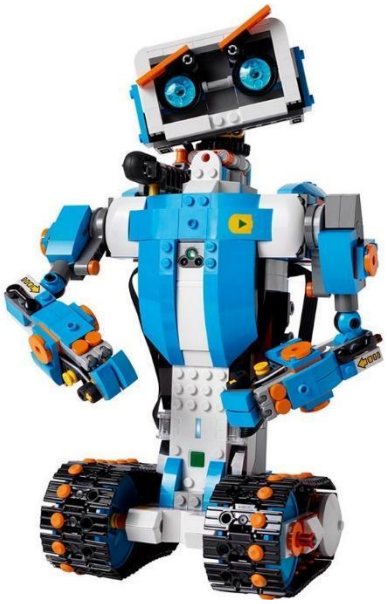
Robotics4Deaf



Robotics through sign language: Ensuring access and engagement of students with disabilities (deaf or with hearing impairment) to the digital world of coding and robotics

Project number: 2019-1-PL01-KA201-065123

IO1-A3: ROBOTICS4DEAF competence Framework

Leader: Emphasys Centre

Contents

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	National Center for scientific research ‘Demokritos’, Greece
	DeafStudio, Slovakia
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READER EXPECTATIONS

In the present document the reader can expect to find the following:

- The aims of the first Intellectual Output and the activities the partners were involved to achieve the objectives.
- The methodology for designing the framework
- The teaching plan

Description of IO1

Intellectual Output 1: ROBOTICS4DEAF INCLUSIVE INDEX: MAPPING THE SCENE, IDENTIFYING REQUIREMENTS AND CONSTRUCTING THE TARGETED COMPETENCE FRAMEWORK FOR ROBOTICS/CODING

IO1 comprises of five inter-related activities as shown below:

- A1: Benchmark research - collection and analysis of data (P3/P2)

  Summary of survey findings

  The ROBOTICS4DEAF surveys were attended by **183 students** from 6 partner countries: Poland, Italy, Greece, Cyprus, Slovakia and Latvia. Almost the same number of girls (88) and boys (95) participated in the survey. More than 100 pupils attend a special school for students with d/Deafness and/or hearing impairments. There were also people from primary, secondary, high school or Special Units at mainstream schools. 87 respondents were diagnosed with deafness while 90 people had hearing problems. Almost 70% of students (127 people) communicate in the sign language used in their country. The rest use written, spoken or mixed language of all three. 83% of the respondents participate actively in school activities. Over 60% of students have access to both tablet and computer, and 33% have access to a computer only. The vast majority use it regularly daily or at least several times a week. Students can open a Word document, prepare a PowerPoint presentation or use a search engine. Their level of digital skills is mainly defined as basic user (94 people) or independent user (71 people). As it comes to programming and robotics skills, in each case, more than half of the respondents indicated that they had not been dealing with them before. The same applies to attendance at robotics classes in or outside school. In schools where robotics classes take place, they are conducted mainly by an IT teacher, a qualified person from outside the school or another teacher. More than half the children have never taken part in a class where a robot was used. Children who have participated in such activities have used Edison, Leo WeDo, Lego Boost, Mindstorm and Arduino. Nearly three quarters of the respondents (136 people) express their willingness to participate in special robotics classes, which should preferably take place in their own school (116 people) as part of the timetable (101 people). Students mainly express their desire to learn new things (125 people), build a robot (82 people), program it (65 people) and want to win the robot (69 people).

  The survey showed that in each partner country there is a need for robotics and programming classes for deaf or hearing-impaired children. A significant proportion of those surveyed have never had contact with these activities before, but they are willing to participate in such classes. They would be most willing to participate in such activities in their own schools. Such classes should take place in both sign language and spoken language for better communication with children. Students express their desire to learn new things, build a robot and program it, which is a good start for creating such lessons.

