Development of computational thinking, digital competence and 21st century skills when learning programming in K-9

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## Sample

19 preschool school (grades 4 to 9) teachers in 9 schools in different municipalities in Sweden.

## Implications For Educators About

* STEM Education
* Professional development
* Digital citizenship
* Other

# Abstract

Teachers around the world have started teaching programming at the K-9 level, some due to the formal introduction of programming in the national curriculum, others without such pressure and on their own initiative. In this study, we attempted to understand which skills – both CT-related and general – are developed among pupils in the process of working with programming in schools. To do so, we interviewed 19 Swedish teachers who had been teaching programming for a couple of years on their own initiative. The teachers were selected based on their experience in teaching programming. Our thematic analysis of these interviews shed light on what skills teachers perceive pupils develop when programming. This led us to identify three themes related to CT skills and five themes related to general skills. The CT skills identified corresponded well with and were thus thematically structured according to the dimensions of CT proposed in the framework of Brennan and Resnick, namely computational concepts, computational practices and computational perspectives. In addition to the CT skills, our thematic analysis also resulted in the identification of general skills related to digital competency and 21st century skills, namely cognitive skills and attitudes, language skills, collaborative skills and attitudes and creative problem-solving skills and attitudes.

# Outcome

"The CT skills identified corresponded well with and were thus thematically structured according to the dimensions/themes of CT proposed in the framework of Brennan and Resnick (2012), namely computational concepts, computational practices and computational perspectives.... The CT skills identified corresponded well with and were thus thematically structured according to the dimensions/themes of CT proposed in the framework of Brennan and Resnick (2012), namely computational concepts, computational practices and computational perspectives." (Authors, in "Discussion")