ANCONA
20th – 22nd November 2019

FABLEARN CONFERENCE ITALY 2019

INDIRE
ISTITUTO NAZIONALE DOCUMENTAZIONE INNOVAZIONE RICERCA EDUCATIVA

UNIVERSITÀ POLITECNICA DELLE MARCHE

FONDI STRUTTURALI EUROPEI
PON 2014-2020

"CODING E ROBOTICA" 10.2.7.A2-FSEPON-INDIRE-2017

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FABLEARN ITALY 2019

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FONDI STRUTTURALI EUROPEI PON 2014-2020

UNIVPM SOSTENIBILE

EUROPEAN ROBOTICS WEEK
Brought to you by SPARC

REGIONE MARCHE

FabLEARN Italy 2019

The FabLearn Italy 2019 is an international conference that gathers researchers, teachers, educators and practitioners that work with the aim to bring the principles of Making and Educational Robotics in formal, non-formal and informal education.

Lectures, scientific presentations, posters and workshops will discuss latest results on digital fabrication in education, educational robotics, assistive robotics in education, the "makers" culture, hands on learning and innovative spaces for learning environments, to investigate how innovative educational tools and methodologies can support a novel, more effective and more inclusive learner-centred education.

The FabLearn Italy 2019 is associated to the global FabLearn initiative, that advocates and supports constructionist learning experiences for all children. FabLearn is based on the work of Columbia University Associate Professor Paulo Blikstein and the Transformative Learning Technologies Lab (TLTL).

The second edition of the FabLearn Italy is organized this year thanks to the collaboration between INDIRE and Università Politecnica delle Marche, and is funded by the PON "Per la Scuola" 2014-2020 Progetto Coding e Robotica (Codice progetto 10.2.7.A2-FSEPON-INDIRE-2017-1 – CUP: B59B17000000006). The conference will take place in Ancona from 20th to 22nd November 2019. Researchers, teachers and practioners from all over the world are invited to submit to this conference... Registration is completely free!

Conference proceedings will be published in open access and reviewed for their inclusion in Scopus. All accepted contributions will be included in the open-access, website virtual gallery to form part of our database of innovative projects in Education and Technology. The extended versions of best short papers will be invited to submit to a dedicated special issue.

This year, the MARCHE DRONE-WEEK will be associated to FabLearn Italy. This is a national event consisting in workshops for secondary school's students, drone FPV exhibitions and professional driving competitions.

FabLEARN 2019 Organizers

Indire

INDIRE – the National Institute for Documentation, Innovation and Educational Research, is the Italian Ministry of Education's oldest research organisation.

As well as its headquarters in Florence, it has three regional units in Turin, Rome and Naples. It is a public body, scientifically independent, and enjoys statutory, organisational, regulatory, administrative, financial, accounting and patrimonial autonomy (cf. the INDIRE's Articles of Association, Italian version).

Since its foundation in 1925, the Institute has worked closely with the Italian school system, investing in training and innovation while supporting improvement processes in schools.

INDIRE is the benchmark for educational research in Italy. It develops new teaching models, tries out new technology for training courses, and fosters innovation redefining the relationship between space and time of learning and teaching. The Institute boasts consolidated experience in the in-service training of teachers, administrative, technical and auxiliary staff as well as headmasters, and has been a leading player in some of the most important e-learning experiences in Europe.

Together with INVALSI (National Institute for the Evaluation of the Education and Training system) and the inspectorate of the Italian Ministry of Education, INDIRE is a part of the National Evaluation System for Education and Training. In this field, the Institute develops actions to support educational improvement processes to raise teaching quality and pupils' achievements.

INDIRE observes and documents the development of technical and vocational education and training curricula, and school-to-work transition, by means of quantitative and qualitative monitoring, data banks and research reports.

Indire is also the Italian National Agency for Erasmus+, the European Programme for Education, Training, Youth and Sport 2014-2020. Additionally, it is the National Support Service for eTwinning – the community for teachers to connect, collaborate and share ideas in Europe – as well as for Epale – the Electronic Platform for Adult Learning in Europe – and for Eurydice, the network providing information on education systems and policies in 37 countries.

At an international level, INDIRE is part of the EUN Consortium European Schoolnet, consisting of 31 European Ministries of Education, promoting in-

novation in teaching and learning in an international dimension. The Institute looks towards Europe also through its many collaborations which allow the creation of a network for cooperation, contacts, information flows and experience exchanges involving pupils, schools, enterprises and institutions in all European countries.

Its long tradition has endowed the Institute with a historical archive consisting of a rich collection of XIX and XX Century books and documents, one of the few in Italy specialising in the collection and valorisation of documentary material on the history of education.

Università Politecnica delle Marche

Università Politecnica delle Marche (UNIVPM), founded in 1969, is based in Ancona, but geographically dislocated on the territory of the Marche region with its branches. UNIVPM has about 17000 students and includes 5 faculties (Engineering, Sciences, Economic Sciences, Medicine and Agricultural Sciences) which permanently employ more than 500 academics and 500 technical/administration staff. Among the 12 Departments of the UNIVPM, 5 of them were ranked as "excellent" by the Italian Ministry of Research and University which transferred to UNIVPM 30 million euro to promote research and education. The academic programmes offer 39 degree courses, 9 first and second level post-graduate diplomas, 4 specialization courses, 33 specialization schools and 9 Ph.D. schools.

UNIVPM has increased its presence at European level thanks to a high standard in research and industrial collaborations for research and development and innovation. UNIVPM attracts international talents, both students or scientists, reaching in 2017 more than 300 memoranda of understanding signed for research and didactic purposes. UNIVPM has secured funding for more than 115 EU projects mainly in the area of engineering and life sciences, with a total budget of over 25M€, and has coordinated over 20 projects. Furthermore, as an incubator, UNIVPM has already founded a Contamination Lab (C-Lab) to encourage the launch of new activities and promote the cultural contamination between students with different academic backgrounds and areas of expertise. The University supports the constitution of private-law bodies with the aim of promoting entrepreneurial utilization in innovative contexts, the exploita-

tion of research results, and the development of new products and services, through the creation of "academic spin-offs" by students and researchers. In addition, UNIVPM actively engages students from schools, whit a special attention to the gender issues, through scientific formative projects, direct experiences of students into labs, or the counselling service for prospective students, which helps the young pupils to find the paths more appropriate to their future.

Conference General co-chairs

Lorenzo Guasti

(INDIRE)

Engineer, Lorenzo Guasti is currently handler for the "Maker@Scuola" research project which studies the phenomenon of "makers" in relation to the scenarios and the influences that it generates in the Italian school system starting from the lower grades, including the kindergarten.

Since 2014 he has been active in research aimed at the renewal of laboratory teaching through the use of new technological tools (such as the 3D printer and the hydroponic greenhouse) and the application of new teaching methods (such as the "Think Maker Improve" or IDeAL method).

Moreover, since 2014, he has studied the effect of school maker spaces within the school as a new resource for the renewal of the "laboratory space" and of the laboratory teaching.

Since 2017 he has been carrying out, as principal investigator, a research agreement between the the Columbia University of New York and Indire with a particular focus on the application of the Bifocal model to Italian schools.

David Scaradozzi

(Dipartimento di Ingegneria dell'Informazione, Università Politecnica delle Marche)

Graduated in Electronic Engineering and PhD in Intelligent Artificial Systems, David Scaradozzi is Assistant Professor at Università Politecnica delle Marche. His research is focused on two main topics: (i) Educational Robotics, with special interests devoted to all the aspects regarding the study and development of new robotic tools and lesson plans for teaching e-STrEM (environmental Science Technology robotics Engineering Maths) subjects, in formal and nonformal education; (ii) underwater robotics and marine technologies, focusing on tools for 3D scientific documentation of sea operative surveys for marine protected areas and archaeological sites study using Divers, AUVs, ROVs and other tech-

nological devices. He has been involved in different research projects funded by the European Commission, in collaboration with several industrial companies and academic bodies both national and international. In the field of Educational Robotics, during last decade he directed many experimentations involving students of primary and secondary schools. He cooperated with more than 60 primary and secondary schools in Italy, with the Italian Ministry of Education, University and Research, the Italian Ministry for Equal Opportunities and INDIRE. He is currently the coordinator of the Erasmus+ KA201 Project "RoboPisces", aimed at creating a teaching and learning curriculum based on Educational Robotics through a constructionist educational approach and the design of a toolkit, called RoboFish, to engage primary school kids, with the purpose to enhance the learning outcomes in STEAM subjects. He is author of about 90 publications in refereed international journals, books and conferences.

ORGANIZER COMMITTEES

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- Beatrice Miotti (INDIRE)
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- Paola Nicolini (Università di Macerata)

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- Maria Ranieri (Università di Firenze)
- David Scaradozzi (Università Politecnica delle Marche)
- Laura Screpanti (Università Politecnica delle Marche)
- Luisa Zecca (Università Bicocca Milano)

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- David Scaradozzi (Università Politecnica delle Marche)
- Laura Screpanti (Università Politecnica delle Marche)
- Alicja Żenczykowska (FabLearn)

Sommario

Programma

19th November 2019

17:30 - 18:30	**Pre-registration & Welcome Cocktail** (Faculty Club)
17:30 - 18:30	**Poster set-up** (Aula Magna Hall)

20th November 2019

08:00 - 18:45	**Registration** (Aula Magna "Guido Bossi")
08:45 - 10:00 **Plenary session** **Aula Magna "Guido Bossi"**	08:45 - 09:20 **Welcome speech** • Prof. Gian Luca Gregori Rector of UNIVPM • Dr. Loretta Bravi Councillor for education of Marche Region • Dr. Giovanni Biondi President of INDIRE • Dr. Marco Ugo Filisetti Director of the USR Marche 09:20 - 09:35 **Opening speech** Lorenzo Guasti (INDIRE) *"Maker@School"* 09:35 - 10:00 **Keynote speech** **Prof. Paulo Blikstein** (Teachers College, Columbia University) *"Reinventing education: If we could start from scratch, how schools would look like in the 21st century?"*
10:00 - 10:30	**Coffee break (**Room "Sala studio" quote/quota (q.) 150)

10:30 - 12:30

Short-papers session

TRACK A1: Maker Spaces and Fablabs at school: a maker approach to teaching and learning
(Room q. 160/1)

Chairs: Giovanni Nulli (INDIRE), Tamar Fuhrmann (Teachers College, Columbia University) and Lorenzo Guasti (INDIRE)

1. **Keynote: Giovanni Nulli**
   "School Makerspace Manifesto"
2. Meltem Eti Proto and Ceren Koc Saglam
   "Furniture Design Education with 3DPrint Technology"
3. Giuseppe Alberghina
   "Makerspaces for innovation in teaching practices"
4. Tiziano Fattizzo and Pierfrancesco Vania
   "Montessori creativity space: how to give a physical space to creativity"
5. Sofia Scataglini and Daniele Busciantella Ricci
   "Fab the knowledge"
6. Track Round Table

TRACK B1: Curricular and not curricular robotics in formal, non-formal and informal education
(Room q. 160/3)

Chairs: Linda Daniela (University of Latvia), Beatrice Miotti (INDIRE)

1. **Keynote: Linda Daniela**
   "Pedagogical considerations for technology enhanced learning"
2. Dave Catlin
   "Classroom Maker Projects and User Bots"

3. Laura Screpanti, Lorenzo Cesaretti, Michele Storti and David Scaradozzi
   "Educational Robotics and social relationships in the classroom"
4. Lorenzo Cesaretti, Laura Screpanti, David Scaradozzi and Eleni Mangina
   "Analysis of Educational Robotics activities using a machine learning approach"
5. Arta Rudolfa and Linda Daniela
   "Learning platforms in the context of education digitization as strong innovative character with respect to education methodologies applied - Experience of Latvia"
6. Track Round Table

10:30 – 12:30

Short-papers session

TRACK C1: How innovative spaces and learning environment condition the transformation of teaching: good practices and pilot projects
(Room q. 160/2)

Chairs: Samuele Borri (INDIRE) and Gianluigi Mondaini (Università Politecnica delle Marche)

1. **Keynote: Samuele Borri**
   "Learning Spaces: 1+4 Learning Spaces for a new generation of schools in Italy"
2. Lino Cabras and Fabrizio Pusceddu
   "UP School: motion, perception, learning"
3. Massimo Faiferri and Samanta Bartocci
   "Landscapes of knowledge and innovative learning experiences"
4. Marco d'Annuntiis and Sara Cipolletti
   "Child Friendly Architectures. Design spaces for children and adolescents"

10:30 - 12:30 **Short-papers session**	5. Anna Celeste Rubino *"Multipurpose learning environments for a flexible didactic"* 6. Gianluigi Mondaini and Marco Rosciani *"Adaptive environments. New spaces for learning"* 7. Massimo Ferrari and Claudia Tinazzi *"Imagining the School of the future"* 8. **Keynote: Kasper Kjeldgaard Stoltz** ***"The maker process as design tool for learning spaces and school architecture"***
12:30 - 14:15	**Lunch** (Room "Sala studio" q. 150) **Poster session** (Aula Magna Hall)
14:15 - 16:15 **Short-papers session**	**TRACK A2: Laboratory Teaching with the makers approach: models, methods and instruments** (Room q. 160/1) **Chairs:** Domenico Aprile (Liceo Scientifico Fermi Monticelli - Brindisi), Margherita Di Stasio (INDIRE) 1. **Keynote: Domenico Aprile** ***"Maker in education: teaching is a hacking stuff"*** 2. Valentina Costa and Floriana Falcinelli *"The Maker Movement: from the development of theoretical reference framework to the experience of DENSA Coop. Soc"* 3. Elena Parodi, Emanuele Micheli and Laura Iozzi *"Touch - Arte da toccare: a cultural project of social inclusion, between school, museum and 3d printing lab"* 4. Agnese Addone and Luigi De Bernardis *"Chesscards: Making a Paper Chess Game with Primary School Students, a Cooperative Approach"*

5. Laura Giraldi, Mirko Burberi, Francesca Morelli, Marta Maini and Lorenzo Guasti
   "New graphic user interface design for children 3D modelling software"
6. Track Round Table

TRACK B1: Curricular and not curricular robotics in formal, non-formal and informal education
(Room q. 160/3)

Chairs: David Scaradozzi (Università Politecnica delle Marche), Laura Screpanti (Università Politecnica delle Marche)

14:15 - 16:15

Short-papers session

1. Elena Liliana Vitti, Alberto Parola, Margherita Maria Sacco and Ilio Trafeli
   "Learning technologies for curricular STEAM skills"
2. Lina Cannone
   "Educational robotics in informal contexts: An experience at CoderDojo Pomezia"
3. Luca Iocchi, Jeffrey Too Chuan Tan and Sebastian Castro
   "RoboCup@Home Education: a new format for educational competitions"
4. Giovanni Di Dio Bruno
   "Erwhi Hedgehog: a new learning platform for mobile robotics"
5. Daniela Bagattini, Beatrice Miotti and Fiorella Operto
   "Educational robotics and gender perspective"
6. Track Round Table

14:30 - 16:30 **Event** **Aula Magna "Guido Bossi"**	***"Architecture, Form, Space, Construction"*** **Introduction:** Gianluigi Mondaini and Maddalena Ferretti With **Kasper Kjeldgaard Stoltz, NERDArchitects, Copenhagen** *"The maker process as design tool for learning spaces and school architecture"*
16:15 - 16:45	**Coffee break** (Room "Sala studio" q. 150)
16:30 - 18:30 **Workshops session**	Room "Cesmi 2" q. 155 ***Co-m@king LAB - "hands-on-minds" programming and design laboratory*** by Domenico Aprile (Liceo Scientifico Fermi Monticelli - Brindisi) Room "Cesmi 1" q. 155 ***Coding and Educational Robotics: stereotypes and opportunities*** by Daniela Bagattini, Beatrice Miotti (INDIRE)
20:00	**Social Dinner** (Ristorante Giardino, Ancona)

21st November 2019

08:30 - 18:45	**Registration** (Aula Magna "Guido Bossi")
09:00 - 10:00 **Plenary session** **Aula Magna "Guido Bossi"**	09:00 - 09:10 **Welcome speech** David Scaradozzi (UNIVPM) 09:10 - 09:35 **Keynote speech** Prof. Maria Ranieri (University of Florence) *"Making to Learn. Pedagogical implications of making in a digital binary world."* 09:35 - 10:00 **Keynote speech** Fiorella Operto (Scuola di Robotica) *"Roboethics: for a Responsible Use of Robotics and Digital Systems."*
10:00 - 10:30	**Coffee break** (Room "Sala studio" quote/quota (q.) 150)
10:30 - 12:50 **Short-papers session**	**TRACK A2: Laboratory Teaching with the makers approach: models, methods and instruments** (Room q. 160/1) **Chairs:** Luisa Zecca (Università degli Studi Milano-Bicocca), Jessica Niewint (INDIRE) 1. **Keynote: Luisa Zecca** ***"The game of thinking: interactions between children and robots in educational environments"*** 2. Alessandra Carlini *"Museum education between digital technologies and unplugged processes. Some project experiences"*

3. Alessandra Carlini
   "Museum education between digital technologies and unplugged processes. Some project experiences"
4. Sara Ricciardi, Stefano Rini and Fabrizio Villa
   "Officina degli errori: an extended experiment to bring constructivist approaches to public schools in Bologna"
5. Danila Leonori and Irene Frazzarin
   "Service Learning: a Maker approach proposal"
6. Paola Mattioli
   "Makerspaces to foster STEAM and reading"
7. Stefano Di Tore, Giuseppe De Simone and Michele Domenico Todino
   "Learning by making: 3D printers Guidelines for teachers"
8. Track Round Table

10:30 - 12:50

Short-papers session

TRACK B1: Curricular and not curricular robotics in formal, non-formal and informal education
(Room q. 160/3)

Chairs: Giovanni Nulli (INDIRE), Lorenzo Cesaretti (Università Politecnica delle Marche)

1. Michele Domenico Todino, Giuseppe De Simone, Simon Kidiamboko and Stefano Di Tore
   "European recommendations on robotics and their issues on education in different countries"
2. Rita Tegon and Mirko Labbri
   "Growing deeper learners (How to assess robotics, coding, making and tinkering activities for significant learning)"

