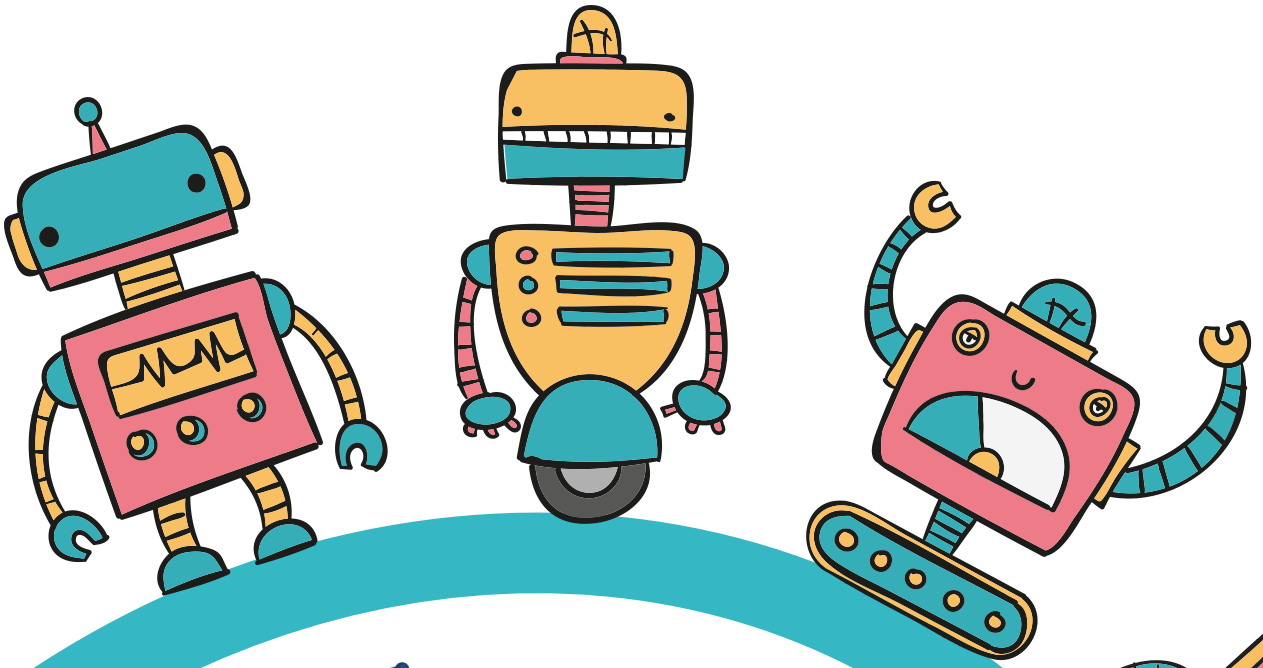

RoboSTEAMKIDS

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

PR1. A1.1. Desk research and policy documentation on the current scene in each partner country

Author: Scuola di Robotica

Co-funded by the European Union

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:

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

By 2022, the study of computational thinking and coding should become compulsory in pre-school and primary education, in line with the national curriculum guidelines. On the basis of the Motion No. 1-00117, approved by the Italian Parliament, the Government to take initiatives to gradually introduce, by 2022, the study of computational thinking and coding in kindergartens and first cycle of education as part of the compulsory digital curriculum, in line with the national curriculum guidelines.

In 2015, the Italian government (Ministry of Education) launched the PNSD (Piano Nazionale Scuola Digitale, National Program for the Digital School) which structured - and funded - many activities dedicated to AT, and to Computational Thinking, tools being coding and educational robotics.

"This Program is not simply a deployment of technology: no educational step can be separated from intensive teacher-learner interaction, and technology cannot be distracted from this fundamental 'human relationship'.

This Program responds to the call for the construction of a vision of Education in the digital age, through a process that, for schools, is related to the challenges that society as a whole face in interpreting and supporting learning throughout life (life-long) and in all contexts of life, formal and non-formal (life-wide).

This is confirmed by the High-Level Conference of the European Commission in December 2014, several publications of the OECD Centre for Educational Research and Innovation, the New Vision for Education Report of the World Economic Forum (PNSD, https://www.miur.gov.it/scuola-digitale).".

The Digital Economy Index sees Italy in 25th place out of 28, with structural weaknesses in connectivity and human capital. The digitisation process has also been developed through resources allocated at European level under the National Operational Programme (NOP Education) 2007-2013 and through the training of teachers.

