



RobotSTEAMKIDS

UPGRADING EARLY CHILDHOOD EDUCATION AND CARE THROUGH
THE DIGITAL UPSKILLING OF TEACHERS AND THE INTRODUCTION OF
AN INCLUSIVE STEAM AND ROBOTICS PROGRAMME

Desk research and policy-documentation
on the current scene in Poland

Desk research report

Author:





PROJECT INFORMATION

Project acronym:

roboSTEAMKIDS

Project title: roboSTEAMKIDS: UPGRADING EARLY CHILDHOOD EDUCATION AND CARE THROUGH THE DIGITAL UPSKILLING OF TEACHERS AND THE INTRODUCTION OF AN INCLUSIVE STEAM AND ROBOTICS PROGRAMME

Project N°:2021-2-PL01-KA220-SCH-000048987

Sub-programme or KA:

KA220-SCH - Cooperation partnerships in school Education

Website: <https://robosteamkids.eu/>

Consortium:



Table of Contents



What are the national policies supporting the integration of Educational Robotics and STEAM education in ECEC (Early Childhood Education and Care)? 4

Present 2-3 good practices related to the integration of Educational Robotics and STEAM education in ECEC at the school level (formal and nonformal). 4

Are there any support services (e.g. associations, advisors) that provide resources for teachers to incorporate Learning Robots and STEAM education in ECEC? 9

Are there CPD (Continuing Professional Development) programs for teachers specializing in educational robotics and STEM education in ECEC? If so, please briefly identify them. 10

What are the main gaps and room for improvement in Educational Robotics and STEAM education in ECEC? 11

What are the main challenges for Educational Robotics and STEM education at ECEC? 12



What are the national policies supporting the integration of Educational Robotics and STEAM education in ECEC (Early Childhood Education and Care)?

Among the main directions of the state's educational policy in Poland, which were set for years 2022/2023, there are two related to digital upskilling of teachers and STEAM education:

- Developing methodological skills of teachers regarding proper and effective use of information and communication technologies in educational processes. Support of IT and media education (...)
- Supporting teachers and other members of the school communities in developing pupils' basic and transversal skills, in particular with the use of teaching aids purchased under the "Laboratories of the Future" program.

However, the first direction, even though refers to all levels of education, is not followed by policies supporting implementation of actual solutions in ECEC. The second one, in turn, points directly at schools. There are also some policies in place corresponding to the above-mentioned courses of action at elementary school level. Since 2017 programming is present in the core curriculum (starting from the first grade) and the Ministry of Education and Science (in cooperation with GovTech Centre in the Chancellery of the Prime Minister) has started "Laboratories of the Future". Under this initiative primary schools will receive over a billion zlotys (2.15 million euros) for buying equipment and introducing STEAM education.

At ECEC level, however, such policies and programs are still lacking. No robotics nor STEAM elements are explicitly included in the national curriculum for pre-schools. Many aspects important in ECEC – as indicated in the core curriculum – can be taught within STEAM model but, in practice, this approach is still rarely adopted by Polish nurseries and pre-schools.

Present 2-3 good practices related to the integration of Educational Robotics and STEAM education in ECEC at the school level (formal and nonformal).

STEAM is not widespread in ECEC in Poland, however, apart from informal learning opportunities, there are some pre-schools that take steps in order to incorporate elements of STEAM into their program. Among them, the following groups can be distinguished:



- Pre-schools that have regular classes/activities for children present in the plan of the day: including coding and programming, mathematics, robotics – mainly in private institutions
- Institutions offering STEAM related activities as additional regular classes
- Pre-schools where STEAM workshop is a one-time event (they either invite private educators or go out to specially designed labs)
- Pre-schools that take part in different, often nationwide actions or projects lasting for a specific period of time (e.g. 10 days, 1 month, half a year) – mainly in public sector. There are several projects/actions covering all country, initiated by private companies, foundations or even pre-schools. They often encompass the following elements:
 - tasks for children (e.g. one task per week – all participating pre-schools work on the same problem and then share results) + instructions for teachers
 - various materials for teachers, parents and children on how to adopt STEAM education into everyday learning and playing

Below we present a selection of good practices developed or introduced by organizations representing private, public and third sector.