3. Matteo Torre *"Buzzati Robots"*
4. Paola Pazzaglia and David Scaradozzi *"Escape from Tolentino during an earthquake saving more lives and cultural heritage objects as you can"*
5. Mariantonietta Valzano, Cinzia Vergine, Lorenzo Cesaretti, Laura Screpanti and David Scaradozzi *"Ten years of Educational Robotics in Primary School"*
6. Mauro Gagliardi and David Scaradozzi *"Nintendo Labo for Educational Robotics at the Primary School"*
7. Track Round Table

10:30 – 12:50

Short-papers session

TRACK B2: Educational technologies and assistive robotics (Room q. 160/2)

Chairs: Andrea Monteriù (Università Politecnica delle Marche), Daniele Costa (Università Politecnica delle Marche)

1. Maria Letizia Corradini, Gianluca Ippoliti, Giuseppe Orlando and Simone Terramani *"Study and development of robust control systems for educational drones"*
2. Irene Marzoli, Nico Rizza, Alessandro Saltarelli and Euro Sampaolesi *"Arduino: from Physics to Robotics"*

Michele Storti, Elisa Mazzieri and Lorenzo Cesaretti *"Weturtle.org: a web-community for teachers' training and resource sharing on educational technologies"*

3. Marco Cantarini and Rita Polenta *"Good educational robotics practices in upper secondary school in European projects"*

10:30 - 12:50 **Short-papers session**	4. Alessandro Freddi, Catia Giaconi, Sabrina Iarlori, Sauro Longhi, Andrea Monteriù and Daniele Proietti Pagnotta *"Assistive Robot for Mobility Enhancement of Impaired Students towards a Barrier-free Education: a Proof of Concept"* 5. Track Round Table
10:00 - 14:30 **Atelier informatico q. 150**	**Lab: 3D printing @ Kindergarten** with Kindergarten Istituto Comprensivo Solari (Loreto - AN - Italy)
11:00 - 14:30 **Aula Magna Hall**	**Lab: Tinkering @ Lunch** with Primary School Istituto Comprensivo di Sigillo (Perugia - Italy)
13:00 - 15:00	**Lunch** (Room "Sala studio" q. 150) **Poster session** (Aula Magna Hall)
15:00 - 18:00 **Room "Cesmi 2" q. 155**	**Opening conference of RoboPisces Project** (Erasmus+ KA201, coordinated by UNIVPM) • 15:00 - 16:00: Opening conference and Project presentation • 16:00 - 16:30: Coffee Break (Room "Sala studio" q. 150) • 16:30 - 18:30: Workshop "RoboPisces: how to build and program educational marine robots with Lego Mindstorms EV3" by Lorenzo Cesaretti & Laura Screpanti, Università Politecnica delle Marche Co-funded by the Erasmus+ Programme of the European Union

22nd November 2019 - FabLearn Italy

08:30 - 10:30	**Registration** (Aula Magna "Guido Bossi")
09:00 - 10:30 **Workshops session**	Room q. 160/3 ***Educational Robotics: modelling learning*** by Laura Screpanti (Università Politecnica delle Marche) Room "Cesmi 2" q. 155 ***Robotics, a practical approach*** by Leonardo Falanga (student at University of Salerno)
10:30 - 11:00	**Coffee break** (Room "Sala studio" quote/quota (q.) 150)
11:00 - 12:30 **Workshops session**	Room "Cesmi 2" q. 155 ***Educational Robotics, problem-solving and creativity*** by Lorenzo Cesaretti (Università Politecnica delle Marche)
12:30 - 12:45 **Aula Magna "Guido Bossi"**	**Awards: Best Poster & Best Paper**
12:45 - 13:00 **Aula Magna "Guido Bossi"**	**Closing** **FabLearn Italy 2019**

22nd November 2019 - Marche Drone-Week

09:00 - 09:30	**Student's Registration** (Aula Magna "Guido Bossi")
09:30 - 09:40 **Aula Magna "Guido Bossi"**	**Welcome speech**
09:40 - 10:45 **Aula Magna "Guido Bossi"**	Scientific workshop: flying and navigating with intelligent autonomous systems: • Structure of an autonomous intelligent system • FPV Drone Racing
10:45 - 11:15	Groups creation
11:30 - 12:45	Activities in groups Pre-admission tests to UNIVPM Visit to laboratories
12:45	**Students and teachers leaving OR Lunch at University Canteen**
14:30 - 14:45	Groups creation
15:00 - 16:15	Visit to laboratories

Keynote speakers

Paulo Blikstein

Paulo Blikstein is an Associate Professor at Teachers College, Columbia University, where he directs the Transformative Learning Technologies Lab. Blikstein's research focuses on how new technologies can deeply transform the learning of science, engineering, and mathematics. He creates and researches cutting-edge educational technologies, such as computer modeling, robotics, digital fabrication, and rapid prototyping, creating hands-on learning environments in which children learn science and mathematics by building sophisticated projects and devices. He also focuses on the application of data-mining and machine learning for the assessment of hands-on, project-based learning. Blikstein has spearheaded the FabLearn project, building advanced digital fabrication labs in middle and high schools in four continents. Paulo was also the Founder and Principal Investigator of the Lemann Center for Brazilian Education at Stanford, a 10-year initiative to transform public education in Brazil.

KEYNOTE: "Reinventing education: If we could start from scratch, how schools would look like in the 21st century?"

Fiorella Operto

Educated in Philosophy, Fiorella Operto collaborated with the Italian Research Council (IAN and IEIIT Institutes) on the social impact of Advanced Robotics applications. In 2000 she founded the Scuola di Robotica (School of Robotics Society), and is its ViceChair today. Operto contributed to the definition and development of Roboethics (Ethical, Legal, and Societal Issues in Robotics). She is Member of the *High-Level Advisory Committee for ECWT* (EU European Centre for Women&Technology) and Consultant and member of The Open Roboethics Initiative. She is the Italian Partner of the European Robotics Week, and member of the Executive Board of the Foundation for Responsible Robotics.

KEYNOTE: "Roboethics: for a Responsible Use of Robotics and Digital Systems"

Linda Daniela

Linda Daniela is Professor and senior researcher, Chair of the Council for PhD Defence in Pedagogy, Head of the Scientific Institute of Pedagogy at the University of Latvia. She also serves as Expert in Education at the Council of Sciences of the Republic of Latvia. Her expertise spans Technology enahnced learning, Smart Pedagogy, Virtual Education, Smart Education, Digital Learning Materials, Educational technologies for learning, Educational robotics, Educational processes and solutions for reducing social exclusion from the educational processes, and Behavioral problems. Professor Daniela is an author and co-author of more than 70 publications about processes in all dimensions of education. She has been involved in more than 30 research projects. At the moment she is leading the research projects: "Human, Technologies and Educational Quality"; "MyHUB – a one-stop-shop on inclusion practices, tools, resources and methods for the pedagogical staff at formal and non-formal educational institutions"; "The gap between political development documents and real practice of digitalization of higher education"; "Audio learning materials for preschool education" and is involved in other projects as a researcher. She has been involved in editing books and journals on Technological aspects in the Knowledge Society for such publishers as Springer, Routledge, Emerald, IGI Global etc.

KEYNOTE: "Pedagogical considerations for technology enhanced learning"

Maria Ranieri

Maria Ranieri is an Associate Professor at the Department of Education, Languages, Interculture, Literature and Psychology at the University of Florence, and the Director of the Master programme "New digital competences: open education, social and mobile learning" (University of Florence). Her recent papers have appeared in Computers & Education, Journal of Computer Assisted Learning, International

Review of Research in Open and Distance Learning (IRRODL), The Internet and Higher Education. Her current research interests gravitate around digital literacy education, social network sites in education, mobile learning, teacher professional development. On these topics she published more than a hundred papers and several chapters and books. She also coordinated national and international research programmes in the area of media and technologies for teaching and learning.

KEYNOTE: "Making to Learn. Pedagogical implications of making in a digital binary world"

Luisa Zecca

Luisa Zecca is currently Assistant Professor at "Riccardo Massa" Department of Human Sciences for Education of the University of Milano-Bicocca. She has received Visiting (ESPE, New Hampshire University) and Teaching Fellowships (SUPSI). She has been involved in different research and dissemination activities in more than 20 national and international projects. She is member of several institutions (CeSDID, CRESPI) and research teams (SIRD, PRIN 2018-21, SIPED, *Education for Social Justice*). She is director of different projects (DEMETER) and she coordinates the pedagogical research activities of the Laboratory of Robotics for the Cognitive and Social Sciences. Her research interest is especially focused on didactic planning and evaluation, with special reference to robotics and laboratory didactics. She has authored 2 books and more than 50 scientific articles in peer-reviewed journals, book chapters and communications in international conferences.

KEYNOTE: "The game of thinking: interactions between children and robots in educational environments"

Samuele Borri

Samuele Borri is research director of the Technology Area and head of the Information Systems for Indire. He is in charge of Indire's research group in the field of Educational Architecture. The research area analyses and defines new learner-centred spaces and new organizational requirements of the school environment in relation to current educational needs as well as cultural, cognitive, technological and other changes occurring in today's schools.

KEYNOTE: "Learning Spaces: 1+4 Learning Spaces for a new generation of schools in Italy"

Giovanni Nulli

Giovanni Nulli is a researcher in Indire where he studied mostly the impact of technologies in teaching and learning. From 2014 he studies coding, and then robotics into Indire's Avanguardie Educative projects. In the same year participated to Indire's project "Costruire giocattoli con la stampante 3d", a pilot in which 3d printers were used into three kindergarden. Then he started to study the maker phenomenon merging studies on technologies and the Indire's model 1+4 on learning environments and makerspaces. Actually he is working in conding and robotics Indire's projects focusing on curricular challenges and opportunities and on makerspaces into schools."

KEYNOTE: "School Makerspace Manifesto"

Domenico Aprile

Computer Science Engineer Degree, Master and PhD in Management Engineering, Master in European Project Management.
He was formerly consultant in IT and process management projects in several fields of PA.
He teaches computer science in High Secondary School and since 2013 he uses open source teaching tools and educational robotics (Linux, Arduino, 3D Printer, Lego Mindstorms, raspberry pi).
He is Instructor certificated "Lego Academy Introductory Course to robotics", "Arduino CTC101 for educator", "CISCO IT Essential Instructor".

KEYNOTE: "Maker in education: teaching is a hacking stuff"

Kasper Kjeldgaard Stoltz

Kasper Kjeldgaard Stoltz, MA (Ed) in curriculum theory and educational studies, are considered one of the leading experts on learning space design and school architecture in Scandinavia.
He is partner at NERD architects, a Danish architectural company specialized in educational architecture and physical learning spaces. NERD is behind several new, innovative learning spaces and schools in Denmark and Norway.
With a former background as a primary school teacher, he furthermore has an in-depth knowledge of everyday school life and teaching practices.
Stoltz has contributed to several publications on learning space design and held numerous lectures and talks in both Denmark, Portugal, Norway and Sweden.

KEYNOTE: "The maker process as design tool for learning spaces and school architecture"

Short-Paper abstracts

TRACK A1: Maker Spaces and Fablabs at school: a maker approach to teaching and learning

20th November 2019, morning session

Furniture Design Education with 3DPrint Technology

Authors: Meltem Eti Proto (Marmara University) and **Ceren Koc Saglam** (Marmara University)

The three-dimensional printer technology has an important place in furniture and interior design, which is a strong global sector in responding to the rapidly changing needs and expectations of the individual and society. Allowing us to imagine new life models beyond that, should be the main problem of design education. The fact that 3D printing technology enables the search for original forms that cannot be produced by molding, less waste production, being a production method that can be reached by everyone paves the way for designers working in the building and furniture sector and attracts great attention. "Today, the design profession is trying to imagine possible futures." The importance of creating an innovative profession, innovative materials and knowledge of innovative production technologies that feed creative thinking in design education are increasing day by day. This knowledge will allow us to imagine, discuss and pioneer design production ideas for new life models. In this context, the effect of 3D printer technology on furniture sector has been examined. In this paper, it is emphasized that 3D printer technology and the method of furniture design studio and its contribution to design education which is carried out in the Interior Architecture Department of Marmara University Faculty of Fine Arts.

Makerspaces for innovation in teaching practices

Author: Giuseppe Alberghina (Associazione Formazione Professionale del Patronato San Vincenzo)

"MakIN Teach – MAKerspaces for INnovation in TEACHing practices" is a 2-year lasting project recently funded by the Programme Erasmus+. It aims at promoting an exchange of good practices in using rapid prototyping techniques, tools and spaces in the fields of education and training with the purpose of supporting teachers/educators working with students/learners showing poor educational results in theoretical subjects (e.g. mathematics, biology, geography, history, language, communication etc.). The project will realize three short-term joint staff training activities and one student learning event, which will provide the oppor-

tunity to have practical experiences in Makerspaces/FabLabs both to teachers/educators and students/learners. The materials and ideas developed during these transnational activities will be collected in an interactive e-book containing information about rapid prototyping technology and tools for the innovating the educational system and integrating the FabLabs and Makerspaces into the traditional teaching practices. Thanks to this project, all the partners involved will build a fruitful and durable network of Education Institutions and Makerspaces/FabLabs both at a local and European level.

Montessori creativity space: how to give a physical space to creativity

Authors: Tiziano Fattizzo (Comprehensive Institute II, Francavilla Fontana (Br)) and **Pierfrancesco Vania**

Starting from the concept of Malaguzzi's atelier, the birth of the "Montessori creativity space", the maker space Francavilla Fontana's Second Comprehensive Institute, is described, a learning environment available to students, teachers and local associations or artisans, where imagination and doing met to build transversal learning around robotics and educational electronics, logic and computational thinking, digital and manual artifacts.

Fab the knowledge

Authors: Sofia Scataglini (University of Antwerp) and **Daniele Busciantella Ricci** (University of Trento)

Adopting a speculative approach, this paper links what happens in makerspaces and how these processes can be simulated by adopting the mathematical co-model of the Research Trough Co-design (RTC) process. The result is the identification of the main variables for simulating the 'making' dynamics in the RTC model. This result is consequently discussed underlining the 'intangible' role of 'making' with the proposal of the concept of "fab the knowledge". The speculative thinking is here used for linking innovative and theoretical aspects of the design research field of study to their application in, and, for innovative learning contexts. The RTC co-model can be used to compute, simulate and training for a co-design process into an intangible space that can be the Fablabs. In these spaces multiple actors with different skills and backgrounds, experts and non-experts in designing, collaborate from the setting of a design question to the identification of a shared design answer in a RTC process. A "network" of neural mechanisms that acts and communicate between experts and non-experts in designing such as computing system of biological mechanism can be used to train and simulate a research answer to gain the fabrication of the knowledge.

TRACK A2: Laboratory Teaching with the makers approach: models, methods and instruments

20th November 2019, afternoon session

The Maker Movement: from the development of theoretical reference framework to the experience of DENSA Coop. Soc

Authors: Valentina Costa (University of Perugia) and **Floriana Falcinelli** (University of Perugia)

The Maker Movement, which has been in the limelight for many years now, it still does show a great deal of economic, social and educational implications. The community of practice to whom the Movement refers can be defined as «a knowledge building community» (Scardamalia & Bereiter, 2006 as cited in Martin, 2015, p.36) and this appropriate definition, related to the ipercomplex and connected society, opens to new possibilities in the field of education. The main goal of this reflection was linked to the creation of a theoretical framework that could explain and support the background of the Movement and, in doing so, it was possible to analyse three different pedagogical models (Célestin Freinet, Loris Malaguzzi, Bruno Munari) that resulted to be compatible with the Movement. We focused our interest on studying all the most positive makers' inclinations; social inclusion, democracy and the failure positive/ collaborative approach. For this reason, considering the crucial matter of European Key Competences, we aimed to create a bridge between the «maker mindset» (Dougherty, 2013, p.9) and Competences, in order to hypothesize the introduction of the Movement in the national curriculum. In this sense, this point of contact can support and promote the development of an active citizenship, which should be obviously based on Key Competences. Subsequently, as a proof of what we analysed in the first part of our reflection, it was presented the experience of DENSA (Developing Edutainment for New Skills and Attitudes) Coop. Soc.

Touch - Arte da toccare: a cultural project of social inclusion, between school, museum and 3d printing lab

Authors: Elena Parodi (Madlab 2.0 Genova), **Emanuele Micheli** (Scuola di Robotica) and **Laura Iozzi** (Cooperativa Il Laboratorio)

Touch – Arte da toccare is a project born in Genoa thanks to the support of Compagnia di San Paolo. Its purpose was to create a concrete opportunity for blind or partially sighted people to visit a museum being able to enjoy the collections

exposed. This project, led by Coop Il Laboratorio, involved also Scuola di Robotica, some local primary and secondary schools, David Chiossone Onlus (a foundation expert in visual impairment) and MadLab 2.0 (a lab specialized in 3d printing, humanoid robotics and science dissemination). Thanks to a series of actions, like art and technology classroom labs or sensorial interactive museum visits, dedicated to making students aware on the importance of accessibility in every place, especially in the cultural ones, Touch brought the community to a big result. Some of the artworks collected in Galleria Nazionale of Palazzo Spinola, in fact, has been reproduced with 3d printing technology and are now available for special guided visits.

Chesscards: Making a Paper Chess Game with Primary School Students, a Cooperative Approach

Authors: Agnese Addone (Istituto Comprensivo Alfieri Lante della Rovere) and **Luigi De Bernardis** (Luiss Guido Carli University)

Introducing chess game for K 6-9 graders can be too theoretical for children and quite difficult for teachers and chess Masters. It's hard to make it accessible and not too abstract, keeping accuracy despite its professional technique. The educational project, called Chesscards, born from these observations, intends to translate chess theory in an active way, tinkering with paper and colors. The amazing experience, conducted from 2015 to 2019 in a primary school in Rome, Italy, allows children to achieve a great competence in chess by cooperating in making. The playing cards and the paper chessboard are realized in school by small groups of kids aged 7-10 along the lines of most famous games. The huge success of the initiative, iterated along these last years, lies in the strictly constructionist approach to making: Chesscards become an original way to learn, and easily a social game that any child can play.

