# Chapter 8
# School Activities With Educational Robot to Facilitate Student Learning

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## ABSTRACT

*The teaching of programming and its basic concepts even to young children has a crucial influence on the development of their cognitive functions and blends the lessons in the class with real life. In this chapter, school activities with educational robotics performed at both the special-needs education school and general public school were described. The students with mild intellectual disabilities and physically handicapped at the special needs school could build the robots nicely using small blocks and move them as they wanted through coding. The intellectual disabled students usually do not have enough long-term memory and are weak in abstraction but could develop the ability to actually understand logical thinking through hands-on learning with educational robotics. Through the present activities, the students including the public school could become aware of various goods around them programmed with coding and connect the learning in class to the real world.*

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## INTRODUCTION

The International Society for Technology in Education (ISTE) has collaborated with the Computer Science Teachers Association (CS Standards, n.d.) to prepare young learners to become computational thinkers who understand how today's digital tools can help solve tomorrow's problems. Because both associations believe that computational thinking (CT) is vital for raising the level of students' achievement, preparing students for global competitiveness and blending academics with real life, they have made the resources free to all educators (Sykora, 2014). In the digital age, CT is an essential skill for students and educators alike.

In many districts, however, students still get their first introduction to computer science and coding in middle school or high school. That timing, argues John Pearce (2016, March), is all wrong. Julie P. Randles (2020) introduces that Pearce states that K-5 students are wonderfully able to grasp universal and key concepts in computer science and that there exist other six reasons for coding in K-5 classrooms; (1) It sparks interest, (2) It opens up a new domain of knowledge, (3) It addresses the gender gap, (4) It leverages the magical power of parents, (5) It provides momentum for the CS curriculum, and (6) It helps students address the ISTE standards for Students (Computational Thinking, n.d.).

Starting in April 2020, in Japan, "programming education" was compulsory at all elementary schools, by using some of the lessons of the ordinary required subjects, at least. Primitive programming education is already included in the required subjects of technology and home economics and information at junior and senior high schools, respectively. Although there are not many cases of practicing advanced coding lessons even in junior and senior high schools, at present, it is expected that this engagement in programming education at the elementary school level will promote the development of new ways to incorporate programming education in junior and senior high schools as well.

In starting programming education at all the elementary schools, the Ministry of Education, Culture, Sports, Science, and Technology in Japan (2020), has published a guide that proposes the following objectives of the programming education: that it cultivates CT; that students become aware of the role of the programming and its merit, become aware that the information society is supported with information technology like computers, cultivate the attitude to solve problems, and build up society to be comfortable to live in; and that it upgrades learning in the existing required subjects.

Until April of 2020, however, programming education courses and lessons did not exist in almost all of the elementary schools. There exists no independent, compulsory subject for programming education, even in the new course of study, and the definition of programming education is not clear. Many schoolteachers, therefore, are worried about performing these new programming lessons. Indeed, almost all of the teachers are not adept at programming and, also, they do not have many ideas on how to teach programming as part of ordinary, required subjects, such as mathematics, science, social science, and so forth. Urgently, all the in-service schoolteachers need on-the-job training at least on basic concepts of CT and programming using both unplugged coding activities and visual blocked-base programming like Scratch.

Educational robotics is now recognized as a powerful tool to promote learning, acquiring social skills and students' engagement with STEM and CT education. STEM is an abbreviation that stands for science, technology, engineering, and mathematics (Study.com, n.d.). Students apply science, technology, engineering, and mathematics in contexts that make connections between the classroom and the world around them. Educational robotics (ER) engage students in activities focused on building and controlling