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Self-Explaining the Notional Machine to Improve Novice Programmers' Learning and Mental Models, Supported by a Computer Tutor System

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Abstract

A notional machine is an abstract representation of how a computer works. Prior research shows that students often form incomplete or inaccurate mental models of the notional machine, reflecting misunderstandings and causing programming errors. To date, however, there is very little work on how to help students acquire accurate models of the notional machine. To fill this gap, this research focuses on novice programmers and experimentally investigates the impact of direct instruction of the notional machine compared to standard instruction that does not include the notional machine. The instruction is embedded in an online computer tutor that we implemented and compared to a version of the tutor that does not refer to the notional machine but otherwise includes the same materials. In particular, both tutor versions include instructional videos followed by self-explanation prompts. We will present data from an evaluation of both tutor versions.