The most significant steps in this 5-years Digitalization of Italian Schools:

The digital school, in cooperation with families and local authorities, opened to BYOD (Bring Your Own Device), i.e. policies whereby the use of personal electronic devices during teaching activities is possible and efficiently integrated. (Lodi, 2020).

The student's digital curriculum was introduced, i.e. a way of certifying and enhancing the skills, both formal and informal, that students acquire during their school years, during school hours and outside school, including individually.

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The creation of a single digital identity, the teacher's personal profile will be associated with a wide range of administrative information and interactions (teacher file), as well as those relating the professional development, also financed by the resources allocated to the Teachers' Charter. In a single tool, therefore, there is a way to highlight the work in the classroom and at school, and therefore the professional portfolio that each teacher develops, starting from the probationary year and throughout their career; the wealth of training experiences of the teacher, built through the paths offered by the Ministry or independently, including through the Charter of the Teacher. (Gabriele et al., 2019).

Equipping schools with digital technologies. In this context, digital technologies intervene to support all the dimensions of transversal skills (cognitive, operational, relational, metacognitive). But they also come into play vertically, as part of the literacy of our time and fundamental competencies for full, active and informed citizenship, as anticipated by the Recommendation of the Europeann Parliament and the Council of Europe.

Specifically, for Primary School: PNSD has promoted "Programma il Futuro" (see action #17). (see action #17), a course dedicated to primary schools. Each primary school student already followed a corpus of 10 hours per year of logic and AT (called the 'Program the Future' initiative. (Seee Corradini, Lodi, Nardelli, 2017).

Other Italian PNSD Tools:

- making, educational robotics, internet of things,
- digital art, digital management of cultural heritage,
- reading and writing in digital and mixed environments, digital storytelling, digital creativity,
- Action #20 - Girls in Tech & Science

In addition, the Italian Ministry of Education has set up a close collaboration with several associations, including Scuola di Robotica, to carry out

- training of teachers and technical staff
- the organisation of coding and educational robotics contests
- collaboration with Europe through EU Code Week and EU Robotics Week

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2. Present 2-3 good practices related to the integration of Educational Robotics and STEAM education in ECEC at the school level (formal and nonformal). REMARK: good practices presented here can be also presented and extended as part of A1.2 (Collection and mapping of Good practices).

Good practices for teachers training.

STEAM in pre-schools - Training Course (STEAM Pole - Cuneo)

During the course, various examples of activities to be carried out in the classroom were proposed, which, through the use of innovative teaching methods, enable learners to develop both transversal skills (soft skills) and curricular skills in the STEAM fields (science, technology, art and creativity, engineering and mathematics).

Special attention was given to mediating tools, from the most traditional ones used for tinkering and unplugged coding, to the most innovative ones such as robots. In the meetings, teaching methods were presented accompanied by practical examples of classroom activities designed for pre-schools. The course was structured in 6 hours of synchronous lessons and 4 hours of self-training on a MOOC platform for a total of 10 hours.

The final meeting gave teachers the opportunity to share their field experiences, reflections, doubts and personal analyses in a collaborative discussion.

See: https://scuolafutura.pubblica.istruzione.it/fr/le-steam-nella-scuola-dell-infanzia

2.Coding skills and educational robotics for childhood - Training Course (STEAM Pole - Livorno)

The training course aims to illustrate how to introduce the concepts of coding, computational thinking and educational robotics into the teaching of disciplines in pre-school education according to the principles of active teaching methodologies and laboratory teaching.

The course includes the creation of an unplugged coding kit, various practical exercises up to the introduction of augmented reality in unplugged coding to then move on to robotics kits suitable for the primary school age group, digital storytelling with the scratch junior programme, and the world of social robots.

See: https://scuolafutura.pubblica.istruzione.it/fr/coding-skills-e-robotica-educativa-per-l-infanzia-10

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3.From coding to robotics in kindergarten. Training Course (Future Lab - Umbertide)

The course provided an understanding of the basic principles of coding, through a theoretical/didactic framework and an understanding of the basics of visual and block programming. It also provided knowledge of innovative environments for coding and the tools of educational robotics for children and its possible applications.

https://scuolafutura.pubblica.istruzione.it/fr/dal-coding-alla-robotica-nella-scuola-dell-infanzia

4."CODING WITH SCRATCH AND ROBOTICS" - TRAINING COURSE FOR PRIMARY SCHOOL TEACHERS

The I.T.S. "Deledda-Fabiani" of Trieste, as STEAM pole school, in collaboration with SISSA Medialab, organised a course aimed at primary school teachers in the field of "Computational thinking, programming and educational robotics".

