NEWSLETTER

Technology-Supported Teaching Interventions and Student Computational Thinking: A Meta-Analysis Based on 37 Empirical Studies

By Zhou, Q. & Deng, Y.
Correspondence to: Qin Zhou, Southwest University, China. E-mail: zhqjojo@126.com

COMPUTATIONAL thinking, which integrates a wide variety of thinking activities such as problem-solving, system design, and comprehending human behavior, has become a critical thinking ability in the context of accelerated digital transformation. Numerous studies from various counties posited that technology-supported teaching interventions (TSTI) had the potential to foster the development of computational thinking skills in students, whereas some suggested that the potential was insignificant. This article employed the meta-analytical technique to research into 37 domestic and foreign empirical studies published between January 2006 and October 2022, with a focus on examining the impact of TSTIs on student computational thinking. Research findings are as follows.

i. TSTIs had positive effects on the development of students' computational thinking skills.
ii. The effectiveness of computational thinking training differed in various disciplines; there were prominent inter-group differences in the efficacy of teaching interventions. The outcomes of computational thinking training were insignificant in English and information science courses, but significant in Spanish and dance classes.
iii. The intervention effects of graphical/ modular programming languages and game-based programming contexts were significant, indicating that these two types of tools were substantially beneficial for cultivating students' computational thinking skills. That means the ideal match between the tool and the learning agent can result in desirable teaching outcomes.
iv. Among evaluation tools of student computational thinking, formative assessment based on the programming environment were timelier and more authentic, though posing higher requirements for technical development compared to other forms of assessment. Furthermore, there was no one single evaluation tool that suited all teaching settings.
v. Teaching interventions for small-size class, junior secondary school students, and lasting 6-11 weeks had better effects, and there were no

significant gender differences in their impact on computational thinking development of students.

Recommendations were made based on the foregoing findings. (i) Place high premiums on computational thinking development of students and design teaching intervention strategies corresponding to differential categories of computational thinking skills. (ii) Contextualize teaching inventions in real-world situations and give students opportunities to showcase their computational thinking skills, which can potentially increase students' ability to transfer and apply computational thinking skills in a variety of disciplines. (iii) Employ intervention tools that can train multidimensional computational thinking skills in students as well as meeting their problem-solving and advanced learning needs. (iv) Introduce foreign evaluation tools for computational thinking that pertain in China's education settings and strengthen developing localized ones. (v) Adopt small-size class teaching with special focus on junior secondary school students; place emphasis on the development of computational thinking skills in both male and female students to forego the stereotype of computer science-related disciplines being dominated by male students.

Source: Journal of Southwest University (Natural Science Edition), 2023; 45(6):44-56.