating the Guide to Good Practices on Robotic Coding

METHODOLOGY

-the project meetings: presentations, reports, discussions, monitoring and evaluation

-the workshops in schools: work on groups of students for cultural, geographical preparation, preparation of robot presentations and practical work; conducting questionnaires and surveys; monitoring and evaluation

-the student exchanges - workshop in multinational groups learning by doing of robot construction and programming; work on the eTwinning platform; presentations of schools, cities, good coding practices in each country; discussions, games, sports, movies, dances, arts and crafts; monitoring and evaluation of progress, conducting surveys, questionnaires, etc.

RESULTS AND IMPACT

Expected impact at partner school level

- applying a new approach to active learning through practical, constructivist applications, adapting good practices to the school educational program, thus creating a more modern, more dynamic and professional environment in each school;

- promoting active citizenship through project-based learning.

Impact on teachers

-the project will contribute to the improvement of foreign language skills, ICT skills, construction and coding of robots through the good practices shared by each country, will help them to get out of the professional routine

Impact on the level of the participating students

- will gain experience in the construction and programming of robots and will acquire skills that will make them more competitive on the international labor market,

-they will improve their ICT and mini robot programming skills for active learning with an emphasis on robot application constructions;

- through the knowledge assimilated to the programming of the Arduino robots will be easily transferable to other subjects and will obtain better results in the other disciplines in the curriculum;
-they will develop their critical thinking, teamwork, social, civic and intercultural competences

LONG TERM BENEFITS

-the 6 partner schools in the project (some countries without experience in Erasmus + projects),
 from the European space and from outside will continue the work and long-term collaboration;
 - Continuing online work on the eTwinning platform
 - the participating students will be active and will occupy the required jobs on the international market, due to the coding skills, with wide applications in various fields of activity.

2.1. Main Achivments and Results

Through this project we set out to achieve the following objectives:

O1. Development of digital and technological competences for the achievement of minirobots and understanding
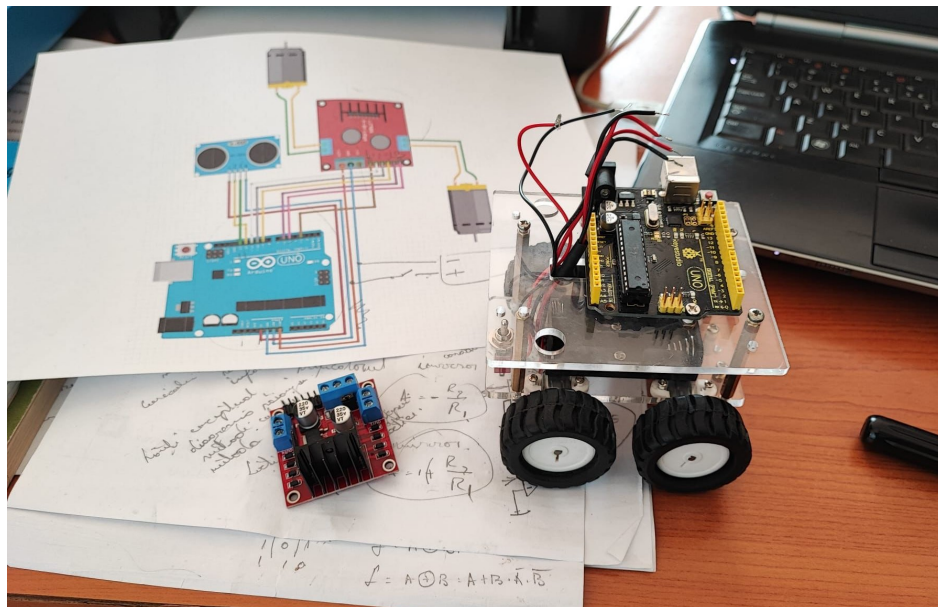of how coding works, under the conditions of social inclusion of students from disadvantaged backgrounds, promoting tolerance for different cultures, equality and non-discrimination, throughout the project.
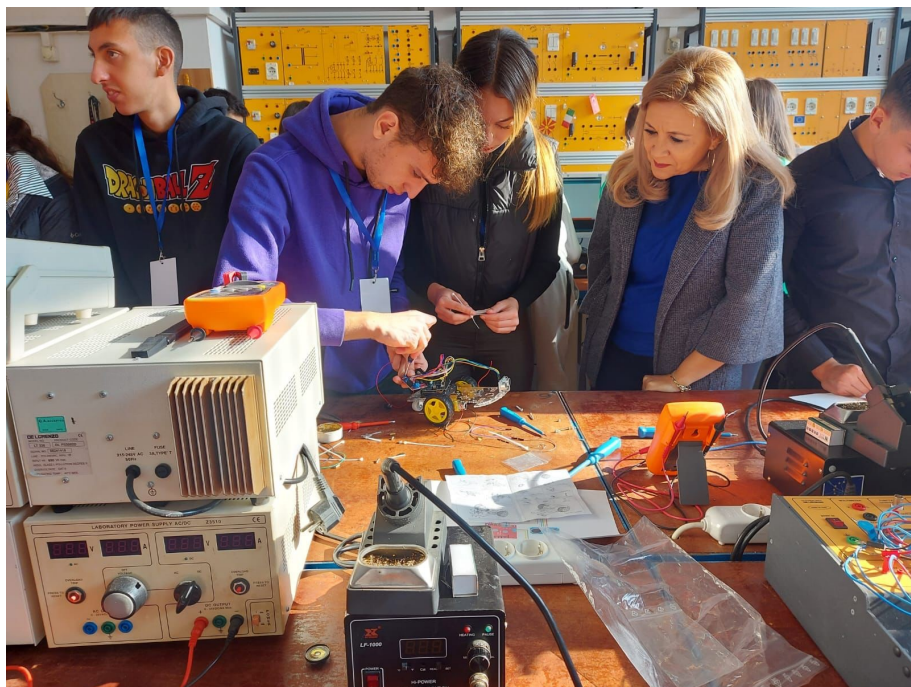
O2. Increasing the level of achievement and interest for robotics based on Arduino programming, stimulating young people to reduce school dropout, with a minimum of 2% in each school, by the end of the project.