  The ROBOTICS4DEAF survey involved **253 teachers** from 6 partner countries: Poland, Italy, Greece, Cyprus, Slovakia and Latvia. The survey was completed by 97 men and 146 women, 10 people preferred not to share their gender. The respondents were divided into 4 age groups: 25-35 years old (75 people, 29%), 36-45 (91 people, 36%), 46-55 (58 people, 23%) and 55-65 (29 people, 12%). 107 respondents (42%) have been working in their profession for less than 10 years,

82 (32%) for 11 to 20 years, and 68 (27%) have more than 20 years of work experience. The vast majority of respondents work in primary schools (36%) or special schools (35%). The rest are teachers of secondary schools and special units in mainstream schools. The respondents are teachers in primary schools, science teachers, language related teachers, IT teachers, sign language teachers and special education teachers. Over 65% of the teachers surveyed teach children who are deaf or with hearing impairment. 87% of people indicated that they have access to the Internet at their school, 74% have access to peripheral devices (projector, printers, scanners, etc.), the same amount to teachers' computers, 46% to interactive whiteboard, 50% to students' computers, 39% to students' laboratories. In 44% of cases robotics is not taught in schools, and if it appears in computer science lessons, students attend it after class or during the holidays. Three quarters of the teachers surveyed are not familiar with robots, the rest indicate knowledge of Lego WeDo, Edison, Lego Boost, Mindstorm and Arduino. ICT is mainly implemented at the same level (about 30%) in computer science classes, in other classes, as part of homework or not introduced at all. Respondents are divided on equal access to digital education for deaf people compared to other students. 48% of those surveyed notice that it is not the same as for regular students. 69% of those surveyed note that deaf students have the same access to electronic equipment/ materials as other students. The most commonly used communication techniques in class are sign language (22%), gestures (22%) and support by a sign language teacher (25%). Teachers agree that their students will be interested in taking classes in robotics and programming, and they would be glad to take part in such courses. For more than 54% the best time would be during the school week, 26% would attend afternoon/evening courses or on weekends. More than half of the teachers pointed out that they do not have sufficient knowledge of robotics, programming or data and do not acquire this knowledge. 84% of the respondents have never participated in any seminar on educational robots. When it comes to contact with the term STEM, 52% are not aware of what it is, and 94% do not know or are not sure how to include it in their classes. 90% of teachers have never used robots in their classes because they do not have the right infrastructure, training or are unsure about technical issues. Respondents agree that educational robots can be useful for classes in computer science, mathematics, physics, art or geography. For typical humanistic subjects such as history, mother tongue or foreign language, robots will not fulfil their function. In terms of ingenuity, creativity, improved motor skills, cooperation and problem solving, the teachers confirmed that robotics will be very helpful in all these areas. 39% of the respondents believe that educational robots would find the best in computer science lessons, 21% in extracurricular activities, 30% as a School Activity Program. The most appropriate teacher would be a computer science teacher (43%) or any teacher who would have the help of a sign language interpreter (33%).

The survey showed that there is a strong demand in all partner countries for learning and implementing robotics and programming into the curriculum. Teachers currently do not have sufficient knowledge and training to transfer knowledge through robotics or programming to their students. Despite relatively well equipped schools, teachers do not use all the possibilities of ICT in their classes. They are also unaware of the term STEM and how to use it in class. Teaching robotics and programming will be more relevant to science subjects such as computer science, mathematics, physics or geography, while completely useless in humanities classes. In terms of

ingenuity, creativity, improved motor skills, cooperation and problem solving, the teachers confirmed that robotics will be very helpful in all these areas. The best teacher to teach robotics and programming for deaf children will be a computer teacher or any teacher who would have the help of a sign language interpreter.

- A2: National (ALL) - Comparative INDEX (P7)
  The comparative Index illustrates the desk research in each partner country and includes information on their education system, disability law for the deaf community, deaf/hearing impaired inclusion in schools and educational infrastructure and opportunities regarding coding and robotics as well as digital inclusion of the students. The comparative index shows that specific laws are set to cover the rights of deaf community in each country and deaf students are included in mainstream schools although there are difficulties in using sign language interpretation as well as have special schools which integrate students successfully in most countries. For this reason, most of the mainstream schools which integrate students with deafness have specifically organised and appropriately staffed classrooms for deaf students. However inclusive and integration education in countries such as Poland, does not provide the deaf child with effective adapted educational development. Moreover, in respect to the integration of coding and robotics in National Curriculum, it is shown that in the last years emphasis is given on students acquiring digital skills especially in Cyprus, Greece and Poland. Schools in Italy face important limitations in accessing digital technology while schools in Latvia don't mostly use digital materials and technologies. Furthermore, courses on robotics are widely limited in all school settings and in all partner countries. The detailed comparative Index can be found on the following link: https://robotics4deaf.eu/io1/

