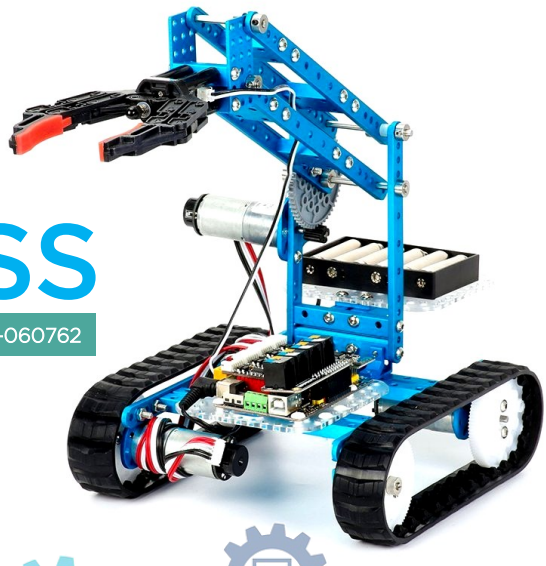
steAm4SEN

# IN PROGRESS



A newsletter on Project 2019-1-PT01-KA201-060762

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## PROJECT PARTNERS

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## DISSEMINATION ACTIVITIES IN BULGARIA

### ACTIVITY 1

NART's traditional Summer Academy for Inclusion was held in Pomorie (Bulgaria) in the beginning of July. The event was engaging, and the effective work carried out led to relevant outcomes despite the limited number of participants due to safety measures in place because of the pandemic.

Participants included teachers and inclusive education specialists from all over Bulgaria. Bring together representatives from each region of the country enabled participants to share experiences, practices and expertise towards a common goal. New perspectives for distance educational support for students with special educational needs were outlined.

The STEAM4SEN project was presented and participants learnt about the opportunities offered through the project. Participants showed great interest in the upcoming development of the Educational Kit and future trainings.

### ACTIVITY 2

An informative presentation on the STEAM4SEN project was delivered during the Palette of Good Educational Practices event, organised by the association Knew and Can on the 9th and 10th of July, 2020 in Sofia (Bulgaria). Representatives of the National Association of Resource Teachers have presented the aims, outputs and partnerships of the project.

NART presented the survey results of the opportunities and challenges for STEAM education in relation to SEN students in Bulgaria. The ongoing work on the Education Toolkit was shared with the participants and various good ideas were generated. The event was attended by teachers, school principals, NGOs' representatives, organisations working in the field of education and training, resource specialists and others. A number of participants were interested in contributing to the subsequent outputs of the project. The STEAM4SEN project was recognised as one of the most innovative projects, providing effective practices presented during the event.

## ERASMUS DAYS 2020 IN PORTUGAL

The Portuguese partners of the STEAM4SEN project participated in the ERASMUS Days 2020, held between 17th and 19th October, 2020.

More information about the event is available at:
https://www.erasmusdays.eu/event/erasmus-projects-in-agrupamento-de-escolas-emidio-navarro-almada-portugal/

Among other initiatives, students and teachers who participated last year in ERASMUS+ initiatives, shared these experiences with their peers. There was also the opportunity to present the projects that this school is participating in.

STEAM4SEN Partners are pleased to inform that they have submitted a paper for EDUROBOTICS 2020. EDUROBOTICS is the International Conference Educational Robotics which witnesses the continuously growing interest in educational robotics worldwide and has helped to build a community of researchers and educators in Educational Robotics at European and international level.

EDUROBOTICS was initially planned to take place at the Department of Information Engineering and Mathematics of the University of Siena (Italy) in November 2020, however it was postponed to 25th and 26th February, 2021 due to the COVID-19 pandemic challenges.

In addition, a call for a paper has been launched this year. The conference will focus on current learning and training needs in robotics from pre-school age to universities and on the development of a sustainable framework to promote education in robotics and with robotics including curricula and resources for school and higher education that will support the development of the 21st century skills for youth. The conference will emphasise the role of robotics as a learning medium and tool in the context of STEAM education and in the light of learning theories and methodologies suggested by Constructivism and Constructionism (Piaget, Papert) as well as the currently emerging education maker movement.