O3. Improving foreign language skills through international cooperation, developing active European citizenship to
prepare young people competitive on the European labor market, by 30%, by the end of the school year.

O4. Development of language skills, IT programming of teachers and the use of new teaching methods based on active learning of students through practical applications of building mini-pilots, with 50%, until the end of the project.

Using ICT skills and knowledge of the Arduino program, English language skills, the participating students will develop robot programming and construction skills, concretely they will be able to:

-Correct use of robot movements by coding with Arduino IDE program

-How to prototype Breadbors

-The issue of connecting prototype circuits to Arduino,

-The subject of coding LED burning programs,

-Creating sensor circuits and programming robot movements with sensors,

-The subject of the mechanical design of the robot,

-Offering opportunity to develop multilingualism.

Increasing employability in sectors such as machinery, electrical-electronic and automotive in the use of Robotics automation with trainings - With different European samples, our students will expand their horizons and they will increase their opportunities to work with foreign companies.

-With the vision they will gain, their career prospects and their desire for higher education will increase, and they will realize that they need to constantly improve themselves in their profession.

With our project, the competencies that will increase in our teachers:

-They will develop themselves socially, culturally and personally by interacting with their colleagues in Europe.

- By developing their foreign language competencies, they will be able to research more about their professions.

-They will realize that they need to constantly improve their profession.

As a result of the project, robot clubs in our institutions will increase their activities. Project poster, promotional brochures, billboard, logo, booklet, ebook, poster, website, social network groups, etwinning platform studies will be done. Robot festivals will be organized. As a result of sustainability studies;

-As a result of the education provided to the parents, conferences will be held on which sectors the students can be employed. To expand our international network with cross-border cooperation.

3. Partners schools

We chose the project partners as the co-helper of the groups on the social networks on Facebook, the Erasmus + Project Results platform (EPRE) and the eTwinning platform. We have not done projects with the partners in this project but, but we considered that we, as a technological high school, have to learn in this field of coding in IT,very young and with many prospects for the future. We have combined our desire to learn concepts in this new field related to coding software applications from Turkish, Italian and other partners, and to help them develop a strategic partnership project with European schools in which students share their experience. with other young people in the field of robotics and programming, and teachers to improve their teaching methods. High schools in Romania, Greece and Hungary have a large number of students with limited opportunities, who cannot afford to travel and we must give them this chance to meet other young people of near age, who are dedicated to new technologies, to put them together, in multicultural groups, communicate in English and work on minirobot constructions.