- A3: ROBOTICSDEAF HANDBOOK (P2&7&5)
  The handbook provides guidelines for creating educational materials for deaf students on e-learning platforms. The handbook was developed for trainers who teach children and youth with hearing impairment and create educational materials for them. The handbook provides information on the ways e-learning platforms should be developed for the deaf community e.g. text, visuals, sign-language videos etc.

- A4: ROBOTICS4DEAF Competence Framework (P3)
- A5: Expert Advisory Group-Synergies- Associate Partners (P3)
  This activity supports the quality assurance of the project. Specifically, all partners will provide to the Coordinator with one external professional to take the role of an expert advisor for guidance and monitoring purposes.

The three products of IO1 are:

- a benchmark survey to map out the integration of coding and robotics skills within the community of young people/students with d/Deafness and/or hearing impairments in participant in comparison to the EU recommendations, as purported in the 2018 Digital Education Action Plan of the European Commission
- Inclusive Handbook for the needs and requirements of d/Deaf people
- the Coding, Robotics and STEM COMPETENCE FRAMEWORK analysing the skills to be used as part of the innovative ROBOTICS4DEAF programme to be offered.

This document provides solely information on IO1:A4 development.

IO1- A4 Competence Framework

The leading partners of this activity are ‘Emphasys Centre’(CY) in cooperation with ‘Demokritos’ (GR).

IO1-A4 focuses on the conceptual mapping of the benchmarks (aims and objectives for the trainer) and the indicators (level of acquisition of competences for the learner) of the COMPETENCE FRAMEWORK on which the monitoring, assessment and validation process in IO3 -IO4 through the ASSESSMENT TOOL and the Open Badges will be based on.

The competence framework encompasses of the modules to be included in the training course and are based on survey results of IO1 as well as on partners’ suggestions.

The modules include topics of introduction to robotics and STEM and creative scenarios in order to teach students with deafness or hearing impairment to build and program robots.

Methodology

Module 1 of the Robotics4Deaf Competence Framework aims to set the foundation needed for participant students to start their journey into the world of Coding and Robotics. It introduces the robotics kit chosen (The Lego Boost) by following a walkthrough with instructions on how to build a multipurpose robot rover called SMARC (SMArt Robotic & Coding). The basic coding concepts are introduced and typical uses of motors and sensors are presented and implemented through various tasks. It serves as a stepping stone for students to progress in a smooth and escalated way to the more complex scenarios set on Module 2.

The second module is divided into two parts.
In the first part the students of both age groups will get familiar with Vernie the robot and M.T.R.4. Students will use the Lego Boost App along with extra educational material in order to familiarize themselves with the functions of the robots.
In the second part of module 2 the students will apply the knowledge they have acquired in four educational scenarios. The educational scenarios are inspired by the following topics:

- Mythology
- Space exploration
- Master chef
- Environmental awareness.

Each scenario has two different versions.
The first version is designed for students of 10 - 14 years old while the second is designed for students 15 to 21 years old, thus we have a total of 8 educational scenarios.
The main difference between the two versions is the fact that in the second version the tasks that students are required to complete are more complex and require the use of all available sensors and sub-programs. On the contrary, the tasks of the first version are simpler and can be solved by the pupils without the use of sub-programs. In this way we have an educational material that is uniform in structure but also adapted to the different educational needs of both age groups.

