Integrating Computational Thinking in Undergraduate Statistics Projects: A Comparative Analysis

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Keywords: computational thinking, statistics

Computational thinking (CT) is a way of approaching problem-solving by breaking the problems into steps or algorithms that can be executed by humans, computers, or both (Aho, 2012; Li et al., 2020; Wing, 2006, 2008). In statistics education, CT may be employed as a problem-solving strategy (Postelnicu, 2025a, 2025b; Postelnicu & Postelnicu, 2020) by guiding students to decompose complex problems or datasets in manageable parts, recognize patterns, abstract key features, and design algorithmic processes for data analysis (Weintrop et al., 2016; Wing, 2006). Recent studies (Astuti et al., 2025; Irawan et al., 2025) pointed out to the benefits of CT integration in the teaching and learning of statistics in high school and college, and the effect of the type of learner and the statistics curriculum on student performance across the CT core components.

We present here the findings from a pilot study, part of an ongoing study, conducted with college students from two undergraduate courses – an elementary statistics course addressed to students with various majors (Group 1), and another course addressed to future early childhood and elementary education teachers (Group 2). The statistics curriculum for Group 2 students included only descriptive statistics. Students from both courses completed a statistics project designed to incorporate CT features and reflected on the CT approach. The following research question was addressed: What similarities and differences emerged in CT integration between the two project sets?

Data was analyzed across the CT core components (Astuti et al., 2025; Irawan et al., 2025; Postelnicu, 2025a, 2025b; Postelnicu & Postelnicu, 2020): i) *decomposition*- dividing problems into manageable parts; ii) *pattern recognition* – identifying patterns, trends, correlations; iii) *abstraction* – simplifying the problem, focusing on essential variables or characteristics; iv) *algorithm desig*n – constructing an algorithm or a sequence of computational steps.

Across both groups, decomposition consistently achieved the highest scores. This was expected, given the structure of the projects, containing the following: title and research question, data collection/ dataset description, descriptive statistics and/or inferential statistics, visual representations, analysis and interpretation, CT reflection, references, data source documentation. Some of the projects from Group 2 demonstrated strong pattern recognition, especially those projects requiring comparisons between various populations with respect to some characteristics. The projects from Group 1 achieved higher scores in abstraction and algorithm design. Overall, Group 1 reflections showed stronger CT integration, connecting each CT component to the design and execution of the project. Group 2 reflections were more of a practical nature, focusing on how to perform calculations or use the software.

The CT integration is promising, but we need to account for its variability across educational contexts (Astuti et al., 2025; Grover & Pea, 2018; Irawan et al., 2025; Postelnicu, 2025b; Shute et al., 2017).

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