The students from the Nicolae Bălcescu Technological High School worked very well with the students from Italy, Greece and Turkey, being partners in two other strategic partnership projects. One of our first eTwinning projects was on this topic - "Robotics and Arduino", ID: 100241, when the students got to know the Arduino platform, with partners having a school in Italy and one in Turkey. We rely on this partnership based on the experience of the Macedonian partner who has also carried out Erasmus + projects, a strategic partnership and which will greatly help us in understanding and learning the Arduino platform. The Romanian high school will use its experience gained in the 2017-2019 project, as coordinator for the coordination and implementation of this project, if approved.

We will have online meetings between teachers before mobility and whenever it is needed. We will keep in touch permanently through groups on WhatsApp, Google Drive, Facebook etc.

The first meeting between schools will be held in Romania, project coordinator, who has the experience of two strategic partnership projects, in one he was the coordinator, so the colleagues with less experience will learn how to organize. We will also determine how the documents are prepared: the list of participants, Europass Mobility, the certificate of participation, minutes teachers meeting and others. In the meetings of the teachers within the LTT activities of each school, we will establish details about the activities that will follow in the next school. Thus, schools with less experience will clarify their activities.

3.1 Liceul Tehnologic Nicolae Balcescu

The high school is organized on 3 levels of education: 1.High school level/day, comprising 2 branches: a.Theoretical field: -sciences(Mathematics, Nature Sciences); -art (Philological, Intensive English, Social Sciences) b. Technological chain: economic and technical services (Mechanics, Electronics, Automation, Textile and Leather) 2.High school/evening classes: Motor Mechanic 1054 students are enrolled in our high school, guided by 67 teachers, 14 non-teaching staff and 9 auxiliary staff. The high school comprises 39 classrooms, 10 laboratories, 3 computer rooms with internet connection, 12 workshops for practical training in the specializations.A peculiarity of our high school is that, in the technological sector, 80% of the students come from the rural area, the social inclusion of these students being a priority for us in all the projects initiated and carried out in school. -Participation in the Erasmus + project, KA2 ,2014-2016, as a partner, "Employability -A challenge for youth-Dreams and Reality", with 7 partner countries from Italy,France,Spain,UK,Turkey,Greece and Romania; - KA1(VET), "Specialization in mechanics and automation for the European employability", 2017-2018, in which 33 students specialized in Spain and Portugal in the jobs of mechanical technician for maintenance and repair and technician in automation. - Participation in the Erasmus+ project, KA2 strategic partnership, as coordinator, "Your Rights are My Rights, Fighting discrimination and promoting equality", 2017-2019, with 6 partner countries: Italy, France, Portugal,Cyprus,Hungary and Romania. -KA1, school education, teacher training "Emotional intelligence and aggression prevention, new teaching methods by including social media in lessons", 2019-2020, in which 12 teachers participated in the courses: "How to use Tablet, Educational Apps and Social Media in your Classroom-Florence" and "Conflict Management, Emotional Intelligence and Bullying PreventionBarcelona". -Participation in eTwinning projects: Robotics and Arduino, SHARING MY L.I.F.E.=Lively Images From Europe , eTwinCapsules , TwinGeneration Songs. Students from Electronics, Automation participated in the National Science and Technology Competition with the project "Exploratory Minirobot" and took Mention.

