

## Enhancing Computational Thinking through Generative AI-Supported Pair Programming

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### Abstract:

This study investigates the effectiveness of integrating Generative Artificial Intelligence (GAI) into a pair programming context and examines its impact on students' Computational Thinking (CT) skills. With the rapid advancement of artificial intelligence technologies, GAI tools such as ChatGPT have shown considerable potential in programming education. These tools provide real-time feedback, error detection and correction, and optimized code generation, enabling students to engage in problem decomposition, pattern recognition, and algorithmic thinking more effectively. Through interactive scaffolding, GAI supports learners in constructing a deeper understanding of core programming concepts. By offering timely guidance and personalized support, GAI enhances learners' self-efficacy, and increases motivation in programming learning environments. A quasi-experimental design was employed to compare the learning outcomes of students participating in GAI-supported pair programming with those receiving traditional programming instruction. The findings reveal that students in the experimental group significantly outperformed their counterparts in various dimensions of computational thinking. Overall, the results suggest that incorporating GAI into pair programming is an effective instructional approach that enhances students' computational thinking abilities and contributes to the advancement of AI-supported programming education.

### Keywords:

Generative Artificial Intelligence, Pair Programming, Computational Thinking, Programming Education.