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Global Trends in Computational Thinking in Curricula: A Comparative Review

Martha Nury BONILLA-CASTAÑEDA[a], Klinge Orlando VILLALBA-CONDORI[b], Hector CARDONA-REYES[c*], Claudia ACRA-DESPRADEL[d] & Kee-Fui TURNER-LAM[e]
[a]*Universidad de la Salle, Bogotá, Colombia*
[b]*Universidad Católica de Santa María, Peru*
[c]*CONAHCYT-CIMAT Zacatecas, Mexico*
[d]*Universidad Nacional Pedro Henríquez Ureña, Santo, Dominican Republic*
[e]*Edu-Aequitas Pte Ltd, Taiwan*
*hector.cardona@cimat.mx

Abstract: Computational Thinking (CT) has emerged as an interdisciplinary cognitive skill, garnering the interest of educators and policymakers worldwide. Through a documentary analysis involving 27 countries, a series of similarities and differences have been observed in the understanding of CT as an essential curricular project in the face of current educational challenges. Indeed, research articles, official reports, and methodological guides were consulted to conduct a conceptual cartographic analysis, which identified significant trends regarding the inclusion of CT in primary and secondary education between 2016 and 2024. Meanwhile, the authors are utilizing this conceptual mapping of CT as part of an ongoing research project aimed at developing a curricular proposal in Colombia.

Keywords: Computational Thinking, Curriculum, Conceptual Mapping

1. Introduction

Computational Thinking has gained prominence in global curricula as an essential tool for developing students' cognitive skills. This study focuses on an empirical analysis of the inclusion of CT in the curricula of 27 countries, providing a comparative perspective that is crucial for understanding how CT is implemented and adapted to diverse educational contexts. The analysis was conducted using a conceptual mapping based on eight criteria (Tobón et al., 2015), which allowed the identification of correlations and particularities in educational approaches to CT. This type of research is invaluable, especially in countries where the integration of CT into education is nascent or still developing.

2. Research Method

The research is based on an exhaustive documentary analysis covering research articles, curriculum policy reports, and methodological guides obtained from online databases of 27 countries. Boolean operators were used to search for key terms related to "Computational Thinking" and "Curriculum Policy." The documents were classified and analyzed according to the conceptual mapping criteria proposed by Tobón et al. (2015), which provided a deeper understanding of how CT is conceptualized and applied in different educational systems.

2.1 Concept of Computational Thinking

There is a global consensus on CT as a set of skills that include problem-solving through logic and abstraction. This approach not only emphasizes the technical importance of CT but also

its pedagogical potential for developing essential 21st-century competencies (Smith, 2023; Kellow, 2018; Park & Kwon, 2022).

2.2 Categorization

CT is integrated into various disciplinary areas, such as computer science, digital technologies, and mathematics education. Some countries, like Mexico and Canada, have adopted broader approaches that extend the application of CT to disciplines such as natural sciences and the humanities (Fowler & Vegas, 2021a; Schroeder et al., 2018).

2.3 Characterization

Key skills associated with CT include decomposition, abstraction, and algorithmic thinking. However, there are variations in emphasis depending on the country. For example, while decomposition and abstraction are predominant in Australia and New Zealand, algorithmic thinking is more valued in the United States and Singapore (Bubica & Boljat, 2022; Wong & Cheung, 2018).

2.4 Classification

Approaches to implementing CT vary, with some countries adopting a progressive strategy that spans from primary to secondary education, while others integrate it across multiple disciplines, showing a view of CT as a transversal competence (Gazzano, 2023; Lee & Chan, 2019).

2.5 Integration

CT is considered a key multidisciplinary tool in STEAM education, promoting critical and creative thinking. Countries like Australia, Chile, and France use it not only in technical fields but also in teaching critical life skills (Wing, 2010; Hsu, 2019).

2.6 Examples

Successful programs in countries like England, Australia, and Singapore have demonstrated the effectiveness of CT in developing 21st-century competencies, preparing students to face future challenges with a strong foundation in computational skills (Seow et al., 2019; Sentance et al., 2022).

3. Conclusions and Discussion

Computational Thinking has achieved significant global presence in curricula, promoting fundamental skills for the advancement of education in the 21st century. However, contextual needs and specific challenges in each country require adapted approaches and flexible implementation. The results of this study are being used to develop a CT curriculum proposal for Colombia, emphasizing the importance of continuous teacher training and adapting teaching methodologies to meet current educational demands (Buitrago et al., 2022; Fowler & Vegas, 2024).

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