3.2 Cigli Naime TOMEK Mesleki ve Teknik Anadolu Lisesi

Our school is a vocational high school with 43 Teachers, 378 students, 14 classrooms, 2 Workshops, 1 Conference Hall, 2 IT Classes and 1 dining hall with the fields of Justice, IT and Accounting. In our school that follows the developing technology, with the Programming branch the students also receive current Network Expertise training all over the world with the feature of being the only Cisco Networking Academy in the region besides the current design and programming trainings. Our school in 2014/ 2015 academic year provided the opportunity to get to know the European culture with the project titled "e-commerce& quot; for Erasmus + Leonardo Project. In 2015-16-17, many projects such as TÜBİTAK innovative approach, game-based learning and new technologies, which were coordinated by Alev YÜCELİŞLİ and Pınar ÇETİN, were accepted and exhibited in our school. Our institution ;experiences about this application;In 2017-2018, our school received a Quality Label with aneTwinning project called "Journeywith Independent Generation" carried out by the school counselor, Elçin YEGENGİL. In 2018-19, Pınar GÜNGÖR carried out the "Cyber Bullying" project again with e-Twinning. Our participating students prepared presentations and went to other schools and informed their peers about the issue. Our school teacher, Pınar GÜNGÖR, implemented the "Young We" Entrepreneurship Program conducted by the Young Achievement Foundation in 2018-19, and the students found out a product by learning the entrepreneurship steps by establishing a company. In 2019 Codeweek week, together with our students we went to Çiğli 75th Yıl MTAL to learn how to design robotics in the robotics laboratory. (http:// naimetomektml.meb.k12.tr/icerikler/codeweek-haftasi-etkinligimiz_7884543.html). In our activity, the awareness of our students on robotic coding has increased. In order to increase employability in this area, we have started negotiations with partners from abroad.The fact that our partners are relevant and experienced in this regard has enabled us to cooperate with these partners.

3.3 Saba High School ,Skopje

SABA is a private vocational high school established in 2007. It has four departments: Business, Administration, Computer Science (IT) and Tourism. The first year (2007) the school was opened in the capital of Macedonia, Skopje. The next year (2008) a branch was opened in Bitola. In 2014 another branch was opened in Stip. In September 2017 a branch in Kumanovo has been opened.Today there are around 200 students studying at SABA. The practical placement was part of the project "Digital competence and learning", an ERASMUS + project. They had traineeships in automotive companies to see how digital technology is used in the automotive industry. The traineeships were organized by Wisamar, educational institute from Leipzig, Germany. The aim of the traineeships was to give our students a chance to have a European training experience where they could use the IT skills they have gained at school. In February 2016, 5 teachers from SABA had one week training in Florence, Italy. This staff mobility was also a part of the Erasmus + project "Digital competence and learning". During the training the teachers learned new ways, methods and tools how to incorporate Information Technology into everyday teaching. The training was organized by the vocational training organization EUROPASS Centro Studi Europeo from Florence, Italy. The principal of SABA and the school coordinator and a law teacher are involved in this application. The school coordinator Angela Krstevska prepared the application for the Leonardo Da Vinci project "Gaining European Teaching experiences" (in 2013), the application for the Erasmus + project "Digital competence and learning" in 2015, "Effective school management" and "E(uropean) business" in 2016, "Building the best team" in 2018 and "Practice and project based learning" in 2019. She had done all the organization about the projects (finding partners, everyday communication with the partners, making all the practical arrangements, travel, accommodation etc), so she has big experience in this field

3.4 1 EPAL KAVALAS

1o EPALKavala is a educational opportunities to people who intend to expand their knowledge or skills and to receive also a lyceum degree. - We offer them educational opportunities which will help them in adjusting to the technological, economical, social and cultural developments. - We offer also opportunities which would help to obtain vocations according to the employment policies parallel to economic development, through our educational programs. - We prepare the students to get to the job market or to continue to the University. - We undertake tasks connected with education and bringing up of our students with fewer opportunities and smaller chances of successful living. We have several departments as: - Mechanical Engineering - Electrical Engineering - Computer science - Electronics - Hairdressing - Esthetics & beauty - Constructions - Environmental studies Lessons are both theoretical and practical. Our school is situated in a beautiful town of Kavala in North Greece which is near the sea. In addition a big proportion of our students are migrants or one parent families who live in remote villages of the region under the danger of exclusion and of being considered second - class students. Some of our students are economy immigrants from Albania, Georgia, Bulgaria and Russia. Lately ships full of refugees from Syria leave hundreds of them in the port of the city in order to find a proper way to continue their lives In our institution the priority is to provide different learning opportunities for our learners, so we are working in different projects with them out of the curriculum as (environmental, health care, orientation, outdoor activities etc).