New graphic user interface design for children 3D modelling software

Authors: Laura Giraldi (University of Florence), **Mirko Burberi** (University of Florence), **Francesca Morelli** (University of Florence), **Marta Maini** (University of Florence) and **Lorenzo Guasti** (INDIRE)

The use of new media has become a central part of the new generations daily experience. These ones are children and young students, called native digital because they birthed and are growing in the ITC era. Moreover, this new generation prefers an active learning rather than a passive one. The Research proposes a concept for a new Graphic User Interface of a 3D modelling software, dedicated to children attending the pre-school and the first years of primary school. This

interface, named SugarCad Kids, has been improved to be more understandable, intuitive and enjoyable, according to the Human Centered Design approach.

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Museum education between digital technologies and unplugged processes. Some project experiences

Author: Alessandra Carlini (Roma Tre University)

This document presents the results of the design and prototyping of educational kits in the museum context through a link between digital technologies and unplugged processes. The field of application is cultural heritage. The topics identified are part of curricular plans. Two case studies are presented. The first is the museum display of digital video installations and educational kits that processes mechanisms of symmetry, starting from geometric-patterned pavement. The second is the set up of a scholastic FabLab for the prototyping of educational kits with 3D printing for Rome schools and museums in partnership whit Municipality of Rome and Ministero dei Beni e delle Attività Culturali (Directorate-General Education and Research, Italy). The cases are the result of interacting each other for a long time through heterogeneous application areas. They include professional, research and didactic experiences leading to funding-supported projects implementation. The experiences described represent a key to show good practices of informal and cooperative learning and evidence the relationship between education and dissemination benefiting from our huge architectural culture.

Officina degli errori: an extended experiment to bring constructivist approaches to public schools in Bologna

Authors: Sara Ricciardi (INAF -OAS Bologna), **Stefano Rini** (IC12 Bologna) and **Fabrizio Villa** (INAF -OAS Bologna)

In this contribution we will describe an extended experiment to bring constructivist approaches to the public schools in Bologna and in particular our latest incarnation of "Officina degli Errori" an extended teacher training for primary school teachers. In this paper we highlight our motivation, the structure of Officina degli Errori and the lesson learned co-designing the activities and implementing them in the reality of public schools in Bologna. We also interviewed teachers to understand criticalities in the implementation of costructivist approaches in public primary school.

Service Learning: a Maker approach proposal

Authors: Danila Leonori (IIS Mattei – Recanati) and **Irene Frazzarin** (IC Zanella – Padova)

Education has a vital role to play in promoting the acquisition of 21st century skills. This is the reason why it is important to implement a social intervention project linked to a learning by utilizing the maker approach and technology, which allows students to come together and face the problems within their community.

Makerspaces to foster STEAM and reading

Author: Paola Mattioli (Istituto Marymount, Rome)

We often complain about our students who seem to forget the contents from one year to the next. If instead we talk about skills rather than contents, we can refer to Einstein's phrase that says "Education is what you have left after you've forgotten everything". In few words, although we may not remember everything (content), we should be able to apply our experience (skills) to new situations. Everybody remembers the book which loved when was a child, so why don't use these books to create STEAM activities? National Science Teaching Association promote the use of picture books to inspire STEAM activities at school. The idea is to insert the R of Reading in the acronym STEAM becoming STREAM.

Learning by making: 3D printers Guidelines for teachers

Authors: Stefano Di Tore (University of Salerno), **Giuseppe De Simone** (University of Salerno) and **Michele Domenico Todino** (University of Salerno)

Educational research, from many years, and more in details since Thirties with Dewey, didactics focuses on the concept that all authentic education comes from experience. Nowadays, activism finds an expected point of connection with makers movement. FabLab and creative ateliers spread with explicit educational purposes thus implies the birth of new types of "learning by doing". However these new forms of "learning by doing" cannot leave aside technologies present in a specific creative space used from a maker. Typically, these technologies are: 3D printers, CNC milling machines, 3D scanners, laser cutters, etc. This short paper introduces to teachers, media educations and "animatori digitali", through a proper didactical ergonomic concept, teaching implications deriving from the implementation of the different forms of H.M.I. in didactic, describing main features of sla and sls 3D printing. More in details, technologies impact on didactic is based on 3D printer's resolution, types of printing materials, average printing times,

post-processing forms and costs. These criteria described above have been selected because in each verified school experience, they strongly effect on possible disciplinary applications, i.e. FDM 3D printer could be useful for easy printed object but, sometimes, it is inadequate to reach a level of detail necessary for a meticulous reproduction of artistic objects or precision mechanisms that require a SLA 3D printer.

TRACK B1: Curricular and not curricular robotics in formal, non-formal and informal education

20th November 2019, morning session

Classroom Maker Projects and User Bots

Author: Dave Catlin (Valiant Technology Ltd)

The EduRobot Taxonomy identifies three basic types of education robots: Build, User and Social Robots. As its title implies, we associate Build Robots with maker-projects where students mainly learn from making a robot. Students learn with User Robots, like Turtles, by using them to solve problems and engage with invaluable experiences. However, just as you can make a Turtle robot from a Build Robot, you can utilise some User Robots as platforms for maker-projects. This paper reviews thirty years of maker-projects involving User Robots. I'll present examples from different continents, cultures and social-economic groups. Although I'll cite a few research projects, this isn't a research-driven paper. It's chiefly a report on the work of experienced classroom teachers delivering regular lessons to students aged between 4 and 18-years-old. It explains how they used robots and maker ideas to meet curriculum objectives for students of varying abilities. Using this evidence, we'll gain a broad appreciation of classroom maker-projects featuring User Robots and glean a few helpful tips you might find useful. We'll also detect the authenticity of this bottom-up approach - it shows what happens when experienced teachers use robots effectively.

Educational Robotics and social relationships in the classroom

Authors: Laura Screpanti (Università Politecnica delle Marche), **Lorenzo Cesaretti** (Università Politecnica delle Marche, Talent Srl), **Michele Storti** (Talent Srl) and **David Scaradozzi** (Università Politecnica delle Marche)

In a constructionist environment, robotics engagingly teaches traditional concepts while applying them to compelling real-world problems. Educational Robotics can help students develop soft skills, like teamwork, and improve the way they relate to each other. To explore this dimension, researchers of different disciplines have devoted many efforts. One tool that may be useful to explore the relational dimension of the activities is the sociogram. The case study reported on the present paper presents findings from an experience which brought Educational Robotics, Coding and Tinkering in the fourth grade of a primary school of Ancona (Italy). A questionnaire and a sociogram were administered to students, during curricular experiences, before and after the activities took place. Findings seem to highlight that there were some improvements in students' relations, but more investigation is needed to dig deeper into the process of describing students' relationship and their development in a project involving innovative methodologies and technology.

Analysis of Educational Robotics activities using a machine learning approach

Authors: Lorenzo Cesaretti (Università Politecnica delle Marche), **Laura Screpanti** (Università Politecnica delle Marche), **David Scaradozzi** (Università Politecnica delle Marche) and **Eleni Mangina** (University College Dublin)

This paper presents the preliminary results through the utilisation of machine learning techniques for the analysis of Educational Robotics activities. An experimentation with 197 secondary school students from Italy was conducted, through updating Lego Mindstorms EV3 programming blocks in order to record log files containing the coding sequences designed by the students (within team work), during the resolution of a preliminary Robotics' exercise. We utilised four machine learning techniques (logistic regression, support vector machine, K-nearest neighbors and random forests) to predict the students' performance, comparing a supervised approach (using twelve indicators extracted from the log files as input for the algorithms) and a mixed approach (applying a k-means algorithm to calculate the machine learning features). The results have highlighted that SVM with the mixed approach outperformed the other techniques, and that three learning styles were predominantly emerged from the data mining analysis.

Learning platforms in the context of education digitization as strong innovative character with respect to education methodologies applied - Experience of Latvia

Authors: Arta Rudolfa (Research Institute of Pedagogy, University of Latvia) and **Linda Daniela** (University of Latvia)

Modernization of the education system, digitalisation of the educational environment and learning management systems (LMS), where one of the solutions is learning platforms, are the most urgent directions in today's pedagogical work in order to reap the benefits of the digital environment in a meaningful way. The quality of education can be improved in different ways - by changing the content of learning, forms of learning, learning methods and teaching aids, promoting the use of learning platforms in schools, introducing programming and robotics, using learning management systems and other systems. Technologies and digital solutions are transforming educational landscape in technology enhanced learning environment. From one side there are a lot of possible solutions to ensure technology enhanced learning but form other side there is a need to transform educational process, need to transform teaching competence, need to analyse learning outcomes to ensure that technology enhanced environment supports knowledge construction. Authors of this paper analyse research results on learning platforms, where several research methods were used: systematic literature analyses, development of learning platform evaluation tool, analyses of learning platforms and survey on teachers' attitude to learning platforms. Altogether there were 705 teachers who expressed their opinion on using learning platforms as a tool to enhance knowledge construction, to provide feedback and to analyse students' learning results. In this paper authors will provide results of nine learning platform analyses which are developed in Latvia which are analysed by using developed evaluation tool where are 22 criteria and 43 sub-criteria.

20th November 2019, afternoon session

Learning technologies for curricular STEAM skills

Authors: Elena Liliana Vitti (Università degli Studi di Torino), **Alberto Parola** (Università degli Studi di Torino), **Margherita Maria Sacco** (Università degli Studi di Torino) and **Ilio Trafeli** (Università degli Studi di Torino)

Lots of attempts to introduce robotics in schooltime were made, but those experiences are occasional and discontinuous, and often arranged to give specific knowledges, devaluating the enormous potential of technology. Those experiments are often entrusted to outsider experts of Academic Board, who deal with all project's phases almost without teachers' involvement. Our research project is thought for the first grade of secondary school and with it we are going to try to overcome the dictates of "teach robotic" in favour of a less disputing vision of

"teaching with robotics": in accordance with Datteri [Datteri, 2018] we are proposing the use of robots as mediator instruments for regular learning and transversal competencies in school context. For the research development, we propose a three-years program, thought for regular school-time, to deal with curricular contents in accordance with the hosting school's programmes, using our approach as facilitator tool of learning processes. The topics aren't just about coding and robotics: we try to go beyond the limits of STEAM subjects to improve significative experiences on humanistic subjects as language, literature and geohistory.

Educational robotics in informal contexts: An experience at CoderDojo Pomezia

Author: Lina Cannone (Istituto Comprensivo Orazio Pomezia, Champion CoderDojo Pomezia)

The project aims to develop technical skills of pupils in primary schools. Technical courses are usually not popular among pupils. With the introduction of PNSD by Italian Education Ministry since 2015, words like coding, robotics and computational thinking were introduced into primary school classrooms. CoderDojo is a worldwide movement working to introduce children to robotics and computer science. As CoderDojo Pomezia we prepared a number of activities, which should encourage pupils' interest in the computational thinking and robotics and improve their skills. During the last years we held several workshops for primary school pupils. The workshops contained activities such as the programming of robotic kits, use robotics with 6 years pupils, programming videogames, modelling 3D objects. Activities have always a hands-on approach. Over 100 primary school pupils participated in the workshops. We held also workshops for teachers to prepare them to introduce these technical skills in their classrooms. This paper presents the work made by CoderDojo Pomezia to train children and demonstrate how pupils improved their technical and social skills.

RoboCup@Home Education: a new format for educational competitions

Authors: Luca Iocchi (Sapienza University of Rome), **Jeffrey Too Chuan Tan** (Nankai University) and **Sebastian Castro** (Mathworks, Natick, USA)

In this paper we present a novel methodology for developing educational robot competitions that has been developed within the RoboCup@Home Educational initiative.

Erwhi Hedgehog: a new learning platform for mobile robotics
Authors: Giovanni Di Dio Bruno (Ass. Officine Robotiche)

Erwhi Hedgehog is one of the smallest mobile robots that allows mapping, vision analysis and displays machine learning features simultaneously. While it can behave like a small curious animal eager to explore the surrounding environment, the robot can be useful to test navigation, mapping and localization algorithms, thus allowing to prototype new hardware and software for robotics. This application is particularly handy for education in robotics, both at the high school and university level. On the one hand, the project is fully open source and open hardware under MIT license and available on Github, so everyone can build his/her own Erwhi Hedgehog robot with a step by step guide; on the other hand, students with a more advanced knowledge in the field can further develop new softwares and features using it as a starting platform for prototyping. Erwhi uses Intel Realsense, AAEON UP Squared and Myriad X VPU technologies, with software based on Robotic Operating System (ROS), and implements SLAM algorithms, such as RTABmap. The machine learning aspect is based on OpenVINO framework and a dedicated ROS wrapper was implemented. The software package includes also all programs required to create a Gazebo simulation. From the hardware point of view, motor control is based on STM32 microcontroller and Arduino software and the robot works on differential unicycle model. Finally, Erwhi is compatible with AWS RoboMaker tools.

Educational robotics and gender perspective

Authors: Daniela Bagattini (INDIRE), **Beatrice Miotti** (INDIRE) and **Fiorella Operto** (Scuola di Robotica)

In this paper we explore the role of stereotypes in educational choices: the data on enrollment in secondary school show abandonment by girls of stem subjects. There are many reasons for this: social and family expectations, but also the perception that jobs and careers in techno-scientific sectors will make family care difficult. This is a main theme for the future: jobs in ICT will increase and the low number of women in these sectors will have a strong impact on the possibility of a supply of skilled workers, as well as increasing the gender gap. In this contest, which is the role of school? Which activities can help girls get closer to science? In particular, we focus on how innovative approaches such as educational robotics can help girls to approach stem subjects, as happened with the experimentation of the Roberta project, whose results will be illustrated in this work.

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European recommendations on robotics and their issues on education in different countries

Authors: Michele Domenico Todino (University of Salerno), **Giuseppe De Simone** (University of Salerno), **Simon Kidiamboko** (Institut Supérieur des Techniques Appliquées, RD-Congo) and **Stefano Di Tore** (University of Salerno)

This short paper describes a preliminary phase for an innovative line of research to compare Italian and other countries education about robotics from a media education point of view, starting from European recommendations to the Commission on Civil Law Rules on Robotics. More in general, childhood and adolescence must be included in decision process that determinate methods and devices able to guarantee digital citizenship about robotics. For these reasons in this work a group of high school students, from a fifth-grade class, formulate a SWOT analysis about robotics issues, reading EU recommendation, to highlights their point of view. This research started last year will be replicated this academic year on Italian and Congolese students - from Institut Supérieur des Techniques Appliquées - to highlights, through a qualitative research, students' patterns arising from robotics topics. Results are analyzed in a qualitative way because SWOT analysis already divided them in information categories and shows a variety of concepts grouped through data collection. These results will be compared with those of future years, collected in Italy and other countries, to find more potential patterns.

Growing deeper learners (How to assess robotics, coding, making and tinkering activities for significant learning)

Authors: Rita Tegon (Liceo Ginnasio Statale "A. Canova" Treviso) and **Mirko Labbri** (Istituto Comprensivo Statale "S. Barozzi" San Fior)

As more and more project-based unstructured activities fill the learning time of pupils, there is a growing need for sound and safe assessment models of educational robotics, tinkering, making and coding activities. On one side the need for evaluation and its strength in systems' and learning outcomes' betterment is poorly perceived or underestimated, on the other it is difficult to identify or elaborate adequate assessment frameworks. Examples out of the international context are here discussed more as samples to raise awareness than to offer tie-breaker answers.

Buzzati Robots

Author: Matteo Torre (Liceo Scientifico Statale "L. B. Alberti" Valenza)

The paper describes the didactical and methodological choices on an educational path inspired by the story "The seven messengers" by Dino Buzzati. The aim is to deepen and introduce basic mathematical and physical skills. The education project involves 35 students of the 1st high school year, attending the "Liceo Matematico project" promoted by the Mathematics Department "G. Peano" of the Turin University.

Escape from Tolentino during an earthquake saving more lives and cultural heritage objects as you can

Authors: Paola Pazzaglia (Istituto Comprensivo "G. Lucatelli" Tolentino) and **David Scaradozzi** (Università Politecnica delle Marche)

In the last five years, the Italian Ministry of Education has focused its attention on digital skills, recognized as fundamental and indispensable for the growth of future citizens in the information age. Therefore, it has supported projects aimed at developing computational thinking and digital creativity in schools. The project "Più vicini al nostro territorio – Valorizziamo i monumenti di Tolentino... giocando con Scratch e App Inventor" ("Being closer to our territory– let's give the right value to the Tolentino monuments ... playing with Scratch and App Inventor"), whose the first activities results are described in this paper, is one of the most financed. This project and its vertical path, are presented in the paper. The aim of the results here provided, relate to the first part that has already been carried out (as for the primary school), is to show how skills and competencies developed, not only regarding those connected to the PON document "For school 2014-2020" (Axis I Education, Objective 10.2, Improving pupils' key competencies), but also those proposed in the National Plan for Digital School document.

Ten years of Educational Robotics in Primary School

Authors: Mariantonietta Valzano (ICS Largo Cocconi Roma), **Cinzia Vergine** (ICS Largo Cocconi Roma), **Lorenzo Cesaretti** (Università Politecnica delle Marche), **Laura Screpanti** (Università Politecnica delle Marche) and **David Scaradozzi** (Università Politecnica delle Marche)

Many researchers and teachers agree that the inclusion of Science, Technology, Engineering, and Math in early education provides a strong motivation and a great improvement in learning speed. Most of the curriculum in primary schools

include a number of concepts that cover science and math, but less effort is focused in teaching problem solving, computer science, technology and robotics. The use of robotic systems and the introduction of Robotics as a curriculum subject educates children on the basics of technology and gives them additional human and organizational values. This work presents a new program introduced in an Italian primary school thanks to the collaboration with National Instrument and Università Politecnica delle Marche. Specifically, the project's curriculum aim is to improve logic, creativity, and ability to focus; which is lacking in today's generation of students. The subject of Robotics becomes part of the Primary school curriculum for all the five years. The program has allowed the teachers training and a complete way through which children have demonstrated great learning abilities, not only in mere technology but also in collaboration and teamwork.

