

# Chapter 9

## Assessment of Coding Skills and Programming Knowledge in the Age of Generative AI: Best Practices and Effective Strategies for Computer Science Education

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### ABSTRACT

*The rapid emergence of artificial intelligence (AI) and generative AI tools poses a significant threat to the validity of traditional programming assessments. As the boundary between authored and AI-generated code becomes increasingly indiscernible, long-standing assessment models centered on output correctness and code submission are at risk of obsolescence. Despite its urgency, prior work has largely*

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*concentrated on detection, with limited emphasis on reimagining assessment design. This chapter addresses that gap by proposing strategies for assessing programming proficiencies in an AI-mediated context. Its objective is to help educators move beyond surveillance-based models and adopt approaches that emphasize uniquely human cognitive capacities. These pedagogical strategies advance the field by shifting the discourse from reactive prevention to proactive, pedagogically aligned assessment design. In doing so, the chapter affirms that the future of programming assessment is not about resisting AI but about designing systems that assess human thinking over code output.*

## INTRODUCTION

Perhaps nowhere outside of computer programming can a simple typographical error result in hours of failure and introspection. Such an experience reveals the blend of linguistic, logical, and design precision the discipline requires. Programming demands not only technical acuity but also the capacity for abstraction, problem decomposition, and iterative reasoning (Garcia, 2024). As software systems permeate nearly every domain of modern life, the ability to write and comprehend code has become a foundational skill across both academic and professional contexts. Consequently, the evaluation of programming proficiency holds significant importance to cultivate a culture of computational rigor and innovation. Accurate assessments help ensure that learners internalize not just how to code, but why specific design choices, algorithms, and structures matter in diverse contexts. In the era of artificial intelligence (AI), however, the landscape of programming assessment has undergone a profound shift (Lepp & Kaimre, 2025; Wilson & Nishimoto, 2023). Tools such as ChatGPT and other large language models (LLMs) are now capable of generating syntactically valid and semantically plausible code with minimal human prompting. As emphasized by Bringula (2024) and Garcia (2025), the increasing adoption of these AI technologies in educational settings is reshaping how programming is taught and learned. Novice programmers may rely on LLMs not as scaffolds but as surrogates for the reasoning process, which obscures the boundary between assistance and authorship. The practice of assessing programming knowledge is, therefore, undergoing urgent and necessary scrutiny due to the disruptive capabilities of generative AI.

While generative AI offers promising enhancements to programming instruction, its integration into learning environments introduces substantial challenges to assessment validity. According to rapid review of programming education literature (Garcia, 2025), issues such as plagiarism, over-reliance on AI-generated outputs, and the attenuation of individual cognitive engagement pose serious risks to skill

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