I. Foundation for the Development of Digital Education (Fundacja Rozwoju Edukacji Cyfrowej)

<https://akademia.uczymydzieciprogramowac.pl/pl/udp#info>

The Foundation for the Development of Digital Education, supported by the Edu-Sense brand, has developed the "We teach Children to Program" program, in which learning to code is treated as a process, where each action results from the previous one and is an introduction to the next. In the proposals for activities, programming-related games are intertwined with everyday didactic activities, regardless of the currently implemented content or didactic tools. The main goals of the program relate to the conscious, substantive introduction of coding and robotics elements to didactic activities at different stages of education (pre-school education, early school education). In addition, the program aims to:

- Shape soft competences: develop logical algorithmic thinking, task-oriented approach to the problems posed, creativity
- Shape the ability to work in teams, look for compromises, optimal solutions
- Develop sensitivity to truth and goodness
- Develop an attitude of responsibility for the natural environment.

The most important benefits for children comes from the gradual and responsible introduction to the digital world, conscious, active and creative use of modern technologies, shaping key competences and preparation for programming. Teachers during the program are supported to use digital tools and resources in educational processes, introduce digital technologies safely and effectively and improve



qualifications thanks to online workshops as well as methodological materials provided. The initiative runs from 01/09/2022 to 31/01/2023 and pre-schools are welcome to join for free.

Participants carry out the proposed tasks in accordance with the program schedule (taking into account the needs and capabilities of their pupils, their own and of the facility in which they implement the program). After completing a given task, they can share reports from the classes (it is not obligatory) in the form of comments under prepared posts on Facebook groups: We teach children to program, Coding on the carpet. At the end of the program, participating teachers receive certificates and the children receive diplomas.

www.fundacijapfr.pl/edukacja_steam.html

As part of the activities carried out by the Polish Development Fund Foundation the 'Education STEAM at school' co-financed from the Funds EEA. The main purpose and assumption is to promote innovative methods education, exchange of knowledge and good practices educational institutions between European countries and, above all, in-depth reflection on the methods of implementing innovative solutions teaching methods in Polish schools.

The program is implemented as part of the EEA funds worth EUR 17 255. The program is aimed at teachers and educators to support and develop competences, emphasizing the active use of the STEAM method, independent creation and design of lessons, and building cooperation between teachers and students for effective teaching. Program participants receive free 3-day intensive training in innovative teaching methods and the support of experienced mentors from Poland (Central House of Technology) and Norway in the implementation of their own educational project, joining the group of teachers using technology in teaching, engaging students in and outside school, actively developing professionally and a certificate of completion of the Program. Thanks to participation in the Program, each participant: develops skills in designing and building creative educational experiences, integrates modern technologies into pedagogical practice and build self-confidence and proficiency in experiential-based teaching methods, works with tools and techniques such as facilitation and design thinking, trains students to develop the competences of the future, strengthens its competences in the implementation of the educational process.

<https://sp.fundacjaszkolna.edu.pl/projekty/>

The School Foundation is the leading organization in the project "STEAM education in every school", which is co-financed with us by THE VELUX FOUNDATIONS from Denmark.

A total of 100 schools from Podlaskie and Warmińsko-Mazurskie voivodships will be classified to the program. Selected schools will receive free support in implementing new technologies in education and have a chance to obtain the title of "STEAM School" - become an expert in STEAM teaching on a national scale.



Schools selected for the program will be equipped with free equipment and training in STEAM methodology as part of the project. The training, materials and support we will provide will also meet a large part of the ministerial requirements for the “Laboratories of the Future” program. By promoting STEAM education, the project aims to popularize the technical and professional path among primary school students and thus prepare them in the best possible way to the requirements of the changing labor market. In addition, the program will build a network of schools that will become leaders in combining new technologies with subject learning. Foundation wants make school communities friends with new technologies and their daily use through play and experience.

