COMPUTATIONAL THINKING IN PROBLEM-SOLVING: A THEORETICAL OVERVIEW

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Computational thinking (CT) is a quite new and complex phenomenon, closely related with problem solving (Voskoglou & Buckley, 2012). Although the term was first used by Seymour Papert (known as a creator of the Logo programming language), it has been highlighted and popularized by Wing (2006). Her first definition described it as 'taking an approach to solving problems, designing systems and understanding human behavior that draws on concepts fundamental to computing' (Wing, 2008). In the last 10 years, a growing number of studies and debates have appeared among researchers. Despite the differences of views or inconsistent results (for example, Doleck et al., 2017; Román-González et al., 2018), there is a common opinion that computational thinking is one of the most important skills for 21st century students (Grover & Pea, 2013; Swaid, 2015). In our review we have investigated studies reporting empirical research from primary schools (Brackmann et al., 2017; Durak & Saritepeci, 2018) to university students (Ambrosio et al., 2014). There are many components listed in several studies in the educational literature, for example algorithmic thinking, cooperativity, creativity, critical thinking, data analysis, debugging, decomposition, heuristic reasoning, and recursive thinking (Barr & Stephenson, 2011; Brennan & Resnick, 2012; Korkmaz et al., 2017; Yadav, Hong & Stephenson, 2016; Wing, 2006, 2008, 2011, 2014). We find the definition Korkmaz et al. (2017) summarizes the most relevant skill components: algorithmic thinking, cooperativity, creativity, critical thinking, and problem solving. A number of research questions have arisen from the literature review. To name but some of them: How to implement the teaching of CT in the curriculum of schools? How to integrate CT into different learning environments? How to assess the effectiveness of CT? Do STEM tools and robotics support the development of CT? How could teachers be prepared for this new approach? How to support teachers to teach CT instead of traditional ICT? This overview can provide a starting point of further discussion, empirical research and perhaps some ideas for the development of assessment tools and methods (Román-González, 2015). The implementation of teaching computational thinking in Hungarian schools is also a very important and urgent question.