Because of the compliance of the call for a paper with the aim and objectives of the STEAM4SEN project, the Consortium has issued the paper STEAM approaches for inclusive robotics teaching: the experience of STEAM4SEN. Here we will present the Educational Toolkit within the framework of STEAM education: considering the multi-disciplinary vocation of STEAM education as well as its learner-centred instruction, the Toolkit enhances the "formalisation" of robotics education in formal curriculum to be easily embedded by teachers - with or without STEAM knowledge - and with poor or easily accessible materials through experiential learning that drives all students, especially those with SEN, learning difficulties or coming from disadvantaged backgrounds to acquire key hard and transversal competences.

## METHODOLOGY

Primary research was applied in Portugal, Lithuania and Malta through questionnaires. In Italy, Greece and Bulgaria were conducted both Primary and Secondary researches combining questionnaire surveys (Italy, Bulgaria), interviews (Greece) and completed studies.

The research addressed not only STEAM teachers from secondary schools, but also students between the age of 14 to 18 in secondary school (EQF - level 2), including students with mild special education needs.

Comparing the results of the partner countries, the following general overview was reported:

- Most teachers are embracing new teaching methodologies:

  This is done with a combination of enthusiasm and stress because it is something new that implies more work and is still considered something to be added to the previously developed curriculum. One of the challenges is to pull together components of our existing curriculum to create STEAM lessons so that it is not an "extra" but so it replaces parts of the curriculum.

- The educational system is rigid and does not allow opportunities to experiment:

  Results show that the compulsory educational system is slightly rigid and does not give the opportunity to teachers to adopt a STEAM pedagogical approach, especially for students with SEN. Moreover, teachers have an insufficient number of resources, equipment or facilities, adaptation tools to address SEN students and budget constraints in accessing adequate content/material for teaching.

- Lack of opportunities for SEN students:

  The main challenge for teachers in teaching STEAM subjects to SEN students is still the insufficient number of methodologies and educational resources adapted to different SEN students. Children with intellectual disabilities remain the most vulnerable, while it is required to adapt the curriculum to the individual needs of SEN students and to provide tools and technologies for full participation in the educational process. In most cases individual curricula for students with hearing or visual impairment, cognitive delay and / or multiple disabilities are associated with a reduction in the number of STEAM subjects taught, as well as the practical impossibility of many SEN students to participate in practical activities and science experiments. Most of the teachers' difficulties come from the pressure for high achievements in all children and integrating children with SEN inis becoming a threat to this expectation. It is very rare to see opportunities for mutual growth of students, through interaction, understanding and support between different students.

## THE EDUCATIONAL TOOLKIT

Toolkit's Methodology

The Educational Toolkit provides key didactical tools related to STEAM addressing secondary school students with and without SEN. This is composed of 56 different activities that directly address one or more challenges identified during the research phase of the project. Each activity provides useful guidance for teachers and trainers about its preparation and implementation, including useful tips and recommendations.

The methodological approaches for designing the Toolkit were based on Enquiry-Based Learning and Project based learning. Enquiry-based learning focuses on investigation and problem-solving, hands-on

experiences and creative ways to solve problems. It engages students by making real-world connections through exploration and high-level questioning. Problem-based learning gives the students the opportunity to work in groups and to solve an open-ended problem. Both approaches are usually applied within the STEM education, which has long been lauded for the deep connections it brings to teaching and learning.

The distinctive feature of the Educational Toolkit is that it also foresees Arts integration to provide students the opportunity to explore multiple content areas simultaneously, by learning any content area in and through the arts. This additional step allows the inclusion of the Toolkit within the framework of STEAM education.