5.Computational thinking programming and educational robotics - childhood. Training Course (STEAM Pole - Vigevano).

The Course is divided into different meetings/submodules in which teachers tried to understand together the concept of 'computational thinking', its meaning and its importance in children's education starting from pre-school through the implementation of specific activities that can, through play, bring them closer to this practice. The aim was to provide preschool teachers with notions and tools useful for the creation of teaching activities aimed at understanding Coding and the basic concepts behind computer programming; that is, all those mental processes that aim at solving problems by combining characteristic methods and intellectual tools (such as interactive games). Coding thus helped the youngest children to think better and creatively, stimulates their curiosity through what may seem to be just a game.

6. Tecnologies&STEM #21 - Training Course (Future Lab - Pescara)

The course provides an insight into new technologies and innovative teaching methodologies applicable to STEM disciplines. Designing and implementing a teaching activity that employs technologies and software to foster students' encounter with STEM disciplines.

Active learning and STEM disciplines:

Tinkering, a form of informal learning in which one 'learns by doing'. The aim is to express oneself and experiment, making objects out of poor materials, focusing more on the

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process than the result. This methodology represents a constructionist approach to teaching science disciplines, the creative learning of the Lifelong Kindergarten (MIT Media Lab), which rests on four pillars (projects, passion, peers, play).

Models and application examples.

Platforms and technologies for STEM: Simulators, Robots and Programmable Boards.

Teaching examples of the proposed methodologies and tools.

Good practices for designing activities for children

Activities designed by Scuola di Robotica

Unplugged activities: To clearly and actively introduce coding, programme and algorithm concepts to pre-school children, it is a good practice to start with unplugged activities. These activities/games not directly related to coding on programmable devices, aim to designed improving the perception of space, time and movements in young children. These skills are fundamental to developing coding and computational abilities in early childhood. In addition, unplugged activities are very important for developing the concept of algorithms in games and for problem solving.

Unplugged robotics usually use cards to define the movements of a character. Each card, with an unambiguous drawing has a clear meaning, that is a basic instruction to create a code for the character's movements. Unplugged Cards are often used placing the characters on a printed or physically built grid, and each movement card usually means "move one step", so onto the next position on the grid.

a.Physical-motor Activity - Computational thinking

Title: Duck Duck Goose. Duration: 20 mins

Topic: Explore sequences and follow instructions

Objectives: To be able to follow instructions, improve attention skills, make decisions

Age range: 3-5

Skills involved: Computational Thinking, Decomposition, Play Based learning, Computational Thinking Application

All the children sit on the floor in a circle. Movement in directions and going around the outside of a circle is introduced. The adult demonstrates how the game is played using a puppet - going around the circle tapping each child on the shoulder saying 'duck'. Eventually the puppet taps one child on the shoulder saying 'GOOSE'. The Goose has to get up and chase the puppet around the circle. The puppet has to try to reach the GOOSE's place in the circle and sit down before be-ing caught.

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Children observe how the game is played. Then one child is chosen to be on the outside walking around the circle tapping each child on the shoulder saying duck. Eventually they pick one child to be the "goose" by tapping the child on the shoulder and saying 'GOOSE'

They run around the circle to try to take that child's place before the "goose" catches them

If they reach the end without getting tagged, the "goose" returns to their own seat and the original player continues around the circle.

Evaluation Use a rubric and observe the children

Expected Outcomes:

Children can understand the rules

Children can follow a sequence

Children can make decisions

Follow the sequence - duck, duck goose. This can be made more complex and articulated by adding number of times the sequence has to be done.

b. Physical-motor Activity. Computational Thinking

Title: Dodgems Cars

Duration: 20 mins

Topics: Spatial Awareness / Directions / Following instructions

Objectives: Be aware of own space, begin to follow directions and understand instructions

Key CT Elements: Abstraction, algorithms

Age range: 3-5 years old

Resources/Materials: Markers or Chalk to assist finding a space. Hoops or steering wheels

Each child finds themselves a space - use marker or chalk. Each child has a piece of equipment to hold like a steering wheel / or a hoop that the children can stand inside and hold it around their waist to give the idea that they are in a car. They can also hold the hoop or steering wheel in front of them.