ROBOTICS4DEAF **Competence Framework**

MODULE 1: DEVELOP BASIC CODING AND STEM SKILLS

		Age Group	
Main Objective	Introduce primary and secondary school students with hearing disabilities in the field of Robotics and Coding using the Lego Boost platform	**10-14 years old**	**15-21 years old**
Learning Outcomes	- Learn how to build a multipurpose robot called **SMARC** – **SMA**rt **R**obotic and **C**oding, by following a set of given building instructions	✓	✓
	- Learn how to program the robot SMAC by utilising the Lego Boost Creative Canva Coding App from a tablet	✓	✓
	- Learn the fundamental principles of coding: **Sequence**, **Selection** and **Iteration**	✓	✓
	- Learn how to program the robot to perform movements	✓	✓
	- Learn how to utilise the readings of a robot's sensor such as the colour and distance inputs	✓	✓
	- Learn how to program the robot to recognise obstacles	✓	✓
	- Learn how to program the robot to identify colours from a set palette of colours	✓	✓
	- Learn how to measure the reflected light intensity	✓	✓
	- Learn how to measure the distance from an object		✓
	- Learn how to utilise the remote-control option and trigger motion and events	✓	✓
	- Learn how to utilise **variables** and **operators**		✓

	Students should be able to:	10-14 years old	15-21 Years old
Knowledge	- Understand the use of electronic parts: Move Hub, Colour and Distance Sensor and the Interactive Motor	✓	✓
	- Understand the use of the sensor and how it functions	✓	✓
	Understand the various programming blocks available in the Lego Boost App:		
	- Yellow blocks for controlling the flow of a program	✓	✓
	- Orange blocks used for the colour and distance sensor	✓	✓
	- Green blocks used for achieving movement	✓	✓
	- Purple blocks used for setting the Hub and Sensor LED to emit a specific colour	✓	✓
	- Blue and Turquoise blocks for special actions, e.g. making MTR4 to hit an object with a hummer or directing Vernie to dance	✓	✓
	- White blocks for advanced programming, e.g. creating random numbers with a number generator, mathematical and logical operations such as addition, subtraction, multiplication and division, as well as checking if a variable is equal, smaller or larger than a given number		✓
	- Grey block used for creating sub-programs by grouping different actions in one block		✓

	- Understand the three types of iteration blocks
	  - **Forever Loops** which repeats a set of code forever
	  - **For Loops** which repeats a set of code for a set given number of times
	  - **While Loops** which requires a condition to be true for it to repeat a specific set of code
		✓	✓

	- Understand how the Selection (**IF-THEN-ELSE)** blocks work and when a set of code will run depending on the condition	✓	✓
	- Understand what a variable is and how to use them in various operations		✓

Skills	Students should be able to:	10-14 years old	15-21 years old
	- Put together different classic Lego pieces	✓	✓
	- Assemble technic and electronic Lego parts with the help of Technic connectors	✓	✓
	- Build the recommended robot (SMARC) by following the instructions given in a step by step guide	✓	✓
	- Navigate freely in the environment of the Lego Boost App	✓	✓
	- Create new programs by using the available blocks of the LEGO BOOST Creative Canva environment	✓	✓
	- Use a set of blocks to move SMARC in a forward or backward direction in a straight line and also turn to the left or right on a set number of degrees	✓	✓
	- Use the yellow blocks for Looping code	✓	✓
	- Connect the Colour and Distance sensor ○ Use the orange blocks to detect obstacles ○ Use a combination of blocks to detect obstacles and colours ○ Use a combination of blocks in order to make decisions based on the input of the sensor	✓	✓
	- Use the remote control in order to trigger motion and events	✓	✓
	- Use the reflected light intensity input from the light sensor and make the robot move on a predefined path - black line		✓
	- Use the reflected light intensity input from the light sensor and make the robot to follow the side of a wall - object		✓
	- Use white blocks and set variables to code SMARC		✓
	- Use various operators when coding SMARC		✓

Soft Skills	Students should gain the following:	10-14 years old	15-21 years old
	- Collaboration skills - Team work - Communication skills - Project management - Coordination - Critical Observation - Time management - Planning/Scheduling - Attention to detail - Listening - Idea Exchange - Problem Solving - Decision making - Experimenting - Focus - Goal setting - Memory - Presentation skills - Creativity	✓	✓

MODULE 2: THE CREATIVE SCENARIOS	
BUILDING AND PROGRAMMING ROBOTS	
Main Objective	Overview some of the standard models in the Toolbox: Vernie the Robot and MTR4
Learning Outcomes	- Lean how to build and program Vernie the Robot - Lean how to build and program MTR4 - Learn how to use the standard models as a reference point and continue from there on and expand the built - Learn to modify existing programs and also create their own from the beginning
Skills	Students should be able to: - Go through and complete the available tasks and programs of the Lego Boost App - Use the standard models as a reference point, to expand on further ideas and create programs - Add their own imagination and critical thinking to extend programming options beyond the original suggestions - Create own projects, using a combination of motor movements and sensor inputs
Soft Skills	- Team work - Collaboration skills - Communication skills - Creativity - Problem Solving - Decision making - Experimenting