Nintendo Labo for Educational Robotics at the Primary School

Authors: Mauro Gagliardi (Istituto Comprensivo "Imondi Romagnoli" Fabriano) and **David Scaradozzi** (Università Politecnica delle Marche)

In the last five years, the Italian Ministry of Education has focused its attention on digital skills recognizing them as fundamental and indispensable for the growth of future citizens in the information age. There are numerous requests from the European Commission, Italian Ministry of Education, and the work world on introducing new technologies at school on regular curricula or not. National indications for the kindergarten and the primary schools' curricula are to encourage the introduction of the new tools and the new languages of multimedia as a fundamental element of all the disciplines. In particular, with the PON and "Piano Nazionale Scuola Digitale", the idea is to foster the strength of digital knowledge and STEM disciplines. In this context, the project presented in this article was launched in collaboration with the Nintendo company to experiment at educational level the use of the "Nintendo Labo" product. This trial was conducted in a third class of the "Allegretto di Nuzio" primary school in Fabriano (AN). The kit, evolution of the Nintendo Switch console, has been initially created for recreational purposes. The didactic experiment has highlighted advantages and limits of the product within the few months of experimentation. The educational project "Nintendo Labo: assembly - play - discover" allowed students the merge of theoretical and practical bits of knowledge, understanding complex systems through design and simulation.

Not presented

Teaching Environmental Education using an Augmented Reality World Map

Author: Anastasia (Nancy) Pyrini (Hellenic Ministry of Education, Research and Religious Affairs)

The aim of this short paper is to provide readers with a comprehensive Lesson Plan for elementary students which seek to improve students and teachers digital citizenship and competency by fostering the development of digital literacy skills through the augmented reality application. The Lesson Plan has been developed within the framework of the "Digital, Responsible Citizenship in a Connected World (DRC)" project funded under the Key Action 2: Cooperation for innovation and the exchange of good practices of the Erasmus+ programme. The DRC project aims to infuse contemporary pedagogical practices in quality lifelong learning for students and teaching professions including teachers, school leaders and teacher educators across Europe. Specifically, the project seeks to improve students and teachers digital citizenship and competency by fostering the development of digital literacy skills through education.

What are in common Alan Turing, Albert Einstein e John Nash with Lego Mindstorms?

Author: Maria Raschello (I.C. Giacomo Masi Cavezzo)

A key word is enough to trigger the spark in people's minds and refer to Alan Turing, Albert Einstein and John Nash. With the Design Thinking approach we introduced the Lego Mindstorms into the lives of these three scientists who, thanks to their contribution, have revolutionized technology, physics and mathematics. The idea was to weave educational robotics with computer science, physics and mathematics, starting from the biography of the three scientists and linking it to the programming of Lego Mindstorms. Identifying the key word for each of them the students built the Follow line for Lego Mindstorms and start programming it. In this phase they made numerous hypotheses, tests and modifications to allow the robot to cover the entire initial letter of the keyword. To integrate the biography with the Lego path they produced a QrCode that refers to the biography, reworked by the boys, by Alan Turing, Albert Einstein and John Nash.

Roboticsness - Gymnasium mentis

Authors: Paola Lisimberti (Liceo Pepe Calamo – Ostuni) and **Domenico Aprile** (Liceo Scientifico "Fermi-Monticelli" Brindisi)

Roboticsness is an innovative teaching/learning approach based on the European Digital Agenda. The Lego robotics classroom is a living lab where students and teachers work together and share the enthusiasm of finding solutions thanks to new technologies. Project works and prototypes be produced, yet the main objective is to form new prosumers able to foresee and cope with needs of a complex world.

TRACK B2: Educational technologies and assistive robotics

21st November 2019, morning session

Study and development of robust control systems for educational drones

Authors: Maria Letizia Corradini (Università di Camerino), **Gianluca Ippoliti** (Università Politecnica delle Marche), **Giuseppe Orlando** (Università Politecnica delle Marche) and **Simone Terramani** (Università Politecnica delle Marche)

This paper considers the problem of attitude and altitude control of quadrotors using the sliding mode control theory. The mathematical model of the quadrotor is derived using the Euler-Newton formalism. The slidingmode is then applied, in this particular case, to the Parrot Mambo Minidrone, which is a strong example of bringing Educational Robotics in formal (MATLAB, Python, Javascript), non-formal (Tynker, Blockly, Swift Playground) and informal education. The proposed control demonstrates better performances and enhanced robustness.

Arduino: from Physics to Robotics

Authors: Irene Marzoli (Università di Camerino), **Nico Rizza** (Università di Camerino), **Alessandro Saltarelli** (Università di Camerino) and **Euro Sampaolesi** (Liceo "Giacomo Leopardi" Recanati)

This paper discusses how a microcontroller, like Arduino, can improve the laboratory practice in Italian secondary school and change the student attitude towards STEM disciplines. Since 2015, we started a close and fruitful collaboration

with several teachers and institutes in the Marche region to introduce microcontroller programming in the physics lab. Notably the project involved also teachers of other subjects, such as computer science, and with different backgrounds, i.e., electronic engineering, thus showing the inherently interdisciplinary character and versatility of Arduino. Students were engaged in hands-on activities, working in small groups of four to five people, supervised by learning assistants and teachers. Arduino was used to interface to sensors, to control the experimental setup, and for data acquisition. Finally, we could also make contact with robotics, by building a simple prototype of a rover.

Weturtle.org: a web-community for teachers' training and resource sharing on educational technologies

Authors: Michele Storti (TALENT srl), **Elisa Mazzieri** (TALENT srl) and **Lorenzo Cesaretti** (TALENT srl, Università Politecnica delle Marche)

In recent years in Italy, thanks to the increase in national funds and European resources available for innovation in the educational field, the need of opportunities for teacher training on digital skills and pedagogical-didactic innovation has been stronger than in the past. The paper firstly describes the main innovations for learning made possible by web-based and other technologies, and how they currently meet the teachers' training needs. Then, the authors present Weturtle.org, a practical example of the concept of "Community of Practice" and of the TPACK model which allows to get an integrative view on the discipline, pedagogical and technological levels, towards the challenge of learning innovation. In the central section, Weturtle.org is described with a focus on the opportunities for teachers' training and his enhancement, not only as an active user of the community, but also as a trainer himself. Finally, the authors present some browsing data of the last year, final considerations and future developments of the platform.

Good educational robotics practices in upper secondary school in European projects

Authors: Marco Cantarini (Istituto Istruzione Superiore "Volterra-Elia" Ancona) and **Rita Polenta** (Istituto Istruzione Superiore "Volterra-Elia" Ancona)

In the fields of MINT (Mathematics, ICT, Natural Sciences, Technology) there is an increasing absence of young talent throughout Europe. It is evident that early exposure to scientific experiences is the key to motivate young people, especially girls, to develop interest in these fields. MINT Kits for Kids" - Erasmus + Project is an actual real time initiative for design and production of integrated learning

units as Open Educational Resources for primary schools pupils corresponding to a real demand. The main themes are the development of learning media for primary education such as simple mechanical machines, computer software, electrical appliances and corresponding learning material. Our product R4G- Robot for Geometry is a device useful to teach mathematics, geometry and fractions, in order to improve performance and motivation starting from primary school thanks to interactive and innovative teaching methods and tools. A second project, named EUWI - European Waste Investigation, is currently in progress, with the aim to investigate water and pollutions in the countries involved in the partnership.

Assistive Robot for Mobility Enhancement of Impaired Students towards a Barrier-free Education: a Proof of Concept

Authors: Alessandro Freddi (Università Politecnica delle Marche), **Catia Giaconi** (Università di Macerata), **Sabrina Iarlori** (Università Politecnica delle Marche), **Sauro Longhi** (Università Politecnica delle Marche), **Andrea Monteriù** (Università Politecnica delle Marche) and **Daniele Proietti Pagnotta** (Università Politecnica delle Marche).

Smart wheelchairs fall within the field of assistive robots, namely robots that assist people with physical disabilities through physical and/or non-physical interaction, with the aim of extending their autonomy. In particular, smart wheelchairs are assistive robots for Mobility Enhancement, and can be especially useful in Universities to improve accessibility. This paper proposes a smart wheelchair which is able to be integrated in an academic management system for allowing the students who have serious leg problems and can not walk on their own, to autonomously reach any academic building or rooms of the University Campus. In detail, the proposed smart wheelchair receives information from the academic management system about the spaces of the Campus, the schedule of the lessons, the professors office hours, and so on, and the student can select from the user interface, the desired task and, then, the smart wheelchair can autonomously guide the student to the desired point of interest, planning the best barrier free path inside the Campus/building and, simultaneously, avoiding fixed and moving obstacles. The assistive robot has localisation and navigation capabilities which allow each student to freely and autonomously move inside the Campus for reaching a barrier-free education.

TRACK C1: How innovative spaces and learning environment condition the transformation of teaching: good practices and pilot projects

20th November 2019, morning session

UP School: motion, perception, learning

Authors: Lino Cabras (University of Sassari) and **Fabrizio Pusceddu** (University of Sassari)

The common strategy design for the educational spaces of "Up School", based in the metropolitan area of Cagliari, aims to frame a flexible learning space, open to an active experimentation and exploration of places. Indeed, learning doesn't merely mean collecting and memorizing information, but it implies the act of selecting, linking, understanding and integrating them, acquiring self-awareness through the development of perceptual abilities. In this process, space - experienced in its dynamic dimension- plays a crucial role. The principles of the dynamic perception of space achieved by the most relevant investigations in neuroscience over the last years, ante litteram declared by the experimentations of the Bauhaus workshops, strongly relate space, body and mind. Starting from this assumption, the project for "Up School" - nursery, kindergarten and primary school - integrates an innovative educational programme with the space organization of its environments, conceived as a flowing sequence of "affordances" where children, since the early age, can shape their world within a perspective open to good practices of sustainability, enabling technologies and psycho-physical equilibrium. Thus, the school system modifies itself around its center, established around the individual's psychosomatic dimension.

Landscapes of knowledge and innovative learning experiences

Authors: Massimo Faiferri (University of Sassari) and **Samanta Bartocci** (University of Sassari)

In this historical phase, in which the issue of learning spaces seems to be in a crucial moment from the cultural and architectural point of view, it is necessary to investigate the role played by this spatial apparatus in the urban space in order to understand the need of breaking with the outdated collective imaginary about schools, strongly eradicated in our society. There is a common ground between architecture and pedagogy, a possible dialogue between space and knowledge, which can generate new explorations on the ordinary meaning of educational

spaces and landscapes of knowledge, as a chance to expand the concept of inhabiting and of its implication in the world, conceiving a new urban condition for the territory. Considering at first cities as a wide diffused learning space gives the possibility and the incentive to trigger some reflections about the role of space design. The city is an important educational tool, since it represents the space of discovery, growth, socialization, tension, conflict and adventure, and also for the development of autonomy, adaptive intelligence and relational skills: a new relation between school and city defines the future of learning and civilized cohabitation.

Child Friendly Architectures. Design spaces for children and adolescents

Authors: Marco d'Annuntiis (University of Camerino) and **Sara Cipolletti** (University of Camerino)

This paper presents the educational and laboratory experience of the course CHILD FRIENDLY ARCHITECTURES, performed during the 2019 academic year in the School of Architecture and Design of Ascoli Piceno SAAD, University of Camerino, in collaboration with UNICEF Italia. The training course is the first in Italy that builds a dialogue between disciplines of Architecture and protection and promotion of children and adolescents rights and it has been structured in two modules. The first module EDUCATIONAL ACTIVITY, addressed to university students, through a series of training seminars faces and explores the possibility of imagining, designing and creating inclusive human contexts knowing how to look at children and adolescents rights. The second module APPLICATION ACTIVITY provides for involvement not only of university students, but both of children of the Secondary School 'Pericle Fazzini' and of the municipality of Grottammare (AP). The proposed laboratory guided students in a participatory planning process; the youngsters have tried out on reading and planning a specific context in which they live through specially structured tools and methods. The CHILD FRIENDLY ARCHITECTURES training course theorizes a way of thinking about design of spaces for children and adolescents taking into consideration their rights, promoting the learning of tools, design techniques and of new technologies. The competences of a participatory planning, that can be learned, allow to strengthen team work with important net-working and listening opportunities, developing among young people a critical awareness on theme of children and adolescents' rights and on the quality of spaces to them dedicated.

Multipurpose learning environments for a flexible didactic

Author: Anna Celeste Rubino (Università Politecnica delle Marche)

The paper investigates some issues and good practices in which the 21st century educational requirements are related to innovative design solutions of learning spaces, thus providing educational implications.

Adaptive environments. New spaces for learning

Authors: Gianluigi Mondaini (Università Politecnica delle Marche) and **Marco Rosciani** (Università Politecnica delle Marche)

School's architecture can no longer be as rigid as in the past, but spatially open, stimulating and able, with its physical quality, to react and adapt to those who live and work there to use it as an active educational tool. Architecture, however, alone today is not enough to define new spatial models for training, our society and its ever more complex problems and therefore a plurality of disciplinary participation is necessary. Pedagogy, with its close relationship with architecture, and technology, in relation to innovations related to teaching methods, are involved. The dynamism of communication processes and educational practices triggered by the use of new technologies requires a rethinking of the organisation of school environments providing flexible solutions, multifunctional and adaptable. The most interesting models are those in which the conventional classroom "breaks down" physically in favor of open space learning environments, with the creation of flexible spaces aimed at a better acquisition of skills, thanks to the synergy between the technological elements and the physical qualities of the spaces that make learning more engaging.

Imagining the School of the future

Authors: Massimo Ferrari (Politecnico di Milano) and **Claudia Tinazzi** (Politecnico di Milano)

The idea of School has always merged architecture and pedagogy into a unique body, and its existence is characterised by the close relationship between the definition of an appropriate space for those who live the places of education on a daily basis, and a precise educational model suitable for contemporary society and capable of inventing educational spaces for the present and the near future through a consistent transcription of knowledge modes. In School, individuality and universality become one thing and find the balance required for identifying and understanding diversities within common needs; a community of original ob-

jects turned out by hand, who are never the same even if they all are human beings. School architecture represents the concrete opportunity to long for shapes capable to reflect a precise teaching model. In this way, it provides an honest interpretation of all the needs at the basis of a multifaceted theme, with all the peculiarities, the individual accents, and the controversies that accompany major transformations occurred over a limited of time. today's definition of school buildings confirms the uncontrolled frailty and the contradictory and fragmented meanings that characterises contemporary architecture as a whole, no matter what the specific function. In this new transition season, we don't see any consistent attempt to reconsider the principles of a branch of knowledge which seems consumed the speed at which figurative possibilities arise. Forty years ago, typological research was abandoned in favour of partial experiments on management and energy issues.

Poster Abstracts

"Fai da esempio": coltivare l'approccio maker nella formazione degli insegnanti attraverso il costruzionismo

Authors: Angela Lombardo (CoderDojo Bologna) and **Giulio Bonanome** (CoderDojo Padova)

Oltre all'acquisizione di nuove competenze digitali, l'approccio maker permette lo sviluppo di un mindset creativo che si caratterizza per l'entusiasmo di trovare autonomamente le soluzioni ai propri problemi con flessibilità e sistematicità.

Negli ultimi 3 anni abbiamo usato il costruzionismo come modello per la didattica laboratoriale con approccio maker nella formazione di adulti (studenti universitari, educatori, docenti, volontari) in diversi contesti formali e informali.

Imparare come un maker è generalmente un'esperienza appassionante per i partecipanti alla formazione ma, imparare attraverso la sperimentazione senza aver ricevuto istruzioni dettagliate, comporta spesso un certo livello di frustrazione.

Questo tipo di esperienza e la riflessione nel ruolo di "apprenditori", diventa fondamentale per gli insegnanti, perché permette di empatizzare con i loro studenti davanti alla frustrazione per la mancata riuscita di un progetto, l'assenza di motivazione o la percezione di non essere all'altezza del compito.

Durante la poster session ci piacerebbe esplorare gli elementi chiave di un'esperienza di apprendimento con approccio maker e discutere con il pubblico di FabLearn Italia come implementare il modello nella formazione insegnanti.

Ad Astra Centro Didattico Astronomico

Author: Molisella Lattanzi (Ad Astra Centro Didattico Astronomico)

AD ASTRA nasce con l'obiettivo di promuovere lo spazio inteso come laboratorio non solo per sperimentare i concetti fondamentali della fisica, ma anche per promuovere una cultura scientifica diffusa, ove la curiosità incontri la realtà degli strumenti che l'uomo sta realizzando per poterla soddisfare.

Al Centro Didattico Astronomico AD ASTRA si potrà vivere in maniera immersiva l'astronomia con laboratori didattici ed emozionanti esperienze; un luogo dove grandi e piccoli possano stupirsi e riscoprire il senso dell'esplorazione.

Attualmente le attività sono dedicate agli Istituti Comprensivi, ma sono previsti orari di apertura al pubblico generico.

Le attività sono svolte da personale altamente qualificato e il Centro si presenta come una realtà nuova, dinamica, giovane e innovativa.

Alternalab: alternanza scuola lavoro presso Verona FabLab e Megahub di Schio

Author: Giorgia Bissoli (Verona FabLab)

AlternaLab è un percorso innovativo di Alternanza scuola lavoro organizzato da Verona FabLab in collaborazione con Megahub di Schio e realizzato grazie al contributo di Fondazione Cariverona.

Il progetto proposto intende creare le basi per realizzare una forte collaborazione tra le scuole e le aziende del territorio promuovendo una visione dei FabLab come luoghi di apprendimento informale all'interno dei quali poter offrire percorsi dove teoria e pratica si incontrano.

Il primo anno di progetto appena concluso si è svolto in parallelo sulle province di Verona e Vicenza. Nella prima fase, della durata di 50 ore totali, (da Novembre a Marzo) i ragazzi hanno seguito un percorso di formazione per acquisire competenze in diverse aree (informatiche, maker, artigianato digitale, comunicazione e media) utilizzando la metodologia del learn-by-doing e una modalità laboratoriale. La seconda fase invece si è svolta nella seconda metà di Giugno e ha impegnato i ragazzi nella realizzazione di alcuni "project work" assegnati dalle aziende partner sul territorio (50 ore).