During projects our target groups will have the chance to get cultural exchange and get the opportunity to learn the values promoted from EU. The only possibility for our students to get in touch with the foreign realities and cultures is to get involved in international projects. Also, with this project Greek students will have the opportunity to learn about the most popular sports that other countries adolescents prefers. In the field of volunteering, our school participates in municipalities volunteering actions and events and cooperates with the school with students with special needs. 1o EPA.L of Kavala willorganize a team of teachers, co-workers that they will run the project and the contact person will be a beautician teacher MrsEleniVachlioti,Mba. If someone leaves his post the team will continue to work on

3.5 Érdi Szakképzési Centrum Százhalombattai Széchenyi István Szakgimnáziuma és Gimnáziuma

Érdi Szakképzési Centrum Százhalombattai Széchenyi István Szakgimnáziuma és Gimnáziuma (Széchenyi István Vocational Grammar School or SZISZKI as it is commonly known in town) is a relatively new school with its 30 year old history. It is situated on the outskirts of a small industrial town called Százhalombatta and is only a stone's throw away from the Hungarian capital city, Budapest. SZISZKI was formed in 1987 as a Vocational Secondary School and in the year 2000 the school was granted the right to start grammar classes and became a Secondary Vocational and Grammar School. Students have to pass an entrance exam after finishing the 8th form, to gain admission to our school and according to their exam results and their options are accepted to learn at one of the classes. Many students arrive from Százhalombatta and even more apply from the Budapest metropolitan area therefore the social, educational and economic background of our students is varied. At present there are approximately 550 students at SZISZKI and a teaching staff of about 50. The vocational classes specialise in Information Technology, Mechanical Engineering, Accountancy and Economics and Office Management. We also offer traditional grammar school classes and in 2007 a so-called "language training class" was introduced. Students in this type of class are taught two foreign languages intensively in the first year (12 English and 6 German lessons per week) and they stay on as a grammar class with a higher number of language lessons for four more years, i.e. they finish grammar school when they complete year 13. Education takes place in special classrooms equipped with audio-visual appliances, there are computer rooms, scientific laboratories, a library, sport ground and gymnasium.

Our students are from different towns and villages, some from small towns, some from underprivileged small villages, some from suburban towns of the capital therefore knowledge and education of the students is varied when they start our school. Catching up of the students with disadvantaged is really challenging, one of the main aims of the teachers is preventing the early school leaving of our students. The school has experience in implementing European projects like Erasmus+ KA1 and KA2.

This experience from previous years has provided some of the teaching staff with valuable knowledge and showed how important it is to give students opportunity to take part in European-scale activities as these enormously influence their academic, linguistic, social and emotional development. The kay persons involved in the project have already implemented various projects on local, national and European levels. They are creative and open-minded people who see need for change and want to encourage their students to take initiative beyound the curriculum. As there has been a project team working together for years roles could be easily taken.

3.6 ISTITUTO PROFESSIONALE INDUSTRIA E ARTIGIANATO EMILIANO ORFINI

The Professional Institute for Industry and Crafts "E. Orfini " is a vocational institute providing training for people aged between 13 and 18, located in Foligno, Italy, and created in 1959. Its mission is to follow the constant changes of the society giving the right opportunities to learners. The Institute is characterized by the presence of 5 learning curricula: maintenance and technical assistance, social and health services, textile and tailoring productions, commercial promotion for advertising, dental technicians. They aim at training different work professionals, all oriented to the insertion in the productive sectors, of the territory or at national and international level. Moreover, the Institute gives particular attention to training experiences in Italy and abroad, through internship, travels and other experiences with the aim to have open-minded students. The training offer of IPIA Orfini aims to promote the ability of students to explore the social, cultural and economic environment in where we live, also by supporting them to be active part of labor market, that is a first step for a participatory and active citizenship.