Children start on their own marker and then learn to move around the play space slowly not bumping into each other, using the equipment as a steering wheel. Once they are familiar with this we can introduce instructions, given to children in form of lights or coloured tags:

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RED - the children stop

ORANGE the children jog/march on the spot

GREEN the children move again around the playspace

Evaluation: Use a rubric and observe children

Expected Outcomes:

Children can move in different directions

Children can move at different speeds

Children can avoid obstacles

Children can work independently in own space

Children can follow a leader

Notes

Introduce instructions one at a time to ensure understanding

Remind children to look out for obstacles

Use different coloured cards to help understanding of instructions

You can introduce travelling at different speeds for safety and encourage the children to call out "beep beep" when they are near another "dodgem" to develop their spatial awareness

Make play space larger to make activity easier or smaller to make the activity harder

Introduce additional instructions to make activity harder - "roundabout" children turn round on the spot. "Busy road" to encourage children to drive more slowly

Include arrows/lines to direct pathways

Skills involved: Computational Thinking, Decomposition, Play Based learning, Computational Thinking.

Activities with robots

c.Attractions, roller coasters, roller coasters and video games!

The group of kids /4,5 years old) will be divided into two age groups and will turn participants into true engineers of creativity and fun. Inspired by the world's most famous theme parks, we established with the kids an Imagineering Research & Development Team' responsible for the creation, design and construction of incredible parks! And to make it all more realistic, we will alternate real height constructions with miniature robots using LEGO and Little Bits kits.

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d. Let's program the Blue Bot

Edited by Teachers Lucio Negrini and Sara Benini

Phase 1. Exploring Blu Bot commands/Keys

Group work, whole class - Card for programming commands

Pupils are divided into two groups of four sub-groups of three pupils. Four activity stations are prepared to work with the Blue-Bot. In rotation, each sub-group of 3 learners will have approximately 20 minutes to stand at one station and carry out the required grid exercise. In one lesson each group will do 2 stations and the other two will be done in the next lesson.

In order to move, the robot needs instructions. The aim of this activity is to create an instruction manual. The previous activity is resumed by letting the pupils try it out in small groups.

On an empty board they draw (arrows, cross, etc.) / write down the commands they discover in the Blue-Bot (forward, backward, turn right, etc.).

After the group work, the pupils share with the rest of the class which commands they discovered.

The aim is to establish a terminology shared by everyone in the class. The terminology defined ned terminology will be written on the blackboard or a poster/instruction manual will be created.

The stations are as follows:

The alphabet (to be considered whether to introduce this activity according to the pupils' skills): Learners have a card on which to write the sequence of commands to be given to the Blue-Bot to write a certain word.

The hungry mouse: Pupils are provided with a path and following what is written on the card

they have to move the mouse from the blue mat to the burrow via the food it wants to eat.

To practise the use of programming terminology and to understand the robot's movements, the pupils, in pairs or small groups, take it in turns to be robots that have to follow a

path on a giant grid drawn on the floor or on a carpet.

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The teacher gives each group or pair of pupils a starting point and an end point on the grid.

on the grid. The pupil-robot, blindfolded, positions himself at the starting point, the other pupils

will have to give commands, respecting the previously shared terminology, to allow

the learner-robot to arrive at the arrival point.

On the return journey, it will be someone else's turn to be the learner-robot and from the arrival point return to the start, possibly following a different route.

3. 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 some public and many private organisations in Italy that offer refresher courses for pre-school teachers, but unfortunately not on a continuous basis.

See next paragraph.

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

Despite the ministerial initiatives to fund coding and educational robotics projects, there is no similar, continuous and well-structured national operation on teacher and educator training.

The public education research organisation CNR ITD – Council of National Research, Istituto Tecnologie Didattiche, (https://www.itd.cnr.it/), which has carried out several research projects on the impact of RE in childhood and conducted some courses for teachers.