A Verona hanno partecipato 78 studenti di classe terza e quarta superiore di cui il 34,6% erano ragazze, provenienti da 7 scuole diverse (5 licei, 1 ITIS, 1 IPS); sono state coinvolte attivamente 5 aziende del territorio. A Vicenza hanno partecipato 45 studenti di classe terza e quarta, di cui il 29,8% erano ragazze, provenienti da 3 scuole diverse (2 licei e 1 ITIS); qui sono state coinvolte attivamente 2 aziende del territorio.

Augmented Reality Software for Learning and Business

Author: Massimiliano Minaudo (University of Palermo)

Augmented reality ("AR") is being discussed, but what exactly is meant? How does it affect learning? Considering that the objects we can also create in the laboratory with software (for experimentation with students Blender 2.8 was used, but also Sketchup by Google and Dust3D) for 3D drawing and making "sculpting", that is, using modes that allow a approach to modeling, it's right to clarify the real implications before entering the immense sea of the virtual that has enriched human sensory perception with information that otherwise we would never have perceived. The applications in different fields are expanding so much that even the exploration of a city can be anticipated aiming the smartphone (thanks to various App in augmented reality very used both in companies and in training), indeed, the robotic surgery itself works well also in distance and these are just some examples of augmented reality (you can recreate: 3D objects or products, 3D models and renderings, tutorials, videos and 3D graphics). For this reason the experimentation was done: understanding how the AR affects learning and quality of life, assessing the impact with manually created/digitally created and printed (3D) artefacts and verifying whether the subdivision of the structure, intervening with "Brushes" in "sculpt mode" and a "modify" (Dyntopo), corresponds to the model designed and if it works. The future of young people, with the new technologies learned and applied to work, could be represented by new professional figures.

Circuiti morbidi e digital storytelling

Author: Lina Cannone (IC Orazio, Coderdojo Pomezia)

Il progetto è stato sviluppato in una classe seconda primaria. L'idea per tale attività è nata dalla necessità di ricercare un modo per collegare le attività di un makerspace al curricolo della scuola primaria. Si è voluta rappresentare in stop motion, una storia già conosciuta dai bambini realizzando i personaggi con circuiti morbidi. Gli obiettivi dell'attività erano: conoscere gli elementi costituenti di un circuito elettrico, comprenderne il funzionamento e le regole fisiche del passaggio della corrente elettrica, saper rappresentare una storia con tecniche di riproduzione multimediali.

La metodologia maggiormente utilizzata è stata l'apprendimento per scoperta, congiuntamente alle linee guida 'Approches to Curriculum Integration' del MakerEd Organisation. I bambini non avevano conoscenze pregresse né sui circuiti elettrici né sulle tecniche di ripresa in Stop Motion. Le fasi di progetto sono state essenzialmente quattro comprensive di valutazione e autovalutazione finale.

Il progetto ha permesso il rafforzamento di competenze quali la suddivisione in sequenze di un racconto e la costruzione di frasi in discorso diretto. I bambini hanno appreso anche skills che riguardano: le regole del passaggio della corrente elettrica, la polarità dei led, la funzione della batteria e la riproduzione di personaggi con la pasta modellabile. Il lavoro di gruppo ha permesso lo sviluppo di competenze sociali, in particolare la gestione dei conflitti, la collaborazione tra pari e l'organizzazione del lavoro.

Coding and educational robotics for skills development in secondary school

Author: Elena Liliana Vitti (MIUR)

The project entails the use of robots and is based on three elements: a hacking approach, a tinkering methodology based on "Think-Make-Improve" and a Cooperative Learning environment.

The proposed project has educational benefits that go well beyond the simple acquisition of knowledge and skills. Through this methodology, students widely expand their proficiency in both curricular knowledge and social experience. The cornerstones are: strengthening students' motivation, greater persistence in a challenge, increasing the wish for experimentation, tolerating failure and promoting initiative and entrepreneurship.

Comaking LAB - Coding and Making LAB

Author: Domenico Aprile (L.S. "Fermi-Monticelli" Brindisi)

Co-m@king LAB è un metodo didattico dell'insegnamento dell'Informatica nel Liceo Scientifico delle Scienze Applicate, declinato attraverso l'uso di strumenti di making e robotica educativa per lo sviluppo di competenze sia trasversali che disciplinari.

A tal fine, in un ambiente Open Source basato su Linux Edubuntu, si utilizzano schede elettroniche di nuova generazione (Arduino e raspberry pi, sostanzialmente), nonché stampanti 3D per lo sviluppo di applicazioni prototipali di varia natura.

Inoltre, l'applicazione delle Basi di Dati è incentrata sulla comprensione dell'importanza dei Big ed Open Data e il loro (ri)uso in senso civico, proponendo lo sviluppo di applicazioni (bot) basate sul sistema di IM Telegram.

La metodologia utilizzata è principalmente basata su una didattica laboratoriale, del "fare", applicando i principi del PBL (Problem Based Learning) e IBL (Inquiry Based Learning).

Co-m@king LAB mette al centro del processo di insegnamento-apprendimento lo studente, in quanto attore consapevole (pro-sumer) del proprio percorso di crescita, consentendogli di incrementare non solo con i saperi appresi ma portandolo allo sviluppo di competenze ed abilità di estrema rilevanza nel XXI secolo, anche attraverso la partecipazione a mostre/fiere/contest di settore.

Comandi da shell per far volare un drone

Author: Ivan Venuti (I.I.S.L. da Vinci-Fascetti)

Durante la presentazione verrà mostrato il drone AR Drone 2.0 con le sue potenzialità, sarà spiegato come accedere alla shell dei comandi e impartire, da essa, i comandi UDP per far eseguire al drone semplici comandi (alzarsi in volo e girarsi, comandare i led e così via) il tutto usando semplici comandi quali netcat, printf, sleep.

Il drone potrebbe essere usato per conoscere e approfondire la shell Linux e i suoi comandi, per conoscere e applicare il protocollo UDP e le sue caratteristiche, per indagare sulle problematiche di sicurezza e hacking che un simile prodotto presenta. Il drone può anche essere usato per insegnare il coding usando, per esempio, Pocket Code e il suo ambiente di sviluppo visuale.

Crescere con la Robotica - Esperienze di robotica educativa con studenti di tutte le età

Authors: Marco Cantarini (IIS Volterra - Elia Ancona) and **Rita Polenta** (IIS Volterra - Elia Ancona)

Il poster rappresenta una carrellata di esperienze svolte da studenti dell'Istituto di Istruzione superiore Volterra-Elia sia come tutor e progettisti di attività per bambini dalla scuola dell'infanzia a alla scuola secondaria di primo grado, sia come protagonisti nella progettazione e realizzazione di nuovi robot per partecipare a gare e competizioni. Particolarmente significative sono state le attività in cui i ragazzi del triennio delle specializzazioni elettronica e meccanica hanno realizzato prototipi originali per bambini della scuola primaria.

Didattica laboratoriale con approccio maker all'IIS "Einstein-Bachelet"

Authors: Marco Paletta (IIS Einstein-Bachelet) and **Leonardo Sammartano** (Officine Robotiche)

Antefatto:

I laboratori di Progettazione Sistemi Elettronici antesignani dei MakerSpace

Introduzione:

Le attività di progettazione "collaborativa" di sistemi elettronici sviluppate nel laboratorio curricolare (TPSE <http://www.bacheleteinstein.gov.it/wp/tpse3/>) e quelle sviluppate all'interno dello spazio Maker scolastico hanno in comune alcuni obiettivi:

Intervenire sulla didattica lavorando per progetti

sviluppare capacità di lavoro collaborativo

stimolare condivisione delle conoscenze

attivare processi comunicativi negli allievi

introdurre la dimensione "commerciale" insieme alla tecnologica

Il docente, prima "committente" poi tutor, indirizza verso scelte tecnologiche che i singoli gruppi di lavoro approfondiranno condividendole, sviluppando autonomamente soluzioni circuitali.

Materiali/metodi:

Partendo dal problema il docente/tutor presenta materiali e strumenti utili per l'elaborazione delle varie soluzioni progettuali.

I ragazzi, liberi di scoprire nuova componentistica utilizzando il web, costruiscono le soluzioni all'interno dei gruppi testando i circuiti su breadboard, finalizzandoli poi su PCB autoprodotti (via fresa CNC o fotoincisione).

Lo scambio delle conoscenze maturate e l'integrazione trasversale passa attraverso meeting periodici sullo stato dell'arte e la costituzione di archivi digitali.

Risultati:

Applichiamo questo metodo ormai da quattro anni e, oltre ad aver migliorato l'attenzione e l'interesse dei ragazzi, riscontriamo il recupero degli allievi cosiddetti "pigri".

Conclusioni/progetti futuri:

Miglioreremo il sistema integrandolo con le potenzialità della fabbricazione digitale del MakerSpace, sviluppando strumenti per la robotica educativa da condividere con le scuole superiori di primo grado.

Didattica laboratoriale in modalita tinkering: dalla robotica educativa al modellismo

Author: Aldo Domenico Ficara (IPIA Furci Siculo Messina)

Nel Laboratorio 1 di elettrotecnica dell'IPIA di Furci Siculo con la metodologia tinkering tendente al Maker Movement si sono costruite 2 lampade a led comandate da mouse degli anni 90, un robot che disegna soggetti astratti e un modellino di elettrodotto per fare sperimentazioni sull'elettromagnetismo a costo zero. Una dimostrazione su come la didattica laboratoriale competenze e conoscenze negli studenti coinvolti.

DIGITAL SOLARI

Authors: Anna Maria Longhi (Istituto Comprensivo "G. Solari" Loreto), **Riccardo Sampaolesi** (Istituto Comprensivo "G. Solari" Loreto), **Laura Procino** (Istituto Comprensivo "G. Solari" Loreto), **Ambra Coccia** (Istituto Comprensivo "G. Solari" Loreto) and **Livia Alesi** (Istituto Comprensivo "G. Solari" Loreto)

L'Istituto Comprensivo "Solari" di Loreto è composto da 7 plessi: 3 scuole dell'infanzia, 3 scuole primaria ed una scuola secondaria di primo grado.

Il "Solari" è una delle 22 scuole fondatrici di "Avanguardie Educative", il movimento di Indire che si pone come obiettivo quello di innovare la scuola italiana.

Da allora siamo capofila di 5 delle 12 idee proposte da Indire: debate, flipped classroom, spazio flessibile, integrazione cdd/libri di testo (book in progress) e ICT LAB.

Per ict lab si intendono tutte quelle attività che ruotano attorno a 3 temi tecnologici:

- artigianato digitale
- coding
- physical computing, che trova la sua applicazione nella robotica.

Fra i progetti più significativi di coding e robotica sono da segnalare: RETHINK LORETO: WE BUILD OUR SMART CITY che mirava a coniugare l'educazione civica e lo sviluppo delle competenze digitali e delle soft skills negli studenti, che hanno immaginato una versione "smart" della loro città, in collaborazione con l'Università politecnica delle Marche, la startup Talent e il comune di Loreto.

Un altro progetto è nato dal Pon "In estate si imparano le STEM" dove gli alunni delle scuole primarie e secondarie hanno realizzato la loro FRIENDLY GREEN CITY, immaginandosi una città ecosostenibile.

Dallo scorso anno si è cercato di sviluppare i tre temi in un maxi progetto in verticale fra i tre ordini di scuola; DIGITAL SOLARI: CODING, ROBOTICA E STAMPA 3D in

particolare ci sono progetti della scuola dell'infanzia, della scuola primaria e della scuola secondaria di primo grado.

Educational Robotics within the maker culture - Investigation of soil moisture using the GOGO Board controller in the 6th and 7th grades of Elementary School - Fablearn Experience in Sobral - Ce - Brazil

Author: **Cesar De Castro Brasileiro** (CSTI Maria Dorilene Arruda Aragão)

The present work was developed in a full time public school in the city of Sobral in the interior of Ceará State. I work in municipal education with students of the final elementary school (6th to 9th grades - 11 to 14 years old) and our school has an important tool, the Fablearn program laboratory. With the construction of the new Science Curriculum of the municipality, we will have more support to develop our didactic sequences. I am an effective science teacher at the municipal network and I am currently assigned as a laboratory teacher for the Fableran program. I am developing science teaching sequences using educational robotics through the use of the GOGO Board controller. This work will present an investigative didactic sequence on soil moisture developed in the first semester of 2019 with students from the 6th and 7th years (11-13 years). This work made me realize the importance of building more investigative didactic sequences in sciences, bringing students a more protagonist action in the learning process. Another important lesson learned is that we teachers can better prepare our students within the scientific realm and help make the science class more meaningful in the context in which the student is inserted. A class is never completely ready. It is important to be always reviewing and redesigning the developed classes looking for increasingly relevant improvements within the applied sequences.

EduMaking: Maker spaces as learning platforms

Authors: Alberto Calleo (University of Bologna) and **Giorgio Dall'Osso** (University of Bologna)

I maker space, la rete di laboratori che principalmente hanno coltivato la diffusione della manifattura digitale, si candidano nel prossimo futuro a divenire nodi territoriali nei quali fare incontrare l'impresa con le potenzialità delle tecnologie abilitanti. Non più unicamente luoghi di sviluppo di progetti destinati ai consumatori ma veri e propri centri di ricerca nei quali apprendere attraverso dei percorsi didattici e generare progetti in collaborazione con la propria rete territoriale.

Se evidentemente sono necessarie adeguate abilità per riuscire a gestire (puntando alla qualità) un processo di apprendimento e rielaborazione delle informa-

zioni fruite digitalmente allora queste abilità devono tessersi con il tessuto produttivo dei territori ai vari livelli.

Il rinnovato maker space affiancherà all'azione fisica una digitale attraverso una piattaforma che sia luogo dove accedere a contenuti e contemporaneamente comprendere il processo virtuoso.

Erwhi Hedgehog

Author: Giovanni Di Dio Bruno (Officine Robotiche)

Erwhi Hedgehog is one of the smallest mobile robots that allows mapping, vision analysis and displays machine learning features simultaneously.

While it can behave like a small curious animal eager to explore the surrounding environment, the robot can be useful to test navigation, mapping and localization algorithms, thus allowing to prototype new hardware and software for robotics. This application is particularly handy for education in robotics, both at the high school and university level. On the one hand, the project is fully open source and open hardware under MIT license and available on Github, so everyone can build his/her own Erwhi Hedgehog robot with a step by step guide; on the other hand, students with a more advanced knowledge in the field can further develop new softwares and features using it as a starting platform for prototyping.

Erwhi uses Intel Realsense, AAEON UP Squared and Myriad X VPU technologies, with software based on Robotic Operating System (ROS), and implements SLAM algorithms, such as RTABmap. The machine learning aspect is based on OpenVINO framework and a dedicated ROS wrapper was implemented. The software package includes also all programs required to create a Gazebo simulation. From the hardware point of view, motor control is based on STM32 microcontroller and Arduino software and the robot works on differential unicycle model. Finally, Erwhi is compatible with AWS RoboMaker tools.

Il Design Thinking: una metodologia, un modello ma anche un modo di pensare.

Authors: Valentina Ercolani (H-Farm Education) and **Giulio Bonanome** (H-Farm Education)

Il pensiero progettuale si basa sulla capacità umana di essere intuitivi, di saper riconoscere modelli e di costruire idee che siano emotivamente significative oltre che funzionali.

Gli elementi che fanno parte del design thinking si combinano per formare un approccio iterativo, utile per testare e soddisfare le esigenze di chi lo sta utiliz-

zando per risolvere un problema. Più che un modello, si tratta di un modo di pensare, quindi non è un percorso lineare bensì una grande massa di iterazioni che si ripetono durante l'intero ciclo.

La prototipazione rapida, che permette di visualizzare e testare in poco tempo le soluzioni, e l'apprendimento dagli errori sono solo alcuni degli aspetti che questo processo condivide con l'approccio maker. Per questo motivo introdurre il design thinking nella scuola rappresenta un'opportunità per avvicinare studenti e insegnanti al modo di pensare del progettista e del maker.

Attraverso la realizzazione di workshop nelle scuole abbiamo tuttavia osservato che i partecipanti tendono a interpretare il design thinking come un modello composto di fasi e tempi rigidamente definiti. Questa cosa e l'imprevedibilità dei risultati finali, comportano generalmente una diffidenza da parte degli insegnanti nella sua adozione.

Con questo poster ci proponiamo di offrire a insegnanti ed educatori esempi concreti di come poter applicare il design thinking al proprio contesto scolastico attraverso la condivisione di strumenti e una ridefinizione del loro ruolo di facilitatori.

Il Makerspace apre D. O. O. R. S.

Authors: Maria Beatrice Rapaccini (PDP Free Software User Group), **Angela Biocco** (PDP Free Software User Group) and **Luca Ferroni** (PDP Free Software User Group)

Il progetto DOORS propone un Modello Educativo Integrato per contrastare la povertà educativa di ragazzi e ragazze di età dai 10 ai 14 anni. Il Modello intende stabilire una relazione sinergica di partenariato e continuativa tra presìdi scolastici e presìdi territoriali (spazi/strutture fuori dalla scuola) e promuovere, così, una comunità educante.

La base teorica di riferimento è la Pedagogia del Desiderio, adottata e promossa in particolare dal progetto Axè Brasile, che presuppone che l'Arte sia Educazione: i ragazzi/e sono riconosciuti come soggetti di diritto di conoscenza e di desiderio.

Le azioni di tutti i partner sono accomunate dal costante accostamento della pratica ArtEducativa alle discipline tecnico-scientifiche (STEM/STREM) in un'ottica di relazione dialogante e arricchente. Nel territorio di Matelica/Fabriano/Cerreto d'Esi l'associazione PDP (Free Software User Group) propone il paradigma costruzionista di Seymour Papert con i principi delle 4 P: Project, Peer, Passion, Play, già da diversi anni sperimentato all'interno del Makerspace della Biblioteca pubblica di Fabriano (AN).