The project area was largely experimented with the experience "A Scuola d'Impresa" which saw the institute involved for three years with excellent results that made it possible to present the project to the headquarters of the European Community of Brussels.
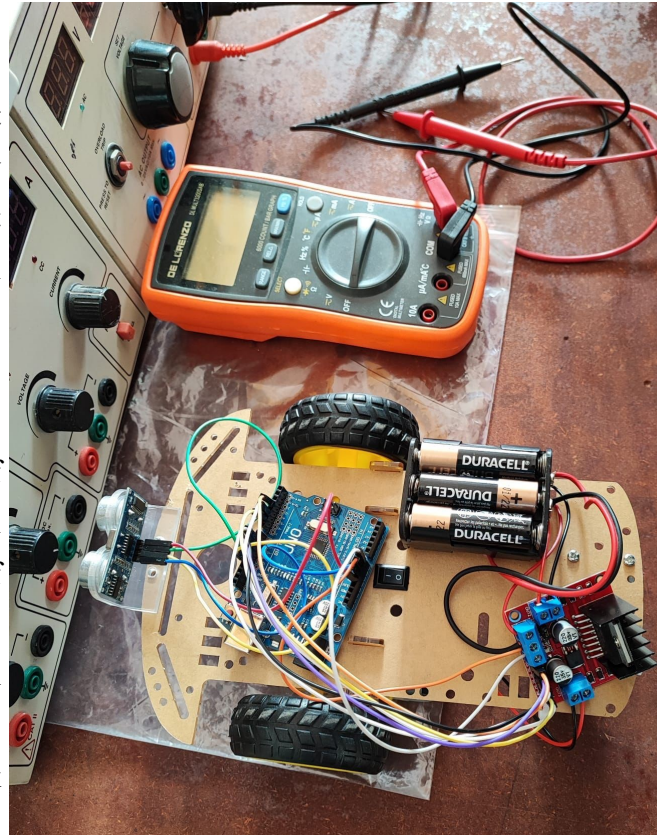
This is a project promoted by the AUR (Agenzia Umbria Research) of the Umbria Region and by the Regional Scholastic Office of Umbria for the purpose of implement collaboration between schools and businesses and promote the culture of entrepreneurship through competition at regional, national and European level. Students, divided into teams, first participated in the theoretical training and activation of simulation games, then, starting from their own idea, they realized a real business project. This is a simulation organized as a game and competition and therefore more engaging and motivating.

4.Objectives

Through this project we set out to achieve the following objectives: O1.Development of digital and technological competences for the achievement of minirobots and understanding of how coding works, under the conditions of social inclusion of students from disadvantaged backgrounds, promoting tolerance for different cultures, equality and non-discrimination, throughout the project. O2.Increasing the level of achievement and interest for robotics based on Arduino programming, stimulating young people to reduce school dropout, with a minimum of 2% in each school, by the end of the project. O3.Improving foreign language skills through international cooperation, developing active European citizenship to prepare young people competitive on the European labor market, by 30%, by the end of the school year. O4.Development of language skills, IT programming of teachers and the use of new teaching methods based on active learning of students through practical applications of building mini-pilots, with 50%, until the end of the project. Using ICT skills and knowledge of the Arduino program, English language skills, the participating students will develop robot programming and construction skills, concretely they will be able to: -Correct use of robot movements by coding with Arduino IDE program -How to prototype Breadbors -The issue of connecting prototype circuits to Arduino, -The subject of coding LED burning programs, -Creating sensor circuits and programming robot movements with sensors, -The subject of the mechanical design of the robot, -Offering opportunity to develop multilingualism. Increasing employability in sectors such as machinery, electrical-electronic and automotive in the use of Robotics automation with trainings - With different European samples, our students will expand their horizons and they will increase their opportunities to work with foreign companies. -With the vision they will gain, their career prospects and their desire for higher education will increase, and they will realize that they need to constantly improve themselves in their profession. With our project, the competencies that will increase in our teachers: -They will develop themselves socially, culturally and personally by interacting with their colleagues in Europe. - By developing their foreign language competencies, they will be able to research more about their professions. -They will realize that they need to constantly improve their profession. As a result of the project, robot clubs in our institutions will increase their activities. Project poster, promotional brochures, billboard, logo, booklet, ebook, poster, website, social network groups, etwinning platform studies will be done. Robot festivals will be organized. As a result of sustainability studies; -As a result of the education provided to the parents, conferences will be held on which sectors the students can be employed. To expand our international network with cross-border cooperation.