HISTORY SCENARIO – THE LABOURS OF HERCULES I (10-14 years old)	
Main Objective	In this scenario, students will be introduced to the legend of Hercules and his famous Labours. They will construct and program a Robot (Vernie) just like the mythical Hercules, and learn simple movement commands and basic obstacle detecting programs. They will have to program Hercules to solve the set of problems which will be given to them, such as: a. Make Hercules move around Peloponnesus b. Spot Nemean Lion, Lernaean Hydra and Ceryneian Hind c. Chase the Ceryneian Hind in various parts of Greece Finally, they will discuss issues related to the protection and preservation of important cultural sites. PRE-REQUISITES There are no cognitive prerequisites.
Learning Outcomes	Students will learn: - The myth of the Labours of Hercules - The importance of Cultural Preservation
Knowledge	- Develop knowledge about mythology - Develop knowledge about history - Assemble a working robot - Familiarise with distance sensor and motors of the robot and develop skills on how to use them in a working program - Calculate the perimeter of Peloponnesus and the speed of Ceryneian Hind - Get familiar with the distance sensors of the robot and learn to use it in basic obstacles detecting programs - Learn simple movement commands - Familiarize themselves with simple “one start method” programs
Relevant Subject	- History - Mythology - Cultural Preservation
Soft Skills	- Creativity - Team work - Problem-Solving
HISTORY SCENARIO - THE LABOURS OF HERCULES II (15-21 years old)	
Main Objective	In this scenario, students will be introduced to the legend of Hercules and his famous Labours. They will construct and program a Robot (Vernie) just like the mythical Hercules, and learn simple movement commands and basic obstacle detecting programs. They will have to program Hercules to solve the set of problems which will be given to them, such as: a. Make Hercules move around Peloponnesus b. Spot Nemean Lion, Lernaean Hydra and Ceryneian Hind c. Find a way to cancel the regenerative abilities of Lernaean Hydra d. Follow the Ceryneian Hind in various parts of Greece e. Find a way to re-route the rivers Alpheus and Peneus to wash out

	Augean stables Finally, they will discuss issues related to the protection and preservation of important cultural sites. PRE-REQUISITES There are no cognitive prerequisites. Finally, they will discuss issues related to the protection and preservation of important cultural sites. PRE-REQUISITES There are no cognitive prerequisites.
Learning Outcomes	Students will learn: - The myth of the Labours of Hercules - The importance of Cultural Preservation
Knowledge	- Develop knowledge about mythology - Develop knowledge about history - Assemble a working robot - Familiarise with distance and colour sensors and motors of the robot and develop skills on how to use them in a working program - Calculate the perimeter of Peloponnesus and the speed of Ceryneian Hind - Get familiar with the distance and colour sensors of the robot and learn to use it in basic and more advanced obstacles detecting programs - Learn simple and more advanced movement commands - Familiarize themselves with advanced “multi start method” programs and sub-programs
Relevant Subject	- History - Mythology - Cultural Preservation
Soft Skills	- Creativity - Team work - Problem-Solving

