

Abstract

Studying computer science (CS) in elementary schools has gained more and more popularity during recent years. The intended advantages of learning CS at such a young age include the ability to learn quickly and to shape positive attitudes concerning CS, especially among female students. Students at such an early age face difficulties when first engaging with CS. Therefore, extra caution should be taken in deciding what exactly they can understand and learn.

Researchers have explored the effect of using robotics to teach CS to young students. The research described here is intended to distinguish between the performance of a task and the understanding of the constructs. The main research question is: What CS concepts can elementary-school students learn and understand from the participation in a robotics-based CS course?

The population consisted of students from four second-grade classes (ages 7-8) who participated in a computer science course. The lessons were taught using the Thymio educational robot and its VPL graphical software development environment. The syllabus was based on existing learning materials that were adapted to the cognitive level of the students.

A taxonomy of six levels was created to characterize the learning outcomes of the course. The students' abilities were investigated using four questionnaires that were based on the taxonomy. The answers to the questionnaires were evaluated quantitatively; in addition, field observations of the lessons were recorded.

The analysis showed that the students were very engaged with the robotics activities and were highly motivated to succeed. Furthermore, they did learn basic CS concepts, although they found it difficult to create and run their own programs. There was a gap in the students' abilities regarding advanced concepts that was reflected between the students' abilities in class and their performance on the questionnaires that they answered without the robot and its environment.