II. Private pre-school „Academy of Smile”

<https://akademiausmiechu.waw.pl/oferta/przedszkole/>

"Akademia Uśmiechu" ("Academy of Smile") is a bilingual private nursery and kindergarten, where great importance is attached to conducting creative activities in order to prepare children for education in primary schools and for life. The staff focuses on independence and responsibility, supporting the development of logical thinking and sensitivity to the beauty of the surrounding world. The kindergarten has a wide range of general development, educational, cultural activities, including:

- LEGO® Education – where the basic laws of science, technology, engineering, arts, and math are introduced. Children learn to solve problems in fun and engaging way, they get to know phenomena such as movement, chain reactions, the functioning of gears and more. Basing on STEAM park set, teachers provide plenty of opportunities to learn to observe and describe the world, develop imagination, play roles and cooperate.
- Coding – in the group of 3-year-olds (already in the second semester), children participate in offline coding classes, following the initiative "We teach children to program". Basic programming issues are implemented using games in the field of children's mathematics and logic, based on the activity and commitment of pupils. The staff identifies the individual needs of children, selecting activities to suit their needs and development opportunities. Thanks to this, it has a positive effect on the development of mathematical, technical and logical competences. Children also learn the principles of cooperation and the basics of programming. Classes have a general developmental character and have a positive effect on various spheres of the child's functioning, they teach, among others, how to solve logical problems and conflicts in a group.
- Robotics – classes designed for older pupils (5-year-olds) allowing the pupils to learn new skills and basic concepts related to robotics, automatics and computer science. Knowledge is acquired through play and the focus is placed on creativity. Using colorful codes, children get a chance to program a robot (Ozobot) that accompanies them in drawing, problem solving and group work.



III. **Teddy bear public pre-school in Tychy:**

<https://przedszkole9tychy.edupage.org/about/>

In the public Teddy bear pre-school, there are general development activities, but also those that build digital competences. Thanks to the staff's approach, children are able to use new technologies and media. The curriculum is designed to stimulate the curiosity of the world, while implementing various activities related to programming (coding, creating simple algorithms). The pre-school is involved in international initiatives related to new technologies, the "CodeWeek" and Safe Internet Day are celebrated. Children play and learn during classes with robots, and teachers use tools such as a multimedia board.

The pre-school introduced in all age groups an innovative program: "Head works, counts and codes". The main goal of the program is to develop logical thinking and teach the basics of programming, basing on the assumption that among the key competences of the 21st century are skills related to the use of a programming language. Teaching programming is not an end in itself, but it enriches learning, integrates and develops its content in a creative way. The program is also aimed at activating children and helping them overcome their internal barriers, as well as recognizing their value. Skillfully designed activities support independence and help in distinguishing important data from redundant and even threatening safety.

IV. **Profi Lingua (private company offering courses)**

<https://www.profi-lingua.pl/blog/edukacja-steam-rewolucyjna-metoda-nauki-stworzona-dla-twojego-dziecka>

The Academy of Programming and Development is a program implemented by Profi Lingua for children. The program was developed by Katarzyna Trojańska (pedagogical therapist, neurodidactics, with many years of experience in working with students and co-author of the first European publication on STEAM education). During the workshops, children can acquire math skills and soft skills. They have the opportunity not only to participate, but also to play the role of inventors, constructors, scientists and discoverers. The role of the teacher is to moderate the activities and support the children, not to give ready-made solutions. Children find them themselves and the teacher provides advice and guidance.

Workshops are for children aged 7-12. Children meet and learn in two age groups: 7-9 years and 10-12 years. The course for children consists of 60 meetings, each of 60 minutes. During the classes, the children are accompanied by Mr. Bystrzak's good friend - the Photon robot and an indispensable element of many projects, i.e. the latest generation iPad. These tools help children to develop not only hand-eye coordination and spatial orientation, but also make the child acquire knowledge without knowing that he is learning.



Are there any support services (e.g. associations, advisors) that provide resources for teachers to incorporate Learning Robots and STEAM education in ECEC?

There are such services but they are usually offered by NGOs or private companies that sell tools and equipment for pre-schools. Depending on the type of support, there are foundations that most often provide technical or financial support. An example of this is the "Digital Dialogue" association, which is a partner of Kidsview and the ING Foundation for Children as part of the "Pre-schools of Tomorrow - Equal Opportunities" program. The aim of the program is to promote in ECEC the methodology of teaching for the 21st century with the use of modern educational tools and to provide comprehensive support to teachers and parents in conducting education focused on the comprehensive development of a child, also with special needs.

In addition, there are online platforms in Poland, such as "SteamEdukacja", where you can find information about the STEAM method itself, educational materials, teaching aids, and more. The platform also offers the arrangement of the learning space in accordance with the STEAM idea (division into appropriate zones). Thanks to this section of the platform, teachers can get inspiration and adapt different spaces.