SPACE SCENARIO – ROBOT FROM EARTH TO SPACE I (10-14 years old)	
Main Objective	In this scenario, pupils will get to know the planets of our Solar System and program the robot in order to explore them. Students will construct a robot or modify one of the existing one's (SMARC, Vernie or MTR4) and they will use it as a spacecraft in order to perform a number of missions. They will have to program the robot to solve the set of problems which will be given to them, such as: a. Travel from earth to other planets b. Detect objects that prevent spacecraft from traveling to the solar system and avoid them c. Plan a search and rescue mission where a broken satellite orbiting mars must be collected and returned to earth for repairs Finally, they will discuss issues related to space exploration, the difficulties, the changes that such an action will bring about and its impact on Humanity. PRE-REQUISITES There are no cognitive prerequisites.
Learning Outcomes	Students will learn: - The differences between planets, stars and comets - The planets of our Solar System - The basic features of every planet in our solar system
Knowledge	- Develop knowledge about Astronomy - Assemble a working robot - Familiarise with distance sensor and motors of the robot and develop skills on how to use them in a working program - Calculate the distance from earth to other planets - Get familiar with the distance sensors of the robot and learn to use it in basic obstacles detecting programs - Learn simple movement commands - Familiarize themselves with simple "one start method" programs
Relevant Subject	- Astronomy
Soft Skills	- Creativity - Team work - Problem-Solving
SPACE SCENARIO – ROBOT FROM EARTH TO SPACE II (15-21 years old)	
Main Objective	In this scenario, pupils will get to know the planets of our Solar System and program the robot in order to explore them. Students will construct a robot or modify one of the existing one's (SMARC, Vernie or MTR4) and they will use it as a spacecraft in order to perform a number of missions. They will have to program the robot to solve the set of problems which will be given to them, such as: a. Travel from earth to other planets b. Detect objects that prevent spacecraft from traveling to the solar system and avoid them c. Plan a search and rescue mission where a broken satellite orbiting mars must be collected and returned to earth for repairs d. Travel across the solar system and identify Mars, Jupiter and other

	planets e. When the spacecraft detects obstacles, It must make a signal in order to inform other spaceships for their existence Finally, they will discuss issues related to space exploration, the difficulties, the changes that such an action will bring about and its impact on Humanity. PRE-REQUISITES There are no cognitive prerequisites.
Learning Outcomes	Students will learn: - The differences between planets, stars and comets - The planets of our Solar System - The basic features of every planet in our solar system
Knowledge	- Develop knowledge about astronomy - Assemble a working robot - Familiarise with distance and colour sensors and motors of the robot and develop skills on how to use them in a working program - Get familiar with the distance and colour sensors of the robot and learn to use it in basic and more advanced obstacles detecting programs - Learn simple and more advanced movement commands - Familiarize themselves with advanced “multi start method” programs and sub-programs
Relevant Subject	- Astronomy
Soft Skills	- Creativity - Team work - Problem-Solving

CULUNARY ARTS - MASTER CHEF EXPLORATION I (10-14 years old)	
Main Objective	In this scenario, students will be introduced to the Culinary Art. Students will construct a robot or modify one of the existing one's such as SMARC, Vernie or MTR4. They will then have to program it to solve the set of problems which will be given to them, such as: a. Pick vegetables and make a salad b. Put together ingredients and make a meal c. Break an egg d. Add spices like salt and pepper on a meal e. Reduce food waste f. Healthy meals Finally, they will discuss issues related with food waste, healthy meals and healthy lifestyle. PRE-REQUISITES There are no cognitive prerequisites.
Learning Outcomes	Students will learn: - Materials needed to create a healthy meal - How to combat food waste
Knowledge	- Develop knowledge about the Culinary Arts - Develop knowledge about Food Science - Develop knowledge about the issue of food waste - Assemble a working robot - Learn simple movement commands - Familiarize themselves with simple "one start method" programs
Soft Skills	- Creativity - Team work - Problem-Solving
CULUNARY ARTS - MASTER CHEF EXPLORATION II (15-21 years old)	
Main Objective	In this scenario, students will be introduced to the Culinary Art. Students will construct a robot or modify one of the existing one's such as SMARC, Vernie or MTR4. They will then have to program it to solve the set of problems which will be given to them, such as: a. Pick vegetables and make a salad b. Put together ingredients and make a meal c. Break an egg d. Add spices like salt and pepper on a meal e. Reduce food waste f. Storage temperature g. Fishing, while ensuring that baby fish are not caught to ensure the sustainability of the seas Finally, they will discuss issues related with food waste, healthy meals and healthy lifestyle. PRE-REQUISITES There are no cognitive prerequisites.
Learning	Students will learn:

Outcomes	- Materials needed to create a healthy meal - How to combat food waste
Knowledge	- Develop knowledge about the Culinary Arts - Develop knowledge about Food Science - Develop knowledge about the issue of food waste - Assemble a working robot - Get familiar with the distance and colour sensors of the robot and learn to use it in basic and more advanced obstacles detecting programs - Learn simple and more advanced movement commands - Familiarize themselves with advanced “multi start method” programs and sub-programs
Soft Skills	- Creativity - Team work - Problem-Solving

ENVIROMENTAL SCENARIO – THE ENVOROMENTAL FACILITY I (10-14 years old)	
Main Objective	In this scenario, students will learn about environment and the importance of sorting the waste that humans create. Students will construct the robot MTR4, and they will have to program it to solve the set of problems which will be given to them, such as: a. Collecting plastic bags b. Recycling materials c. Deliver the materials gathered to specific locations PRE-REQUISITES Students should be able to understand what recycle means, how people recycle and what is the expected impact. Students may make a study visit to the local recycling station.
Learning Outcomes	Students will learn: - Indicators of Climate Change - Results of Global Warming - Ways of recycling and combating Climate Change
Knowledge	- Develop knowledge about Climate Change - Develop knowledge about Global Warming - Develop knowledge about Recycling - Assemble a working robot - Get familiar with the distance sensors of the robot and learn to use it in basic obstacles detecting programs - Learn simple movement commands - Familiarize themselves with simple “one start method” programs
Relevant Subject	- Geography - Ecology - Climatology - Biology - Social Sciences
Soft Skills	- Creativity - Team work
ENVIROMENTAL SCENARIO – THE ENVOROMENTAL FACILITY II (15-21 years old)	
Main Objective	In this scenario, students will learn about environment and the importance of sorting the waste that humans create. Students will construct the Vernie and MTR4 robots, and they will have to program them to solve the set of problems which will be given to them, such as: a. Identify the different types of waste according to their colour (eg green for glass, red for paper etc.) b. Collecting plastic bags c. Collecting the various recyclables separately d. Deliver the materials gathered to specific locations PRE-REQUISITES Students should be able to understand what recycle means, how people recycle and what is the expected impact. Students may make a study visit to the local recycling station.
Learning Outcomes	Students will learn:

	- Indicators of Climate Change - Results of Global Warming - Ways of recycling and combating Climate Change
Knowledge	- Develop knowledge about Climate Change - Develop knowledge about Global Warming - Develop knowledge about Recycling - Assemble a working robot - Learn simple and more advanced movement commands - Familiarize themselves with advanced “multi start method” programs and sub-programs
Relevant Subject	- Geography - Ecology - Climatology - Biology - Social Sciences
Soft Skills	- Creativity - Team work

Conclusion – Next Step

The Competence Framework has been developed based on proposal's guidelines and the transnational survey results.

Based on the development of the benchmark research to map out the current scene in each country, the development of the ROBOTICS4DEAF Competence Framework with inbuilt benchmarks and indicators for students' learning progress and skills identification, the IO2 will be developed.

IO2 is concerned with the 'ROBOTICS4DEAF INCLUSIVE ECO-SYSTEM FOR TEACHING, LEARNING AND ASSESSMENT OF CODING AND ROBOTICS THROUGH THE DIGITAL BADGES'. The next step is to implement IO1-A1 and IO1-A2 which refers to building the Robotics4deaf Bank and the design of the Educational Back Pack respectively.

Within IO1-A1, all partners will start collecting professional development opportunities offered in each partner country and the EU level (KA1 Mobility Courses) and e-tools/e-resources/good practices to support the teaching of the coding, STEM and robotics skills as identified in IO1. Emphasys Centre will provide a template to implement this activity to the rest of the partners.

The competence framework also enables us to implement IO2-A2 of the project which is concerned with the 'Design and development of the Educational Back Pack: Teaching and learning material'. Demokritos and DeafStudio will provide the guidelines for the design and production of the material taking into consideration the needs and characteristics of students, the digital framework designed in IO1 as well as the type of learning and activities. The aim is to produce learning modules for introducing coding/robotics skills as identified in IO1 e.g. on-line learning modules, educational/ informative videos, off line booklets, digital story books resources, games, simulations etc. Each partner will be assigned to develop the material for the topic(s) chosen in IO1 (framework) and based on the needs identified in IO1. In that way continuity and in depth analysis will be ensured.