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The other national educational institute that organises, but not continuously, courses for RE in ECE is INDIRE. The National Institute for Documentation, Innovation and Educational Research is a research body of the Italian Ministry of Education)

https://codingerobotica.indire.it/index.php?action=vedi_singola_esperienza&id_scheda=13

The Ministry of Education's Scuola Futura – the Future School initiative - , which is part of the Next Generation EU Action, has funded many RE activities for children, and among them the schools have independently organised refresher courses for teachers

Private for-profit and non-profit organisations providing teachers training

Sprintalb: https://www.sprintlab.it/progetto/

FEM Modena https://fem.digital/

School of Robotics

Paleso: https://www.paleos.it/

Mondo Digitale, Roma: see https://www.mondodigitale.org/sites/default/files/web_robotica1.pdf

Fondazione Golinelli: https://www.fondazionegolinelli.it/it/courses/io-robot-180

Universities (mostly Education Sciences)

- University of Bologna in cooperation with one Italian distributor of robotics kits: https://www.rivistainfanzia.it/pvw/app/1PWDIN02/pvw_sito.php?sede_codice=1PWDIN02&page=2574614;
- The Ancona Politecnico organised refresher courses for pre-school teachers;
- Scuola Superiore Sant'Anna di Pisa: https://www.santannapisa.it/it/progetto-robotica-educativa;
- The University of Padua, Department of Robotics, organised refresher courses for pre-school teachers

Pre Schools on their own, including:

Primary school Montessori-Bilotta" di Francavilla Fontana (BR): The aim of the course is to initiate pre-school teachers in the acquisition of innovative strategies and methodologies

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using coding and robotics as a support tool for traditional teaching activities aimed at children aged 3 to 6 years;

Scuola Paritaria dell'Infanzia Maria Bambina di Montelupo Fiorentino: https://www.scuolasammontana.it/pagine/si-riparte-con-la-robotica

Istituto Comprensivo "Muttoni", Vicenza: https://ic6muttoni.edu.it/news-dettaglio/150/coding-e-robotica-educativa-per-tutti-gli-alunni-dellistituto

L'Istituto Comprensivo n.7 "Enzo Drago": https://www.icn7enzodragomessina.edu.it/it/index.php/notizie/la-vita-della-scuola/news/285-robotica-educativa-con-dragonao

IC Coazze, Giaveno: https://www.iccoazze.edu.it/informatica-distituto/

Ic Barbera, Caccamo: http://www.innovazionescuola.it/robotica/

IC Onor, San Donà di Piave https://www.iconor.edu.it/pagine/happy-code-il-coding-e-la-robotica-educativa

Public Administration, Municipalities, Regions

The Municipality of Florence initiated and financed a coding and educational robotics project from pre-school to middle school. See: https://educazione.comune.fi.it/system/files/2018-12/Bizzarri_Robotica_educativa_-_nidi_e_scuole_dellxinfanzia.pdf;
https://www.portaleragazzi.it/schede_progetti/robotschool-junior/

The Emilia Romagna Region has set up and finances a service to assist teachers on coding and RE from childhood to high school (Marconi Service). See: https://serviziomarconi.istruzioneer.gov.it/2021/02/05/educare-con-la-robotica-nella-scuola-dellinfanzia/

The Provincial Federation of Trento Nursery Schools introduced ROBOBIMBI, a project born out of the collaboration between the Fondazione Bruno Kessler (FBK) and the Federazione Provinciale Scuole Materne di Trento (FPSM) with the aim of studying the possibility of introducing educational robotics in the preschools associated with the Federation, to support children's learning processes;

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The Region of Tuscany has supported several RE projects in pre-schools, including:

Third Educational Circle, Sesto Fiorentino, 3rd year kindergarten. See: http://www311.regione.toscana.it/lr04/documents/15427/315204/fiee56000v_roboticainfanziaprimaria.pdf/f451628f-b8d9-46dd-8783-b6bf3741c9e3?version=1.0

The Piedmont Region (Turin) organized course o ER for pre school teachers

http://www.istruzionepiemonte.it/torino/2021/10/28/corsi-di-formazione-per-docenti-di-scuola-dellinfanzia-e-del-primo-ciclo-di-istruzione-coding-e-robotica-educativa-una-palestra-per-il-pensiero/

http://www.istruzionepiemonte.it/torino/wp-content/uploads/sites/15/2021/10/PROPOSTA-DI-FORMAZIONE-PER-DOCENTI-CODING_E_ROBOTICA_IC_SPAZIANI.pdf.pades_.pdf

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

A Premise

In Italy, the integrated 0-6 system envisaged by the Italian 2017 legislation has traditionally consisted of two pillars: nurseries and pre-schools. These two pillars have historically followed a very different path. While for pre-schools the State has long since assumed responsibility in terms of financing, this has not been the case for nursery schools, already defined in the original legislation of the 1970s as 'social services of public interest', for which there is therefore neither a subjective right to access, nor a clear and certain financing mechanism.