An enquiry-based STEAM learning provides students with opportunities to investigate a real problem, search for possible solutions, make observations, ask questions, test out ideas, and think creatively and use their intuition

Enquiry-based STEAM learning aspires to engage students in an authentic scientific discovery process. From a pedagogical perspective, the complex scientific process is divided into smaller, logically connected units that guide students and draw attention to important features of scientific thinking. These individual units are called inquiry phases, and their set of connections forms an inquiry cycle. The inquiry phases and cycles are:

1. ENGAGE: Students are involved by stimulating their pre-knowledge and their curiosity which is the foundation of any meaningful learning experience. They are asked to formulate their own questions related to the learning subject and to identify the problem.
2. EXPLORE AND DISCUSS: Students collect information, experiment and exploit resources and then share their ideas with each other and ask each other about their own experiences and investigation. These two phases can also be divided into two different steps.
3. EXPERIMENT: Students generate an accessible, relevant and curiosity driven action to justify inquiry.
4. EXPLAIN: Students communicate their findings.
5. REFLECT: Students think again about the initial question, the path taken and the actual conclusions.
6. EVALUATE: Students' performance is teacher and self-assessed according to a previously shared grid or set of criteria.

This methodology is also recalled in the activity structure in terms of the activities' implementation. In fact, the Toolkit follows this step-by-step approach by providing a set of Usability Guidelines that fully support the teacher to deliver each activity through the Enquiry-based cycle mentioned above.

## STEAM ACTIVITES AND STUDENTS

All Activities produced by STEAM4SEN link themes to reality and respond to concrete problems, leading students to seek answers to them and to connect knowledge and skills they already have with a whole world that they can still discover when investigating, experimenting, discussing, questioning and implementing through collaborative work.

The STEAM4SEN project covers the most diverse areas of science, , technology, arts and mathematics. We approach ways to encourage students to connect mathematics in the most diverse situations in daily life such as, the relationship between the energy we consume through food and the physical activity performed, study of the geometric figures mostly found in nature and through spatial images, recognition of these shapes and studying characteristics of European places.

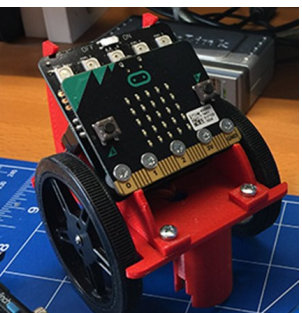
Science is present in all projects - preservation of the environment, climatic changes, material properties and their correct selection, study of light, sound and colours with the respective connection to the arts, through projects that, in addition to using more diverse and current technologies to present the results, lead students to get there by themselves and, in general, to build something concrete which is always motivating.

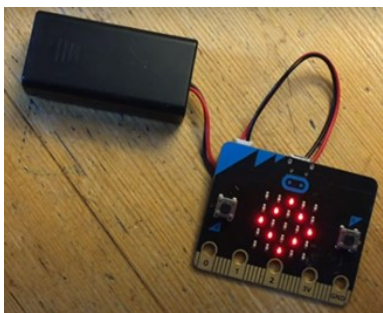
Robotics has a relevant space in the set of projects, not missing the theme 'Artificial Intelligence', a relationship between human nature, robots and technology.

Many projects resort to the use of attractive technologies such as the use of 3D printers, use of microcontrollers with numerous applications such as DotBot micro: bit and Arduino that allow the development at the level of programming and creative imagination appropriate to different age levels. It allows students to build objects, designed and executed by them,, making the various learning experiences more relevant and lasting for students.

Students with special needs are not forgotten. Throughout the project such students will be provided the opportunity to produce their own end product, they will become significantly involved and we will be surprised at how creative they can be.

The approach of these projects prepares the students for life in the real world, where projects are more open and with professional freedom. It prepares the students for the society of the future, for the complex world of the future. This approach includes all students.





The project started with the development of a National Research by each partner regarding STEAM education in their own country analysing the current situation in general and in relation to SEN students. The key challenges related to STEAM education for students with SEN were identified in order to develop a map of challenges. These challenges relate to the following aspects:

1. Learning methods and contents – designed in line with the specific requirements for learners with SEN, to provide adaptation and reduction of learning contents according to learning difficulties and to foresee additional support for personal development.
2. Training delivery – learning contents developed in cooperation with SEN experts, meaning specific learning environments adapted in order to support the learning process.

Furthermore, the toolkit's methodology was based on these challenges. In particular, the methodology was developed in order to specifically address each identified challenge. Also, the methodological approach was based on STEAM education particularly, on Enquiry-Based Learning (EBL), which allows the creation of an environment where the learning process is driven by an enquiry approach owned by the student who asks questions and directed by the teacher who is the 'facilitator'.