5.Activities

Through the activities of the selection of the participants from each school we will give the possibility to enroll in the selection of all the students who wish, without discrimination, with equal opportunities for all students. They will participate in a selection contest according to criteria that will include a minimum level of competences of English language (A1 level), basic IT skills and general knowledge about robots and programming. In schools where no notions about robots are taught, students will learn during the learning/teaching/training(LTT) activities and the hours of mobility preparation, after school, from their teachers or from the other students in the project, who have more a lot of experience in building robots. We will provide the opportunity for all students, including those from disadvantaged backgrounds, from each school to participate in the selection process. Through the LTT, students will work on multinational groups and will make practical applications for: preparing the Ardunio programming application, presenting the topic in which Ardunio programming is used, Ardunino programming application, Presentation of successful robotic coding projects in the country, Arduino circuit beard applications, Motor applications, Infrared applications, Ultrasonic distance sensor introduction and application, Making a mini sumo robot with Arduino. In all these activities we will have practical applications and increase the level of achievement and interest for robotics based on Arduino programming. Through the products we will carry out in the LTT of the partner schools, under the guidance of the accompanying teachers and those of the schools, they will improve their language and professional skills, IT programming. Learning by building robots will be a new method of active teaching / learning by applying the practices of the students. They, by communicating in the families where they will be housed during the mobility, as well as during the worshop in mixed groups, will improve their skills. English, information technology and robot technology and programming, becoming more competitive in the European labor market. We will measure the progress of students and teachers through initial and final tests of the knowledge of English language, robotics and programming. Such activities of evaluation and dissemination of results, as well as questionnaires and student diaries on the eTwinning platform will provide information on the progress of the project and the achievement of the objectives. After each mobility that LTT students will participate, they will receive Europass Mobility certificates attesting all the competences they have acquired during the activities. They will also be indicators to meet the project objectives. It is very important for students to accept and respect the culture of the countries in which they will measure through satisfaction questionnaires after each mobility and which we will post on the project eTwinning.

6.Diaries

Gabriel Stanojevikj

21th November 2021

That morning, four chosen students ,me ,and two professors went to Budapest by a van. Although it was a day in November, the weather was nice and the trip went great! In the afternoon we arrived in the hotel in Százhalombatta , and our adventure began. Students from Greece and Italy were also accommodated in the hotel. We met them and had a small chat as well.

22nd November 2021

We started the morning with a nice breakfast in the hotel, after which we went to the school, our Erasmus+ project host. All participating countries, including us, presented our countries and schools we came from. The presentations were creative and left a good impression on me. After that we were divided into groups with representatives from different countries and had a quiz including some tasks we needed to do. The given tasks were interesting and everyone enjoyed solving them. After finishing the tasks, the hosts invited us to their canteen where we all had lunch together. In the evening we walked around the town and after the walk we rested in the hotel.

23rd November 2021

The next day after breakfast we started with the lectures for the Arduino boards at the school. We had a total of three lectures in which we were briefly explained what Arduino boards are ,what they are used for and they showed us what projects they had done with them. The hosts again invited us to lunch at their canteen, where we were served a traditional potato soup. After lunch we went to a large factory in a place near Budapest where pieces are made through modern technology and robotics. In the beginning the guide showed us a presentation about the factory, after which she led us through it and each sector was explained what it is intended for. We went back to the hotel where we hanged out with the students from other countries and rested as well.

24th November 2021

After eating delicious breakfast we and all the students gathered in the school garden. A bus arrived and we traveled for about 2 hours. We finally got to a small company near the city of Veszprém. Although it was small it was very modern and interesting. The tour was divided into 4 parts. In the first part we were shown a small robot that can transport things. The second part was a video about the company itself. Next, in the third part one man showed us a modern robotic

forklift. Finally, my favourite and last part was when we were shown the „dog"
robot, which is actually used to access areas that are dangerous for humans. After
that we went back to our hotel and again hanged out with the students from other
countries. In the night we went to the local restaurant where we ate pizza.

25th November 2021

This day was a very interesting one. In the morning we ate breakfast after which
we got prepared and went to the Pest side of the beautiful Budapest city by bus.
The first thing that caught my eye was the glamorous Parliament. After making
some photos and walking through the streets we got to the amazing St. Stephen's
Basilica. Then we had some free time. We sat down to drink a coffee after which
we walked through the countless streets. The bus came and we went back to our
hotel. That was an unforgettable experience! In the hotel we rested from the long
walk through the city.

26th November 2021

The penultimate day was a rainy day. Again we went to Budapest, but this time to
the Buda side. There was a wonderful castle and beautiful architecture as well. We
made some pictures after which we were given free time for sightseeing. After the
sightseeing we walked to a big mall. We were in it for 2 hours after which the bus
came and took us back. We ended the day in the local restaurant and said goodbye
to our new friends. I will never forget the memories I made with them.