La Robotica nella mia didattica cross disciplinare

Author: Angela Gatti (Secondo Istituto Comprensivo Francavilla Fontana BR)

Nella mia pratica didattica di scuola primaria, la robotica educativa ha offerto molti interessanti vantaggi,derivanti dalle caratteristiche dello strumento: i robot sono oggetti reali e tridimensionali che si muovono nello spazio e nel tempo e possono essere programmati per eseguire dei percorsi desiderati, sviluppano quindi le capacità di pianificazione e soluzioni di problemi, sono inclusivi poichè sono progettati per rendere accessibile, semplice e divertente la programmazione della loro mobilità. La robotica educativa, infatti, permette di migliorare la capacità del fare attraverso l'hands-on, potenziando così l'acquisizione di competenze trasversali degli alunni. Molto Importante si è rivelato il brainstorming per far emergere all'interno del gruppo tutte le idee. Nel cooperative Learning gli alunni si aiutano e sono corresponsabili del loro apprendimento. Qui il mio ruolo, più che da docente, è quello di un facilitatore. Il percorso di quest'esperienza è stato caratterizzato da aspetti collaborativi e interattivi (stimolo/risposta). L'organizzazione è stata flessibile con gli alunni, riuniti in micro gruppi. Attraverso la robotica educativa i bambini hanno scoperto che non bisogna aver paura di sbagliare, ciò migliora l'autostima di ognuno. Si è partiti da una metodologia costruzionista, con i bambini al centro del processo perchè vi partecipano con i propri stili di apprendimento, per guidarli al raggiungimento degli obiettivi prefissati. Si è cercato di suscitare attenzione e curiosità con domande stimolo sull'elettronica, sulla robotica, sugli oggetti di uso comune. Il clima estremamente collaborativo, ha fatto sì che l'errore non fosse vissuto come un ostacolo all'apprendimento, ma un punto di partenza per proseguire e migliorare.

Make In Class

Authors: Giulio Gabbianelli (Co.Meta srl) and **Marica Sabbatini** (Co.Meta srl)

Make In Class is an Erasmus+ Strategic partnership for the development of innovation in school sector, aiming at supporting teachers and educators in understanding the potential of maker-based activities to prevent early school leaving phenomenon in European secondary schools.

This innovative approach will provide secondary schools, teachers, and other professionals working for inclusion of youth, with resources, tools and practical activities to set up and manage a maker lab ensuring young people develop the kinds of skills and knowledge relevant for school and their digital futures.

Following the Eurostat's data, in 2016 the 11% of people aged 18-24 in the EU-28, were early leavers from education and training; Italy, Spain and Malta are below the EU 2020 target value (10%) and in the first positions for early school leaving rate.

According to the Europe 2020 strategy, it's necessary to explore the potential of more personalised, learner-centred forms of teaching, including by means of digital resources.

The Project will produce the following tangible results:

- A competence map identifying the Learning Outcomes acquirable with maker based activities;
- An online repository of Open Educational Resources for teachers;
- A modularised training programme to promote secondary school teachers' and educators' proficiency;
- A pedagogic handbook with practical information and activities to be implemented with students.

The Project includes 8 partners from Italy, Spain, Malta and Germany: Co.Meta srl (Coordinator), Comune di Fano, ISS Polo 3 Fano, Fablab Munchen, Gymnasium Neubiberg, MCAST, Bylinedu, IES El Clot.

MAKE ME MAKER - Laboratori per imparare le nuove tecnologie divertendosi

Authors: Stefano Sarti (Liceo Rambaldi - Valeriani - Alessandro da Imola), **Annalisa Contoli** (Istituto Comprensivo 6 Imola), Marco Martelli (FabLab Imola), **Emilio Masi** (Officina Immaginata - Cooperativa Sociale) and **Lorenzo Medici** (Istituto Comprensivo 7 Imola)

Il poster illustrerà le esperienze più significative realizzate negli Istituti del territorio imolese al cui interno è collocato – o lo sarà a breve – il FabLab. Alla realizzazione di ciò si è giunti nel 2018 quando l'Istituto Alberghetti, sede originaria di FabLab Imola, ha chiesto all'associazione di liberare i locali. Questa richiesta è stata colta come occasione per modificare il suo status.

Se prima erano i makers che andavano al Fablab, ora la rete di FabLab diffusi nel territorio e afferenti ad alcune rilevanti realtà scolastiche, consente agli studenti di scoprirsi giovani makers.

Il FabLab diviene un altro laboratorio scolastico (a fianco dei laboratori di fisica, chimica e scienze, e collegato ad essi). Durante l'orario scolastico è frequentato dagli studenti dell'istituto, ma nel pomeriggio è accessibile a tutti, in particolare ai soci del FabLab.

Aspetto importante per dare sostenibilità economica nel tempo al progetto è stato il coinvolgimento della cooperativa sociale "Officina Immaginata" che svolge attività nel settore educativo, anche in un'ottica inclusiva.

L'ultimo tassello che ha permesso di avviare il progetto è stato un finanziamento rice-

vuto dalla Regione Emilia Romagna in seguito al bando "I luoghi della conoscenza e della ricerca per nuovi approcci alle discipline STEAM" (delibera n. 1517 del 17/09/2018).

MakerSpace e FabLAB a scuola-il modello Officine digitali Einstein di Roma

Authors: Leonardo Sammartano (Officine Robotiche) and **Marco Paletta** (IIS Einstein-Bachelet)

Antefatto:

Essere vecchi prevede la possibilità di aver accantonato esperienze, non condividerle è egoismo.

Introduzione:

Da 4 anni le attività sviluppate nello spazio Maker di scuola hanno mirato allo stesso obiettivo: Contrastare l'assopimento curriculare, la prevedibilità di ruoli, compiti ed obiettivi.

Da Professore ad allenatore. Docente e Homo Faber. Il fare come via per raggiungere uno scopo reale, partendo dal vissuto personale dei ragazzi.

Da studente a membro. Sostenere il discente nel diventare parte di una comunità produttiva ma con la tutela della "palestra" utilizzando motivi e argomenti in cui si riconosca.

Materiali/metodi:

Coinvolgere, senza esclusione e senza preclusione.

Scegliere un pretesto fra argomenti critici del percorso curriculare, curiosità dei ragazzi, fantasie e dunque mantenerlo per fedeltà al mandato ma senza mai blindare i ragazzi.

Un passo difficile: convincerli a sentirsi impresa. Passare dall'occupare un banco al fare qualcosa per se.

Rendere il laboratorio un'officina aperta è fondamentale. Cambiare il linguaggio, le modalità di relazione, essere credibili e conquistare la fiducia rimane la parte più difficile.

Risultati:

Questo metodo ha permesso ai ragazzi di apprendere anche dagli errori, senza sentirsi giudicati.

Conclusioni/progetti futuri:

Portare il MakerSpace come metodo, integrando la fabbricazione digitale nelle materie curricolari (Disegno 2D/3D, TPSE, Sistemi, Elettronica, area umanistica) generando percorsi didattici innovativi e apertura al territorio.

Moving Beyond Toy Cars: Creative Robotics

Author: Angela Lombardo (FabLearn Fellow 2016)

How can we help students engage in robotics activities going beyond the idea of robots as toy cars?

In this poster, I will share with FabLearn Italia participants how I've tried to figure out these questions while designing a Constructionist experience through robotics.

During the last 4 years conducting robotics after-school programs I've directly experienced the importance of designing and offering to students a learning environment that is safe, supports playful experimentation, and helps them take creative risks.

Only in an environment like that they can work on creating something truly meaningful and inventing new things while developing a better understanding about technologies that surround them in their daily life.

This is true not only for robotics, but can be generalized to any experience where kits provide a convenient option for providing materials for student projects, but may also inadvertently suggest to students that there is "one way" to use the materials.

My students and I will show participants some of the robotic creations they've made.

I'll share materials and resources, as well as the design process I followed to provide them opportunities to imagine, design, and express themselves creatively through microcontrollers, LEDs, motors, and sensors.

Multicomponent contribution (school, university, factory) to climatic data mining by a new electronic board.

Authors: Ilaria Cantini (University of Florence), **Andrea Antonini** (Consorzio LAMMA), **Luca Bini** (Azienda Agricola La Capannaccia) and **Gianni Camici** (IIS B. Cellini Firenze)

The intensification of extreme events and disasters due to climate change has different impacts in human activities, and particularly in agriculture. Heat waves, heavy storms, desertification, water system crisis are key aspects and a challenge for the future. Adaptation strategies must start from better knowledge of natural phenomena and additional information. The diffusion of a large number of sensors can help understanding such phenomena through appropriate technologies and the use of low-cost devices, achieving the augmentation and densification of data collected in due time.

For these reasons a project has been started, aimed at implementation of a very low-cost meteorological station for measuring atmospheric parameters. The project has been fully developed in a high school under the supervision of teachers and experts, involving potential stakeholders interested in its use in agriculture. Some traditional sensors, tipping bucket raingauges, magnetic reed devices anemometers, capacitive/resistive thermohygrometers, and an innovative impact piezo-element raingauge have been adapted to the development of the weather station. An Arduino-based control system has been implemented. The fully automatic equipment broadcasts recorded data in real time using wi-fi. A remote system collects data from all the deployed independent measuring points. Future data elaboration and in-field feed-back are being developed.

No al bullismo con la robotica educativa

Author: Luisa Dicitore (Direzione Didattica Bastia Umbra)

Uno dei modi più interessanti per sviluppare il pensiero computazionale è attraverso la programmazione informatica in un contesto di gioco.

Il gioco è per sua natura e per suo stato educante; infatti è attraverso di esso che i bambini e le bambine imparano a conoscere il mondo, a sperimentare il valore delle regole, a stare con gli altri, a gestire le proprie emozioni, a scoprire nuovi percorsi di autonomia e a sperimentare per tentativi ed errori le convinzioni sulle cose e sugli altri.

Attraverso la realizzazione di percorsi individuali e di gruppo, i bambini sono stati guidati all'utilizzo del mezzo tecnologico in modo attivo e consapevole e hanno potuto sperimentare nuove modalità e nuovi contesti per riflettere, cooperare, sviluppare la creatività e imparare.

I bambini sono riusciti ad apprendere in modo attivo, grazie all'utilizzo di piccolo robot (Bee Bot), l'importanza di valori umani per contrastare il fenomeno del bullismo.

Il lavoro è partito con la lettura di una storia sul tema del bullismo di Anna Lavatelli "Faccia di Maiale" Nord-Sud edizioni. Attraverso l'introduzione di tecnologie, momenti di confronto e lavori di gruppo, tutti gli studenti hanno partecipato ad un'attività altamente inclusiva che ha permesso loro di approcciare a tematiche abbastanza complesse come il bullismo in modo coinvolgente e divertente. Inoltre tutto questo ha permesso non solo lo sviluppo delle loro competenze trasversali ma anche la crescita della loro manualità e di scoprire un uso smart e attivo delle tecnologie, sviluppando così il pensiero computazionale e la loro creatività digitale.

Occhio al robot

Authors: Cristina Cherubini (D.D. Bastia Umbra) and **Nadia Giugliarelli** (D.D. Bastia Umbra)

Classi: due classi 3°

Bambini 34

Insegnanti 2

Obiettivi: Osservare in modo accurato il robot

Descrivere in modo preciso, chiaro e dettagliato usando un lessico appropriato.

Le insegnanti affrontano questo percorso poiché nei due gruppi classe si rilevano differenze notevoli in merito all'impegno, all' attenzione e alla concentrazione.

L'esperienza dell'osservazione è stata svolta in palestra in circle time, le aule non danno la possibilità di creare setting diversi dalla posizione frontale.

Fase innesco: palestra-aula 1,5ora osservazione del robot senza discussione. Ogni bambino ha la possibilità di osservare il robot tenendolo in mano. Rientro in aula e rappresentazione del robot senza vederlo

Attività1 aula-2,5ore Descrizione orale di ogni bambino del disegno di un compagno attraverso domande stimolo e confronto con l'autore del disegno.

Attività2 palestra-2ore Discussione e ipotesi da parte dei bambini sul funzionamento e sulla programmazione del robot. Verifica delle ipotesi attraverso il movimento del robot

Verifica: aula-2ore Rappresentazione grafica con il robot presente e descrizione scritta della struttura e del funzionamento.

Documentazione: disegni e descrizioni dei bambini, foto, griglia valutazione.

Le insegnanti alla fine evidenziano tempi di attenzione più lunghi e livello di motivazione più alto rispetto ad attività similari svolte in precedenza.

La maggior parte degli alunni rappresenta in modo più accurato e dettagliato il robot al termine rispetto alla prima rappresentazione (come da griglia di valutazione)

La descrizione scritta risulta più completa sia per l'uso del lessico sia per la struttura della frase. La connessione logica risulta ancora povera di connettivi.

Progettare la città ideale con il supporto della digital fabrication

Authors: Lina Cannone (IC Orazio, coderdojo Pomezia) and **Melissa Siconolfi** (Università degli studi di Roma Tre)

Il progetto in oggetto è stato sviluppato in una classe terza della scuola primaria. L'idea dell'attività è nata dalla ricerca di connettere le attività tipiche di un fablab o makerspace al curricolo presente oggi nella scuola primaria. Gli obiettivi di progetto erano: realizzare, attraverso la progettazione partecipata del gruppo classe, la città ideale e costruire un plastico con l'ausilio di strumenti per la fabbricazione digitale ed elementi manipolativi. Le metodologie utilizzate sono state mutuate in parte dalle 'Learning dimensions of making and tinkering' dell'Exploratorium, 'Approches to Curriculum Integration' del MakerEd Organisation e PBL.

Il progetto ha permesso l'approfondimento di conoscenze numeriche e geometriche quali la misura, le equivalenze e la riduzione in scala. I bambini hanno appreso anche skills che riguardano: il funzionamento di una macchina da taglio e stampante 3D; il posizionamento del foglio nello spazio; le indicazioni di taglio; la durezza di diversi materiali e le migliori impostazioni per ognuno; il posizionamento degli elementi nello spazio; le misurazioni nello spazio fisico e le proporzioni degli elementi. Il lavoro di gruppo ha permesso lo sviluppo di competenze sociali, in particolare la gestione dei conflitti e la collaborazione tra pari.

Progetto Teens4Kids - Formare giovani creatori digitali

Author: Martina Francesca Ferracane (FabLab Western Sicily)

Il progetto Teens4Kids si basa sull'insegnamento orizzontale da parte degli studenti delle superiori agli studenti delle elementari sul tema dell'educazione digitale creativa. Questo progetto ha formato 100 studenti delle scuole superiori di Marsala che a loro volta hanno formato 750 studenti delle scuole primarie nell'anno scolastico 2018/2019. Gli studenti delle superiori sono stati formati da alcuni volontari all'interno di un progetto di alternanza scuola-lavoro, sia con competenze tecniche (coding e stampa 3D) che trasversali (pedagogia creativa, project management, imprenditorialità, lavoro in gruppo...). Trasmettendo le competenze tecniche acquisite ad oltre 750 studenti della scuola primaria, gli studenti delle scuole superiori hanno imparato a vedere il digitale come strumento formativo. L'obiettivo principale del progetto e di formare giovani creatori digitali, che vedano la tecnologia come strumento attivo di creazione piuttosto che come strumento passivo. Il progetto ha stimolato l'interesse degli studenti in materie STEM (con diversi studenti delle superiori che hanno deciso di intraprendere percorsi universitari in questo ambito) e nell'imprenditoria digitale (con nuove startup di-

gitali create da studenti delle superiori).Il progetto usa un approccio costruttivista, ovvero del fare per imparare, facendo leva sui teenagers. In questo modo si supera l'ostacolo degli insegnanti non nativi digitali. Oltre all'imparare attraverso il fare, gli ingredienti principali del progetto sono il gioco, l'approccio peer-to-peer e la condivisione. Il progetto sarà replicato quest'anno a Pantelleria, con l'aggiunta di due nuovi moduli (elettronica/robotica e taglio laser) e di un RCT per monitore come il progetto promuove importanti competenze per l'era digitale.

Prototipazione di kit didattici con stampante 3D nel FabLab del Liceo Scientifico Cavour (Roma)

Authors: Alessandra Carlini (Liceo Scientifico Cavour, Roma) and **Teresita d'Agostino** (Liceo Scientifico Cavour, Roma)

Proponiamo i risultati di due progetti che mostrano le potenzialità didattiche di un FabLab in un Liceo Scientifico.

Il Liceo Cavour realizza, con fondi PON, un'Officina digitale pensata, secondo l'approccio Living Lab, come Polo Scolastico in rete con le Istituzioni del Territorio, centro di prototipazione, su "commissione simulata", di kit didattici con stampante 3D.

Il primo progetto, "Cono di Apollonio", prende avvio nel Laboratorio di geometria creativa in partnership con il Comune di Roma per promuovere la diffusione della cultura scientifica nelle scuole. Il kit, modellato con i software Tinkercad e Geogebra e stampato in PLA dagli studenti, mostra cerchio, ellisse, parabola, iperbole in superfici calamitate da dividere e rimontare.

Il secondo progetto, "ART-TOUCH-LAB", matura nel Laboratorio di arti applicate in partnership con la Direzione Generale Educazione Ricerca del MiBACT, per promuovere accessibilità e inclusione nei musei. I kit prototipati realizzano dispositivi tattili che riproducono architetture e apparati decorativi di stile Romanico partendo dal rilievo fotogrammetrico su campo condotto in BYOD (smartphone e tablet) con software Autodesk (Zephyr, Recap, Meshmixer). I modelli stampanti consentono l'esplorazione tattile di ciechi e ipovedenti e stimolano, più in generale, un uso attivo da parte dell'intero pubblico motivando l'impulso cognitivo e un diverso approccio alla conoscenza.

Le esperienze illustrate dimostrano come un FabLab possa offrire un ambiente di apprendimento nel quale sviluppare modelli didattici basati sulle materie S.T.E.A.M., proponendo "buone pratiche" di apertura al territorio, di Unità didattiche per compiti autentici, di orientamento in entrata attraverso workshop peer-to-peer e in uscita come progetti di PCTO.