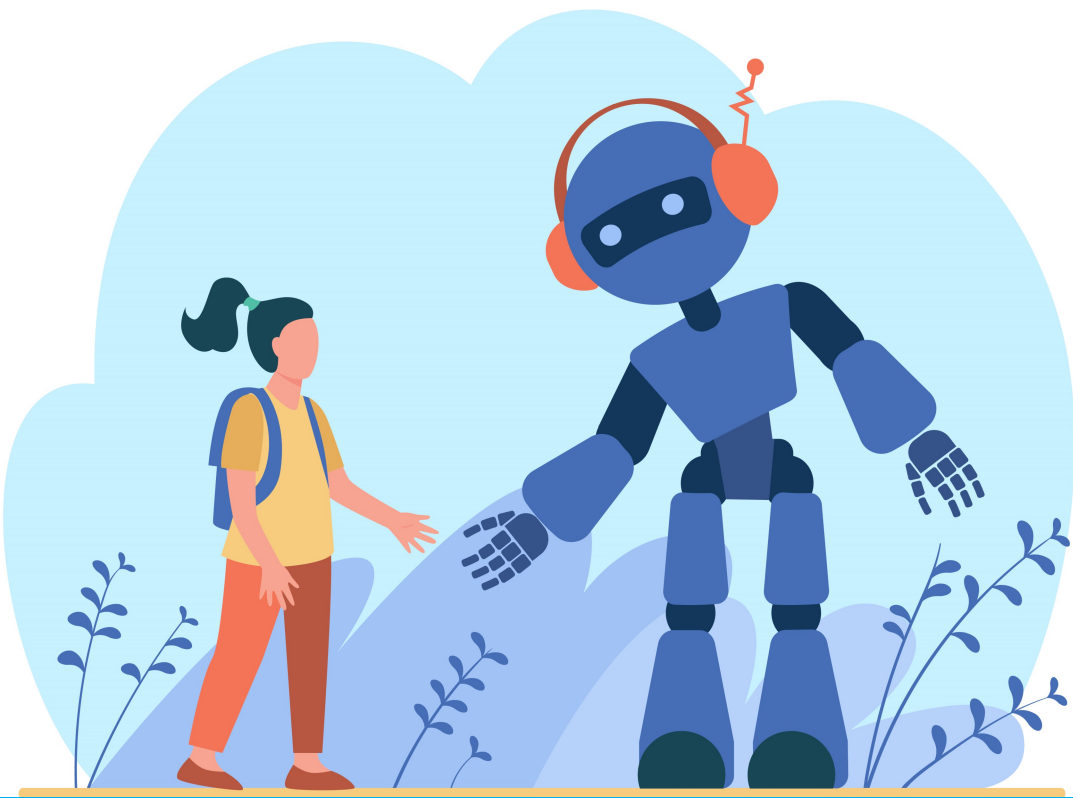
Following this, we developed the educational tools and activities to be included into the toolkit based on the designed methodology. These materials were developed in order to be used both in an online learning environment (the project website) as well as in the classroom. Each partner developed a set of seven activities to be included in the Toolkit.

During the 3-day Learning Activity which took place online in November, three teachers per partner school received training about the Educational Toolkit in order to effectively understand how the kit can be applied during lessons and how to structure lessons for SEN learners based on STEAM.

The Educational Toolkit was presented, and teachers were trained on the practical utilisation of the different tools. They had the possibility to be involved in a practical learning activity and were invited to provide their feedback regarding the validity and effectiveness of the proposed tools in enhancing STEAM education for students with SEN. At the end of this activity, there were two key outcomes:

1. Each teacher developed an action plan regarding the use of the Educational Toolkit with their students and the dissemination of this kit to their network of teachers.
2. Teachers provided recommendations for the final fine-tuning of the Educational Toolkit and related guidelines.

This way, the consortium has practically tested and validated the Educational Toolkit with teachers. Moreover, it gave participants the opportunity to discuss their challenges in implementing innovative practices for SEN students and to share their experience and expertise.



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