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Editorial: Educational robotics as a tool to foster 21st century skills

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Editorial on the Research Topic

Educational robotics as a tool to foster 21st century skills

Educational robotics (ER) has gained interest in the last years because ER is seen as a valuable didactic tool to prepare pupils for a digital society and provide them with the necessary skills that an active citizenship requires (Alimisis, 2013). Different studies highlighted how ER can promote the acquisition of such skills such as computational thinking (CT) and digital literacy in general (Atmatzidou and Demetriadis, 2016) as well as to enhance transversal competences such as problem-solving (Gratani et al., 2021), creativity (Yang et al., 2020), communication (Nelson, 2012), and collaboration (Gueorguiev et al., 2018). There have been several attempts worldwide to promote ER in schools (Kyriazopoulos et al., 2021). However, different questions around the implementation of ER remain open. The aim of this Research Topic is to gather contributions on the affordances and challenges surrounding the implementation of ER in school in order to prepare children for the twenty-first century.

The eight papers of this Research Topic present different facets of the research in this field. Bonaiuti et al., provide a systematic review of the literature regarding ER in Italian scientific journals and show that the main reason for introducing ER in schools is related to the promotion of science, technology, engineering, arts and mathematics (STEAM) skills. Other reasons are to promote the development of problem-solving skills and CT, soft skills, disciplinary competences, scientific thinking, and the use of scientific method. Another field of research is represented by the use of ER in special education. This review shows that the potential use of ER is multiple and ever-expanding. Another review by Sannicandro et al., investigate educational practices with ER in a broader way including the promotion of CT, the use of ER in special education and the use of ER in e-health. The authors advocate for the promotion of a transdisciplinary approach in ER in order to integrate theories and methods from other fields of study and technological advancement.

Two other studies analyze how ER can be used in school with a maker approach. Gratani and Giannandrea present a 1-year research project aimed at incorporating maker education and ER into the curricula of primary and lower secondary schools. ER is used as a tool for working on creativity and ability to design, build, collaborate, and revise. In order

to demonstrate the success of makerspaces in formal educational contexts, Jaipal-Jamani offers some empirical data. The study investigated the effectiveness of a makerspace robotics intervention and a scaffolded, inquiry robotics intervention in relation to two variables: pre-service teachers' knowledge of science concepts and their self-efficacy to teach with robotics.

The teachers, and how to support them in ER, are the focus of other two studies of this Research Topic. Alsoliman investigates the perceived efficacy and viability of a virtual platform, as well as the procedures of teaching and learning STEM using robotics via virtual platforms. The survey found that many educational institutions now embrace the usage of virtual classrooms and applications. Reyes Mury et al., offer a Swiss experience where a robotic teaching community (Roteco) was established. Via a digital platform, teachers may get advice, exchange experiences, and access educational resources, all of which will benefit them and promote the use of robotics in the classroom.

The last two studies present two examples on how soft skills can be promoted through ER. Küng et al., investigate whether the gender composition of a pair influences collaboration during the pair programming process. This study suggests that homogeneous male pairs are not ideal for promoting collaboration in 12–14 years old pupils. Funk et al., focus on the development of CT and present a study where a simple robot is used to promote CT. The authors present the robot, how it works, and some activities that can be implemented in the educational context to promote CT skills.

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Author contributions

LN wrote the first draft of the manuscript. All authors revised the article and approved the submitted version.

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