Realtà aumentata e realtà virtuale nella didattica: una sfida nel percorso di apprendimento.

Authors: Mariapaola Puggioni (Università Politecnica delle Marche), **Emanuele Frontoni** (Università Politecnica delle Marche), **Roberto Pierdicca** (Università Politecnica delle Marche) and **Marina Paolanti** (Università Politecnica delle Marche)

La Realtà Aumentata e la Realtà Virtuale si stanno espandendo oramai in molti settori ed ambiti, non solo quelli specificatamente dedicati alla tecnologia digitale, ma anche in quelli della vita quotidiana. Analogamente negli ambienti didattici si sta diffondendo l'utilizzo delle nuove tecnologie che sviluppano proposte di AR e VR nelle diverse discipline, in particolare quelle scientifiche (1). La familiarità che le giovani generazioni posseggono nei confronti dei dispositivi digitali ne facilita l'utilizzo in ambito didattico, ampliando apparentemente l'interesse nel processo di apprendimento.

Un settore che naturalmente si predispone all'uso delle applicazioni di AR e VR è quello delle discipline artistiche e architettoniche (2) Entrare in modalità immersiva in un'opera ne facilita la lettura e il rapporto empatico. Il processo di apprendimento richiede comunque altri fattori che producano nell'allievo, oltre la risposta immediata ed emozionale rispetto alla proposta di contenuti, anche una permanenza nel tempo di essi. Il lavoro di ricerca intrapreso ha lo scopo di verificare la reale potenzialità degli strumenti digitali all'interno di un percorso didattico che comprenda tutti i processi di insegnamento-apprendimento. In particolare verificando le effettive ricadute a lungo termine sulla formazione culturale e personale dello studente. Il progetto SmartMarca, il cui obiettivo è la promozione turistica e culturale del territorio del fermano, ha fornito una piattaforma ideale per la verifica delle potenzialità didattiche dei suoi contenuti, sviluppati in AR e VR, volti alla conoscenza di opere e monumenti.

RoboEtica Territoriale

Authors: Emanuele Miliani (IC Bosco Chiesanuova) and Roberta Busato (IC Bosco Chiesanuova)

Il progetto proposto ha coinvolto le ragazze ed i ragazzi dell'IC Bosco Chiesanuova VR con l'intento di avvicinarli allo studio del territorio e alle materie STEAM attraverso il coding e la robotica in un'ottica di learning by doing.

Il territorio montano, in cui l'Istituto è sito, è interessato dal fenomeno del carsismo. Ecco che le grotte e i vari Covoli sono diventati luoghi di didattica interattiva per lezioni multi ed interdisciplinari.

I piccoli esploratori dell'infanzia e della primaria sono stati guidati nel loro percorso da "Fade", "Orchi" ed "Anguane", i personaggi tipici dei racconti tradizionali nati in loco attorno a queste grotte, in una sorta di connubio tra fantasia, storytelling e robotica.

I ragazzi più grandi della scuola secondaria, guidati da speleologi, hanno esplorato le cavità ascoltando goccia dopo goccia il crearsi di un luogo buio e misterioso per poi riprodurlo in scala ridotta e programmare un robot che, in autonomia, esplorasse gli spazi più difficili da raggiungere.

In questi luoghi, molto diversi da un'aula scolastica, l'attenzione degli studenti è stata massima perché l'ambiente li ha coinvolti emotivamente: torce elettriche e volo di pipistrelli hanno fissato indissolubilmente le nuove conoscenze apprese.

In virtù dell'idea di una scuola che mette radici nel territorio e crea competenze in esso spendibili, i ragazzi hanno poi potuto visitare alcune realtà locali dove la robotica è già di casa, come nell'automatizzazione della mungitura bovina.

Robotica e rappresentazione. Robot mock-up: esperienze di apprendimento situato per docenti

Author: Stefania Operto (University of Genova)

La diffusione delle tecnologie emergenti nella società sta stimolando la loro applicazione in vari settori. In ambito educativo, stanno crescendo in quantità e varietà le esperienze di robotica educativa curriculare e non curriculare nell'educazione formale, non formale e informale, grazie anche alla crescente disponibilità di strumenti e kit didattici.

Dopo avere osservato diverse esperienze di robotica educativa, è apparso opportuno soffermarsi sui presupposti cognitivi e metacognitivi propedeutici alla loro realizzazione, spostando il focus dai destinatari - tipicamente i giovani studenti - ai soggetti realizzatori - i docenti e, più in generale, gli operatori del settore dell'educazione.

Nell'ambito di un progetto di ricerca in corso presso l'Università degli Studi di Genova è stata realizzata una sperimentazione di apprendimento situato per adulti basata sulla metodologia partecipativa del 'robot mock-up': docenti e formatori sono stati coinvolti, durante workshop partecipativi, in contest finalizzati a costruire il 'robot ideale'.

Obiettivo della sperimentazione è stato individuare e descrivere le rappresentazioni della robotica e del concetto di robot diffuse tra gli adulti; queste rappresentazioni, infatti, possono influenzare il processo di progettazione e realizzazione di iniziative di robotica educativa sia di singoli docenti sia di gruppi di lavoro multidisciplinari.

L'analisi dei manufatti e del materiale prodotto nei vari robot mock-up sembra mostrare alcuni elementi di interesse e suggerisce l'opportunità di riflettere sulla rappresentazione della robotica quale precondizione alla progettazione di interventi educativi per favorire il conseguimento degli obiettivi didattici e l'efficace trasmissione di conoscenze e competenze e, più in generale, per contribuire allo sviluppo della società della conoscenza.

Roboticsness

Author: Paola Lisimberti (Liceo Pepe Calamo Ostuni)

L'aula LEIS (Lego Education Innovation Studio) è l'ambiente di apprendimento ideale per praticare una nuova filosofia dell'educazione: abituare i ragazzi a pensare con un robot è un obiettivo strategico per educare i cittadini di una smart community. La robotica non rappresenta soltanto un ponte tra saperi come matematica, fisica, informatica, scienze, ma è anche un generatore di innovazione capace di coinvolgere la filosofia, la letteratura, il disegno e la storia dell'arte. Dietro un robot non c'è solo tecnologia, ma anche "pensiero": di chi lo immagina, di chi lo progetta, di chi lo costruisce, di chi lo programma.

Service learning: intersezione tra teoria e pratica

Author: Roberto Raspa (IdeAttivaMente)

IdeAttivaMente è una start-up fondata a Bastia Umbra (PG) nel 2016 per iniziativa di tre soci fondatori, under 30, specializzata nell'innovazione didattica e digitale per le discipline STEAM. Il team, oltre ai soci, è composto da un formatore senior e da circa 10 esperti settoriali (es. ingegneri, curatori d'arte, biologi, programmatori).

IdeAttivaMente svolge un ruolo che potrebbe essere definito di interprete o mediatore didattico digitale, stimolando l'efficacia della relazione tra insegnamento e apprendimento. L'obiettivo finale è quello di sostenere lo sviluppo e il potenziamento "digitale" dell'intera comunità, fuori e dentro la scuola. IdeAttivaMente si pone come stakeholder, punto di intersezione tra teoria e pratica, tra ricerca e sperimentazione, tra apprendimento come sviluppo delle competenze individuali e azione solidale (Service Learning).

Il ruolo di mediatore didattico digitale che IdeAttivaMente è riuscito a costruire in questi anni di lavoro è senza dubbio una buona pratica nell'ottica di potenziare e rafforzare il Service Learning riducendo in questo modo la distanza tra apprendimento e vita reale. La compartecipazione tra scuola e soggetti esterni arricchisce i percorsi didattici mediante l'acquisizione di competenze di natura disciplinare e soft-skill.

Smart cities initiative: making new choices for a sustainable future

Author: Rodrigo Lemonica (Lourenço Castanho School)

The paper presents the "Smart Cities project" developed with 9th grade students from Lourenço Castanho School, 'Lourenço' is a private school located in São Paulo, Brazil, which has a creative space known as 'Creation Lab.'; this ecosystem at school intends to develop a culture of innovation and creativity. Through the problem: 'Can tech improve quality of life in a city?' and working in a 'STEM-Maker' scenario, students built their own town, using waste, scrap, Arduino and the IoT (Internet of Things), they made smart prototypes to the city aiming an efficient and innovative solution for many global issues. Linking maker movement and citizenship through the project in-group action, it was emphasized the fundamental role of citizenship in a whole school community, understanding that 'citizenship is everyone's duty'. The paper above is inserted in the following key areas of interest: Maker Spaces and Fablabs at school: a maker approach to teaching and learning; Laboratory Teaching with the makers approach: models, methods and instruments.

THINK MAKE ENJOY method using PolyShaper® innovative and 100% Earth friendly system

Author: Cinzia Pieramico (GIPAT srl)

#THINK#MAKE#ENJOY è un metodo assolutamente originale che permette di insegnare divertendo, coinvolgendo e rendendo lo scolaro figura attiva nel processo di insegnamento/apprendimento, utilizzando come strumento PolyShaper®, una innovativa macchina CNC per sagomare il BioFoam®, polimero simile al polistirolo ma su base PLA 100% compostabile e ad impatto zero! I vantaggi principali nell'utilizzo di questo strumento innovativo sono: a) Multidisciplinarietà; b) Adattabilità e versatilità: utilizzabile – con metodi differenziati – nelle varie fasce d'età dalla scuola d'infanzia alle secondarie e accademie; c) Semplicità d'uso! sia del sw di grafica vettoriale che del ciclo di produzione; d) Stimolo alla fantasia, creatività, pensiero computazionale, pensiero spaziale, progettualità; e) Possibilità infinite degli oggetti da produrre. Possibilità infinite di decorazione e finitura delle sagome prodotte, prodotti finali unici ed irripetibili; f) Incentivo al lavoro in team; g) Coinvolgimento e divertimento del team, che è la chiave del successo ed efficacia di tale metodo.

La semplicità d'uso, l'immediatezza con cui si passa dall'ideazione alla realizzazione e la gratificazione nel fare ciò contribuiscono alla autostima, sicurezza nelle proprie abilità e competenze, manuali e computazionali.

Il sistema PolyShaper® ha ricevuto il Seal of Excellence dalla Comunità Europea in ambito Horizon 2020 e vari riconoscimenti dal Maker movement, tra cui Maker-of-Merit 2016 e Maker-of-Merit 2017.

Il sistema PolyShaper® e metodo Think Make Enjoy sono stati e sono attualmente utilizzati nel progetto SPINP-"Solo Posti In Piedi. Educare oltre i banchi" (2017- GER- 00520).

Tinkering a merenda

Author: Caterina Moscetti (Istituto Comprensivo di Sigillo)

"Tinkering a merenda" descrive l'esperienza didattica sperimentale in una classe seconda della scuola Primaria di Sigillo durante l'intero anno scolastico 2018/2019.

L'idea nasce dalle pratiche di Tinkering descritte nel testo "The art of Tinkering", dalle esperienze dei Fablab scolastici e dalle contaminazioni che via via negli anni si sono andate diffondendo sempre più negli ambienti innovativi di didattica creativa. Osservando gli alunni di classe seconda, la loro passione per la manipolazione e la trasformazione delle cose, è nato il desiderio di far sperimentare loro le attività di Tinkering e Making. Avevamo in classe oggetti e materiali (ad esempio pezzi di cartoncini e altro), che finivano nella spazzatura ma che avevano ancora la possibilità di essere utilizzati in modo creativo. E avevamo bambini che durante l'intervallo si organizzavano spontaneamente in gruppetti per giocare, leggere, disegnare, costruire. Ecco, costruire. La costruzione di cose era una attività in cui i bambini mettevano tanta energia creativa e tanto entusiasmo. Da lì al proporre attività di Tinkering e Making il passo è stato breve e naturale.

Abbiamo dilatato ed arricchito il tempo e le attività che gli alunni avevano avviato spontaneamente durante l'intervallo. Dilatato perché il tempo dell'intervallo si è ampliato arrivando a comprendere anche l'ora successiva di lezione (tutta o in parte). Arricchito perché, progressivamente, i materiali proposti sono stati diversificati e anche le sfide progettuali proposte agli alunni sono state gradualmente più articolate e mirate, lasciando sempre e comunque libero lo spirito creativo innescato con lo stimolo iniziale.

Un robot per l'analisi della respirazione delle piante e per la verifica del fenomeno della fotosintesi clorofilliana.

Authors: Luca Scalzullo (I Istituto Comprensivo Nocera Inferiore), **Rosanna Dell'Università** (I Istituto Comprensivo Nocera Inferiore) and **Pasquale Pepe** (I Istituto Comprensivo Nocera Inferiore)

La robotica educativa si offre come strumento transdiciplinare aiutando i ragazzi a superare il muro della frammentazione della conoscenza di cui è permeata la Scuola. In questo progetto Abbiamo unito le forze raggruppando Scienze, Tecnologia e provando a misurare quantitativamente la respirazione di una pianta. Arduino, una piattaforma online che mappi i dati ricevuti, una teca, una pianta ed il gioco è fatto. Il robot così creato misura in contemporanea la temperatura, l'umidità e la quantità di CO2 all'interno ed all'esterno della teca misurando, registrando la quantità di CO2 prodotta dalla pianta durante la notte. Ecco che argomenti che richiedono per studenti della Secondaria di I Grado un enorme sforzo di astrazione, come la fotosintesi clorofilliana, diventano facilmente percepibili e analizzabili matematicamente.

Abbiamo utilizzato un ESP 8266 per la trasmissione dei dati e una scheda Arduino Uno per la la lettura dei dati da sensore. I dati sono leggibili da web e da smartphone previo inserimento del link di riferimento del canale Thingspeak.

I risultati prescindono da quelli scientifici; occorre lavorare ancora sulla taratura dei sensori, sul tipo di pianta utilizzata, sulla giusta esposizione e, perché no, sulla possibilità di individuare una luce artificiale capace di stimolare la fotosintesi. I risultati migliori sono nell'approccio sperimentale a quella che è mera osservazione secondo i canoni del metodo sperimentale. Lo sviluppo della capacità critica di individuazione dei punti deboli del sistema e di verifica e modifica ciclica del prototipo alla ricerca di un assetto ottimale rappresentano il vero core business dell'attività sperimentale.

Uno spazio innovativo

Authors: Domenico Potenza (Università degli Studi "G. d'Annunzio" Pescara) and **Giulio Girasante** (Università degli Studi "G. d'Annunzio" Pescara)

Rispondere oggi con il progetto alle nuove esigenze pedagogiche ed alle rinnovate istanze tecnologiche della scuola, significa sostanzialmente far registrare agli spazi dell'architettura gli adeguamenti alle nuove condizioni d'uso e di funzioni sopraggiunte con le nuove forme dell'insegnamento scolastico. Il problema non è mai solo di natura tecnico-funzionale ma di coinvolgimento mentale ed emotivo del corpo alle dimensioni dello spazio.

Gli spazi dell'architettura, devono coinvolgere le nuove modalità d'uso dei programmi scolastici, offrendosi come spazio unico integrato in cui gli ambienti finalizzati alle diverse attività specifiche si presentino con lo stesso carattere; abitabili e flessibili e, nel contempo in grado di accogliere con confort e benessere, sia gli utenti diretti, sia i visitatori esterni.

La dimensione d'uso dello spazio deve essere contemporaneamente singola, in cui ciascuno studente potrà beneficiare di una organizzazione individuale dell'ambiente ma, nello stesso momento, plurale in cui le diverse competenze di ciascuno siano espresse attraverso un lavoro collettivo. Condizioni che devono essere soddisfatte in ogni momento della giornata ed in ogni condizione, sia didattico-laboratoriale che ludico-sensoriale. Questo è possibile solo in ragione della costruzione di un'ampia flessibilità, da contrapporre alla necessità di quel principio di autonomia di ciascuno studente ma anche di ogni insegnante o di chiunque utilizzi lo spazio scolastico.

Uno spazio che è complessivamente aperto ed integrato ed anche singolarmente protetto ma collegato agli altri spazi; che sia in grado di favorire una socialità comune, nella quale tuttavia, ciascuno degli individui che vi prende parte esprime anche la sua autonoma presenza. Uno spazio innovativo.

Workshops

1. ***Co-m @ king LAB - "hands-on-minds" programming and design laboratory***

   by Domenico APRILE, Liceo Scientifico Fermi Monticelli - Brindisi

   Description

   The workshop is aimed at illustrating activities and results of an innovative teaching and learning approach to Computer Science in a Secondary High School (Liceo Scientifico delle Scienze Applicate): it come in deep with information technology through the use of Open Hardware platforms (Arduino) and Software (Edubuntu Linux Lab - Scratch, MIT App Inventor, Telegram, etc.) exploring topics on the edge of IT research. Furthermore, a prototype programming and design laboratory will be activated in order to develop computational thinking through practical activities oriented to problem solving. The activity combines aspects linked to "hands-on-minds-on" teaching method with the development of contents related to topics of research / action: making, arduino, creativity, agenda2030, computational thinking, coding, IoT, 4th industrial revolution.

   Expected results

   Prototype design laboratory which, according with the INDIRE guidelines, Law 107/15 and the PNSD, enhances skills of the DigComp2.1 Framework, in particular referring to digital citizenship, computational thinking, problem solving, through the use of platforms open hardware and software.
   Participants, through Tinkercad (www.tinkercad.com) platform, will be involved in small groups, in the "virtual" realization of a circuit that includes the use of Arduino and that simulates a physical reality (a simple weather station; a traffic light station or other circuit based on the starting skills of the group).
   The programming will take place either by simple and intuitive visual language ("blocks") and/or through the use of the "Wiring" language for Arduino, allowing participants to enhance knowledge in programming a microcontroller board (Arduino).

   Target participants

   Teachers of every grade of school

   Short bio of Domenico Aprile

   Computer Science Engineer Degree, Master and PhD in Management Engineering, Master in European Project Management.