Alongside predominantly municipally funded services (either managed directly by the municipalities, or given in agreement to private non-profit or for-profit organisations, or private but agreed with the municipalities), there is a private offer in Italy, mainly financed by fees paid by families, and in some cases by companies (public or private).

Overall, the coverage of places with respect to resident children up to 2 years of age is around 25%. This parameter, including the entirely private supply, is still well below the minimum quota of 33% set by the European Union as the percentage of children who should be guaranteed accessibility to education services for early childhood education services. (ISTAT figures 2014)

Teacher training

One problem concerns the overall teacher training and their continuous upgrade.

The recruitment of teachers and educators to private nurseries is still not linked to a national training and evaluation system.

Re-designing the spaces

In addition, the pre schools need to review the organisation of the spaces and the technological equipment provided.

Co-ordination between pre and primary schools

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The UN Committee on the Rights on the Rights of the Child recommended create a coordinating body at the Ministry of Education for the cooperation with the regions and local administrations and to introduce uniform structural organisational and quality standards for early childhood care and education services.

Contact with the families. Families better informed

Attendance at the nurseries increases rapidly with age: 6.2% of children aged between 3 and 12 months attend such facilities. 6.2% of children aged between 3 and 12 months, while the share rises to 25.7% for children aged between 12 and 24 months and reaches 46% for those aged 24-36 months. Survey data collected by Istat provide a better understanding of the motivations behind of families 'behaviour regarding the use of childcare services. A part of families choose not to enrol their children in a nursery school because they consider their child too young or are concerned about the consequences that such attendance may have on their health.

health conditions.

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

The 0-3 years old

The Italian situation is particularly poor as regards educational services for children under the age of three, given that the level of coverage, between public nurseries subsidised and totally private only reaches 25% (of which only a little more than half are publicly public ownership). There are also strong territorial inhomogeneities, with the southern regions regions (where child poverty and school avoidance rates are highest) that have much lower coverage rates. In addition to territorial inequalities there are those inequalities linked to parents' income and education: children of low-income and low-educated parents are the most likely not to attend nursery school.

Connection with the primary school

The pre-school should maintain a connection of programmes and methodologies with the primary school. One solution could be the elaboration of a vertical curriculum, seen in its generative force, in its evolutionary dynamics, perhaps in a stretch from 3 to 14 years (today made possible by the generalisation of comprehensive institutes) is the best response to the anxiety of anticipation.

Investing in in-service training

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The issue of in-service teacher training represents an obligatory step for the relaunch of pre-school education. Today, in-service training is marginal, both in the profile of the teacher (the right-duty is no longer sufficient) and in the political choices (resources are too meagre).

Regional inequalities

These numerous and profound regional inequalities that still persist in Italy, in fact result in underage people having different opportunities and rights depending on where they are born and grow up. This is a strong discrimination on a regional basis, which has a strong impact on children's lives and which makes it essential to initiate strategic planning capable of effectively investing the resources, including those that will arrive from the European level, for childhood and adolescence.

Increase the high-quality investments

Investments in early childhood education services, pre-schools and in the support for family skills are strategic both socially and economic point of view.

Conclusion

In conclusion, here the main areas where public and private interventions and investments are needed in the field of services children and families with children in the 0-6 age:

- To recognise more fully the educational and instructional rights of children in age 0-6 years, by expanding the degree of coverage and commitment of public interventions;
- Promoting the quality of the integrated education and training system for children aged 0-6 years;
- Promoting the effective and progressive integration of the 0-6 system;
- Promoting interventions to support parenting;

Sources: MIUR, UNESCO, Save the Children Italy, NEXT Generation EU, Alleanza per l'Infanzia.

Attendance rates of early childhood services for children under 3 years of age in EU

and other European countries (2018-19) Source: EU-Silc data processing

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Links to some kit for pre school Educational robotics

Beebot, Bluebot, https://www.tts-international.com/bee-bot-programmable-floor-robot/ 1015268.html

Cubetto, https://www.primotoys.com/

Dash and Dot, https://www.makewonder.com/

MatataLab, https://matatalab.com/en/coding-set

mTiny, https://www.makeblock.com/mtiny

Neuron, https://www.makeblock.com/steam-kits/neuron

Ozobot, https://ozobot.com/

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