27th November 2021

The final day of our adventure came. We ate breakfast and packed our suitcases.
The van waited us before the hotel and around noon we left. After a nice and long
ride which included circling around the city of Belgrade because of a closed
highway we finally made it home in the night hours.

Sara

One of the most meaningful places I have been in Europe has to be Hungary.
Five students from our school SABA including me, together with students from Romania, Italy and Turkey participated in the Erasmus project "Generation coding the future" in Hungary in a little quiet city called Százhalombatta.
On a freezing Sunday morning at 6 a.m. our trip had started.
We were traveling by mini-van for about 8 hours, it was not that bad but when we finally arrived we were so happy. The hotel that we stayed in was nice and comfortable and every morning from 7 am-10 am there was breakfast downstairs in the restaurant.
The school where the project was held wasn't that far, it was about 5-10 minutes from the hotel which was good so almost every morning we had to go by foot.
The night before the first day of the project we met with the Italian group, they were the nicest and funniest people I have ever met, and we got along very well.

Monday, 22nd November 2021
I got up at 6:30 in the morning, cleaned myself up and I went downstairs to have breakfast with the other students from my school. At 9 am we arrived at the school. First day, presentation day, each country has to present themselves and also their school. It was so nice to get to know everyone in the room and learn something about them. At 1 pm we had lunch at the school and after that we played a quiz called "Batta Quiz" where we got to know the town a little better. We were separated in groups and in each group there was at least one person from every country. It was a lot of fun. After school we went back to the hotel and rested.

Tuesday, 23rd November 2021
The second day we had a workshop on robotics at the. We learned everything about robots and and how to work with Arduino and then at 1 pm we had lunch. After that from 14.30 pm – 16.30 pm, we visited a factory at the company Knipping in Szigetszentmiklos, a medium-sized company, that develops and produces complex technical parts and assemblies made of thermoplastics and thermosets, sometimes in combination with metal insert technology.

Wednesday, 24th November 2021
The third day we were lucky because we had extra time to sleep in a little bit late. We met at school at 11 am where we went to Nemesvamos and we arrived there at 13.00 pm. We had lunch in a beautiful café and restaurant called Allegro. At 14.30 pm – 16.30 pm we visited the Robotcenter Innovations Zrt Factory. My favorite part was the robot dog. It was really amusing.

Thursday 25th November 2021 – Friday 26th November 2021
The last two days we visited Budapest. History has it that Budapest is actually a combination of two cities; Buda and Pest, so on Thursday we visited Pest and then the last day, on Friday, we visited, Buda. The drive was about half an hour from Százhalombatta and we arrived pretty fast. Everything about Budapest is beautiful and the architecture is on a level I still can't wrap my head around. We also had free time to explore these two beautiful cities and have fun, go shopping, have the chance to taste the Hungarian food etc.

This project, this trip will always be my favorite and I will always remember it. The people that we met, the different culture, the new friends that we made which will always be like our family and will always carry in our hearts, the beauty that we have seen, the new life experience that we gained, I am so grateful for everything.

7. CONCLUSIONS

The main objective of this project was to give the participants the opportunity to improve their personal skills and to acquire new technical and professional knowledge, by introducing them within a host organization that offered them experience in their entrepreneurial skills in this professional sector, to adapt to the new work team and environment, to acquire a new professional language and intercultural skills, to develop the working spirit of the team and to increase self-knowledge and awareness of European citizenship, at the same time contributing to an international work experience. International work experience is an essential factor in creating the development strategy for companies trying to establish themselves in the respective industries. The training experience aims, first of all, to import innovation in the local environment, which would lead to the improvement of the profiles of enterprises by adding to the value of the product / service and also to optimize the processes of production, organization and communication.

The professional qualifications to be obtained at the end of the internships were, therefore, those aimed at becoming an expert from an international point of view in the field of Robotics, as well as in the search for the improvement of professional and entrepreneurial skills related to this professional field. International experts are essential today because they contribute to the articulation of the international vision to solve concrete problems, not to mention the support they give to the preparation and execution of international plans. Companies want help and advice from people with experience, especially people who have established international networks who could act as "pathfinders" for businesses.