He was formerly consultant in IT and process management projects in several fields of PA.
He teaches computer science in High Secondary School and since 2013 he uses open source teaching tools and educational robotics (Linux, Arduino, 3D Printer, Lego Mindstorms, raspberry pi).
He is Instructor certificated "Lego Academy Introductory Course to robotics", "Arduino CTC101 for educator", "CISCO IT Essential Instructor".

2. ***Educational Robotics, problem-solving and creativity***

by Lorenzo CESARETTI, Università Politecnica delle Marche

Description

In this workshop participants will build and program Robotics artefacts using Lego Mindstorms EV3 Education kit. Teachers will be involved in a hands-on activity and will explore how Robotics could improve students' problem-solving and creativity. The trainer will share with participants some ideas in order to introduce Educational Robotics at school, and he will present the first results of his research work about the real-time analysis and identification of different students' problem-solving strategies during this type of activities.

Expected results

At the end of the workshop participants will:

- Have acquired basic knowledge about how to introduce Educational Robotics at school;
- Have acquired basic knowledge about Lego Mindstorms EV3 hardware and software;
- Have acquired basic knowledge about learning analytics techniques and how these techniques can help teachers during Educational Robotics activities.

Target participants

Primary and secondary school teachers

Short bio of Lorenzo Cesaretti

Lorenzo Cesaretti is a Ph.D. candidate in Information Engineering at the Dipartimento di Ingegneria dell'Informazione (DII) at the Università Politecnica delle Marche. He is co-founder and CTO at TALENT srl, an Italian innovative

start-up working in the field of educational technologies. He has expertise in Robotics, Educational Robotics and Educational Technology. He was involved in more than 60 projects and trainings mainly regarding Educational Robotics, Coding and creative use of technology in education. He is the project manager of the web-platform for teachers Weturtle (https://www.weturtle.org/)
He obtained the first place in the national ranking (about Educational Robotics experts) compiled by INDIRE in 2018 (http://www.indire.it/wp-content/uploads/2018/07/ok_decreto_approvazione_verbali_selezione_esperti_per_materiali_robotica_originale_timbro-1-1.pdf)
Academic papers: https://www.researchgate.net/profile/Lorenzo_Cesaretti/research

3. ***RoboPisces: how to build and program educational marine robots with Lego Mindstorms EV3***

by Lorenzo Cesaretti & Laura Screpanti, Università Politecnica delle Marche

Description

In this workshop participants will build and program marine robots using Lego Mindstorms EV3 Education kit. Proposing Marine Robotics to primary and secondary school students could be very useful to facilitate the development of their environmental awareness: thanks to Educational Robotics learners design and build prototypes to solve current and future problems (marine pollution, protection of biodiversity, etc.). Teachers will be involved in a hands-on laboratory: starting from the construction of a simple fin with standard motors and Lego parts, they will be able to program a robot fish and a robotic marine vehicle utilising EV3 brick and the Lego Mindstorms visual environment. These robots will be really tested in water during the workshop!
This workshop is part of the Opening Conference of the Erasmus+ KA201 Project "RoboPisces" (2019-1-IT02-KA201-063073) and is co-funded by the Erasmus+ Programme of the European Union (CUP I34I19006100006).

Expected results

At the end of the workshop participants will:

- Have acquired basic knowledge about how to introduce Marine Robotics at school.
- Have acquired basic knowledge about Lego Mindstorms EV3 hardware and software.

- Have acquired basic knowledge about how to program marine robots using Lego Mindstorms EV3 software.

Target participants

Primary and secondary school teachers

Short bio of Lorenzo Cesaretti

Lorenzo Cesaretti is a Ph.D. candidate in Information Engineering at the Dipartimento di Ingegneria dell'Informazione (DII) at the Università Politecnica delle Marche. He is co-founder and CTO at TALENT srl, an Italian innovative start-up working in the field of educational technologies. He has expertise in Robotics, Educational Robotics and Educational Technology. He was involved in more than 60 projects and trainings mainly regarding Educational Robotics, Coding and creative use of technology in education. He is the project manager of the web-platform for teachers Weturtle (https://www.weturtle.org/)
He obtained the first place in the national ranking (about Educational Robotics experts) compiled by INDIRE in 2018 (http://www.indire.it/wp-content/uploads/2018/07/ok_decreto_approvazione_verbali_selezione_esperti_per_materiali_robotica_originale_timbro-1-1.pdf)
Academic papers: https://www.researchgate.net/profile/Lorenzo_Cesaretti/research

4. ***Robotics, a practical approach***

by Leonardo Falanga, student at University of Salerno

Description

The aim of the course is to introduce participants the basic notions of electronics, computer science and 3D printing in order to build a robot using open source projects.

Expected results

- Principles of electronics, maker movement and 3D printing.
- An introduction to educational robotics.
- Programming bases in Wiring or Scratch.

Target participants

Teachers

Short-bio of Leonardo Falanga

He was born in Salerno in 1999, when he was 3 he found a screwdriver and he started to to disassemble everything. At the age of 6 he built his first robotic arm and at 15 he made his first app, Never Alone, to fight femicide. He was a speaker at Maker Faire Rome 2015 and at the CNR of Pisa, he is an amateur radio operator (nominative IU8FVO) and he loves to fly. He spent the summer 2016 in Boston with startups and coding and he worked as a senior tester at the Duckietown project, MIT's robotics department. He is a student of electronic engineering at the University of Salerno. His motto: "Try, fail, try again!"

5. ***Coding and Educational Robotics: stereotypes and opportunities***

by Daniela Bagattini, Beatrice Miotti, INDIRE

Description

Even today, data from high school and university applications, tell us there are still strong gender sectorization, which can be considered as horizontal segregation, not necessarily imposed, but even derived from an unconscious conditioning where the context and formal/informal orientation system play a crucial role.

Parents expectations and peer groups, but also of the school system itself, can contribute to reducing the range of possibilities in the choice of educational paths.

For this reason, it is necessary to work in the deconstruction of stereotypes already from the orientation actions, to overcome the idea that study paths and occupations "for males" and "for females" exist.

In the workshop we are going to speak about stereotypes, but also about how to use coding and educational robotics as methodologies and tools which can be useful to work on stereotypes, with particular regard to the relationship between girls and science subjects.

Expected results

At the workshop completion participants will be able to code in Scratch a short story and they will face their level of stereotype by means of a collective reflection and analysis phase.

Target participants

Teachers; no prerequisite needed to attend this workshop.

Short-bio of Daniela Bagattini

Daniela Bagattini, PhD in Social science research, works in Indire since 2011 on ESF and ERDF's projects monitoring. She deals on Gender Politics in Education, Stereotypes impact on educational and learning choices and Equal opportunities promotion

Short-bio of Beatrice Miotti

Beatrice Miotti, Information Engineer and PhD in Computer Science, works in Indire as Technologist since 2014. In the last few years she deals with coding and educational robotics research projects, with particular focus on new technological approaches to curricular learning.

6. ***Educational Robotics: modelling learning***

by Laura Screpanti, Università Politecnica delle Marche

Description

Educational research suggest that educational robotics can help students in developing knowledge, attitudes and skills within the field of technology and robotics, but also some other valuable skills like teamwork, creativity and computational thinking. Notably, STEM knowledge and computational thinking are related by the capacity of representing reality that surround us by decomposing it into sub-elements and depicting its behaviour in an abstract way. During the workshop participants will be presented with evaluation techniques for dimensions of learning and some models of learning dimension will be discussed.

Expected results

At the workshop completion participants will have a comprehensive view of the proposed dimensions of learning and the way they are possibly evaluated within the field of research using quantitative methods.

Target participants

Teachers, researchers and general public; no prerequisite needed to attend this workshop.

Short-bio of Laura Screpanti

Laura Screpanti is an Electronic Engineer and a PhD candidate at the Università Politecnica delle Marche. She took her degree in 2014 with a thesis on the

assessment of Pisa Syndrome, studying a way to represent it from a biomechanical point of view. She worked in the ROAD (RObotics for Assisted Diving) project to capture biometric signals from SCUBA divers during their underwater activity. During her PhD she worked on modeling learning from students engaged in activities of Educational Robotics at school. She is teacher at the ITS Nuove Tecnologie per il Made in Italy and expert on Educational Robotics for the creation of documents included into INDIRE's platform for teachers' training.

University maps

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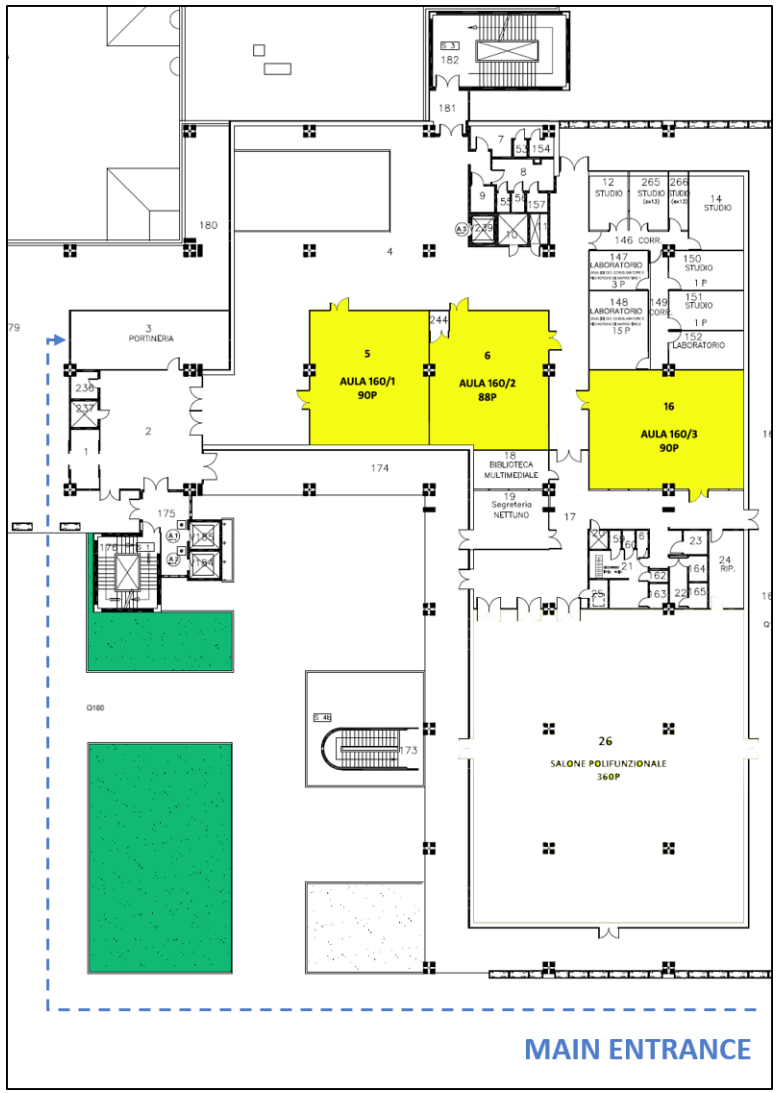

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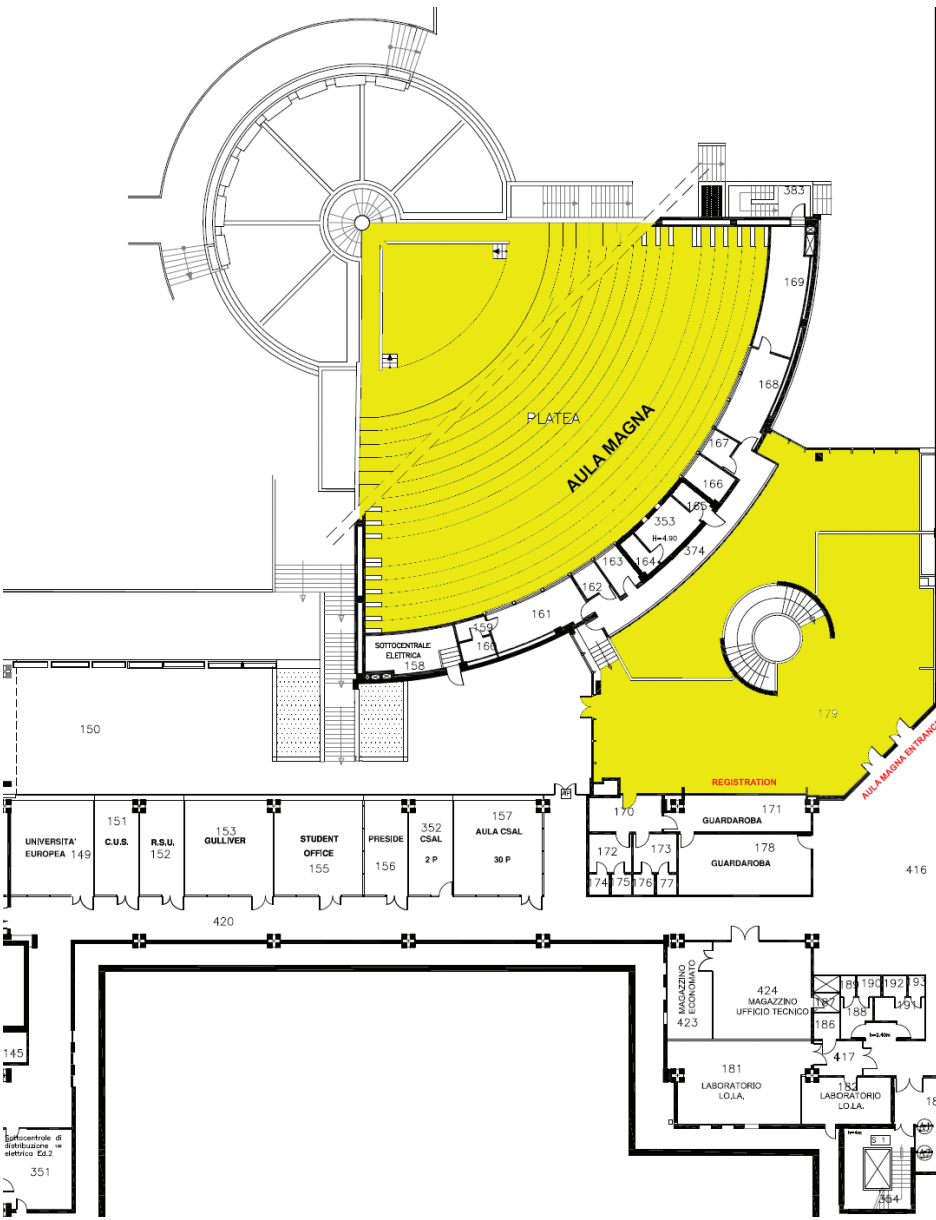
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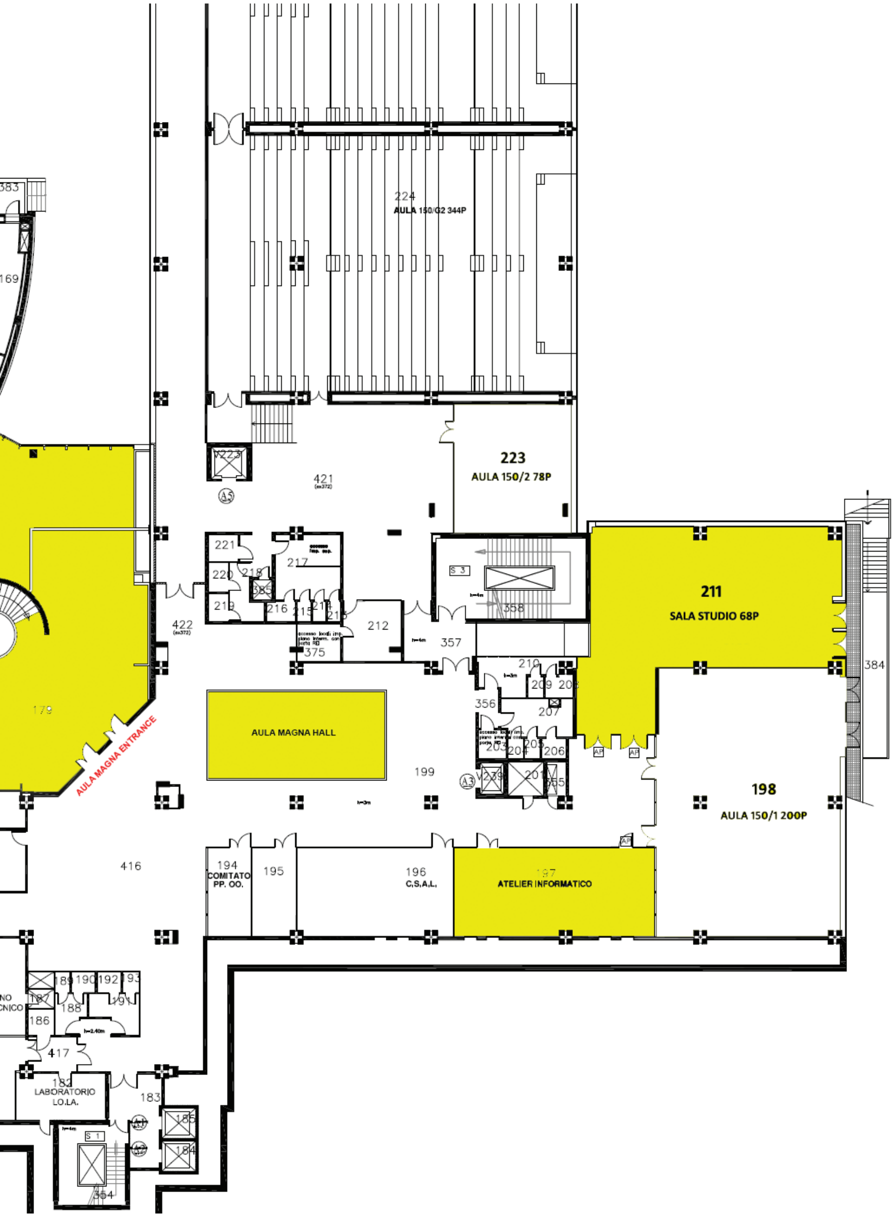
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Useful numbers

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- **Ambulance:** 118
- **Police:** 113
- **Carabinieri:** 112

For informat on about the conference venue and organization, please send an e-mail to *a.pugliese@staff.univpm.it*

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