Another tool, mainly with courses, is the Polish National Educational Platform with free MOOC courses. The course is made available via the Navoica.pl platform, but the organizer is Akademia Ignatianum in Kraków, about which we wrote in point 4. Navoica.pl is a space that provides free courses prepared by Polish universities and institutions. You will learn online at any time and at any pace. After completing the course, teachers receive a certificate.

Another example of a platform that makes available mainly lesson scenarios within the knowledge base is "Akces Edukacja". The company is also an authorized partner of LEGO® Education in Poland, thanks to which teachers can find lesson plans using LEGO® bricks. In addition to class scenarios, you can find articles and scientific research on STEAM, as well as substantive support from Akces Edukacja experts – provided that the aids for the implementation of STEAM classes will be.

When it comes to networking, knowledge exchange in Poland takes place mainly informally on internet groups, including companies, foundations and other organizations promoting the method.



Are there CPD (Continuing Professional Development) programs for teachers specializing in educational robotics and STEM education in ECEC? If so, please briefly identify them.

Pursuant to Polish law, teachers, as a professional group, are obliged to continually educate themselves. Regardless of the form of employment, the teacher has the right to receive funds from the employer for professional development, however it must correspond to the needs of the institutions. The analysis of the available courses and training showed that there is an offer regarding robotics and STEAM education in ECEC, but the availability varies depending on the region, often is very limited, and most of the courses are paid. It should be noted that qualification courses may only be conducted by teacher training institutions. This means that these organizations must be accredited by the competent education superintendent. Due to the above, there are public and private centres for teachers' lifelong learning in Poland. At the same time, on the Polish market there is a wide range of commercial training courses that do not meet the criteria for such classes to be classified as professional development.

There are several workshops/trainings offered by accredited centers of excellence for teachers – either private or public (especially operated by local governments). Some of them are free, some require small fee. Topics covered (at present and in past) include preparing teachers for introduction in ECEC of the following elements:

- Scratch
- Coding
- Classes with laboratories of the future
- Coded math
- Learning and playing with Photon robot (designed by polish university)
- Numicon system.

For example, regional Teacher Training Centre in Kielce offers the Workshops "Learning and playing with the Ozobot Bit / Photon EDU robot in kindergarten and in grades 1-3 of primary school". The workshops are aimed at teachers who want to present the possibility of using the robots in integrated classes in kindergarten or with the younger children of primary school. Classes are carried out in the form of stationary workshops, during which teachers have the opportunity to work with the robots, get to know examples of activities involving their use and learn how to design their own educational activities. The training lasts 1 day, 4 hours (<https://www.scdn.pl/8-frontpage/1048-warsztaty-nauka-i-zabawa-z-robotem-photon-edu-w-przedszkolu-oraz-w-klasach-i-iii-szkoly-podstawowej>).

Another example of a Centre of Excellence is commercial STIMULUS, offering the on-line course "Learning to code in kindergarten", which aims to develop teachers' skills in shaping digital competences of students in preschool education. The program includes



three modules: 1. Coding methodology in kindergarten, 2. Online applications and courses for preschoolers, and 3. Social media support in learning to code, at home and in kindergarten (<https://centrumstimulus.pl/nauka-kodowania-w-przedszkolu/>).

At the same time, on the Polish market there is a wide range of commercial training courses that do not meet the criteria for such classes to be classified as professional development. Among them are opportunities by organizations, including foundations, that offer training in STEAM and coding, or robotics for whole schools or individual teachers, such as "The Foundation for the Development of Digital Education" (the program is described in section 2).

What are the main gaps and room for improvement in Educational Robotics and STEAM education in ECEC?

The main gap regards the lack of systemic approach. Educational Robotics and STEAM education are not incorporated in national curriculum for ECEC in Poland and policies targeted at these topics are not present. Hence, they are rarely being introduced in pre-schools and even if they are, in most cases it happens in private institutions or only to a limited extent (as a one-time event or in the form of extra classes).

However, there is yet another important gap that would need to be addressed before changes in national curriculum could prove beneficial, namely the lack of easily accessible and high-quality learning opportunities for ECEC teachers, coupled with poor motivation system in the context of continuing professional development. Especially, the widely understood accessibility poses a problem. There are some on-line materials (such as textbooks, scenarios for activities with children etc.), as well as courses and trainings but the process of improving skills often requires from teachers investing their free time and, if there is a fee, also their own financial resources. Additionally, some companies distributing robot kits or/and equipment for STEAM laboratories provide an on-line access to varied resources and forms of support (including expert advice, networking platforms etc.) but it is granted only after the purchase has been made.

According to the Teacher's Charter, one of the basic rights and duties of teachers is to improve general and professional knowledge. It is correlated with the responsibilities of the pre-school principal who should provide teachers with assistance in fulfilling this duty. In particular, teachers can submit an application for financing forms of professional development. However, principal is not obligated to grant funds (or allow time during working hours), if such a request does not result from the needs of a given institution. In other words, the procedure for co-financing professional development is aimed at satisfying the educational and teaching needs of a given preschool, often corresponding in the first place to the core curriculum and requirements for preschools, leaving little or no room for robotics and STEAM education. Therefore, teachers who wish



to develop in this field are often required to do that on their own. The problem is that in Poland the teaching profession is not associated with high social status or competitive salaries, which adversely affects teachers' motivation and possibilities for CPD. Hence, a systemic solution is needed – one that will enable teachers to improve their competences and skills, preparing them for introducing robotics and STEAM education to pre-schools. Only then, incorporating these elements in national curriculum could bring the expected outcomes.

Regarding non-formal education, often in a form of workshops or regular classes organized by private companies or foundations, the offer in the field of robotics and STEAM education is expanding. However, it is dedicated primarily to school-age children. Activities for children younger than 6-7 years old can prove difficult to find, especially outside larger cities.

What are the main challenges for Educational Robotics and STEM education at ECEC?

The first key general challenge that Poland faces is to move to more inclusive model of teaching robotics and STEAM at nursery and pre-school level. At present, children who has access to such education are mainly those attending private institutions or taking extra (often paid) classes. And even this kind of offer is not easily available for younger children, not only outside main cities but even within larger urban centres.

Another related challenge, as mentioned before, is to substitute one-time actions and initiatives (often lasting for a very limited time and not repeated in other years with new groups of children) with systemic implementation of robotics and STEAM education, incorporated in everyday playing and learning activities of pre-schools.

There are several goals on the way to overcoming these challenges that would need to be achieved first. Among them the most important are:

- Raising awareness about importance of STEAM in ECEC among policy makers, teachers, and parents.

At present, robotics and STEAM are widely talked about in the context of primary schools. Relevant policies and programs have been implemented, there is an extensive and growing offer of non-formal education for children over 6 years old, and parents can find a lot of on-line materials on how to introduce STEAM and robotics at home. However, there is little interest in the topic when it comes to ECEC. Perhaps the reason is that both teachers and parents think that at this stage it is too early for topics that sounds difficult even for the grown-ups. The knowledge about the possibilities of robotics and STEAM education, and the resulting benefits is still not common.



- Preparing teachers for introduction of Educational Robotics and STEAM education.

As already mentioned, good preparation of teachers is crucial for implementing inclusive, comprehensive STEAM education. It should encompass not only digital skills but also competences related to teaching through play based on different projects that stimulate creativity, problem-solving skills with application of knowledge from different fields. In other words, the challenge is to equip teachers with both the knowledge and skills to be passed on, as well as with appropriate competences, methods of work and tools that will improve the teaching process itself.

- Securing financial resources for educational materials, kits and equipment for pre-schools.

In order to ensure that robotics and STEAM education are included in everyday activities of children within inclusive model, it is important to equip pre-schools with adequate educational materials. But this can prove to be quite a challenge, especially for public institutions run by smaller local governments which face budget pressure and strive to finance their basic needs.

All the above-mentioned challenges are interlinked. Without awareness about importance of robotics and STEAM education in ECEC it is hard to expect any progress, not only in terms of systemic solutions for public education but also in the domain of private sector that responds to the actual demand. But awareness is not enough. To eliminate disparities in children's opportunities and expand access to high-quality robotics and STEAM education, it should be incorporated in everyday activities of pre-schools. However, changes in the national curriculum will not yield expected results if the institutions are not ready. Certainly, investment in STEAM equipment and robot kits would be necessary. But even more importantly, well-prepared teachers who can make a good use of these resources are needed. Combining all these elements on the way to introduce effective systemic solution pose the real challenge.