

# **On Learning How to Program via an Interactive eBook with Adaptive Parsons Problems**

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## **ABSTRACT**

Traditional computer programming practice, such as writing pseudocode, code tracing, and code writing, can be arduous, time-intensive, and frustrating. But adaptive Parsons problems, which require learners to place mixed-up code blocks in the correct order, are designed to support learners' individual differences in knowledge acquisition, reduce extraneous cognitive load, and improve affect while learning how to program. These problems modify the difficulty of the current or next problem based on a learner's prior performance and help-seeking behavior. Adaptive Parsons problems are a more interactive way to learn stereotypical solutions to programming problems. Hence, they can help novice programmers build up the kind of mental library of solutions experts have at their disposal when writing code from scratch to solve any number of critical problems related to computing.

This dissertation presents studies aimed at exploring the problem-solving efficiency of adaptive Parsons problems as a substitute for traditional computer programming practice. Mixed methods are used to understand how learners think, behave, and feel when learning how to program via an interactive eBook with adaptive Parsons problems and equivalent/isomorphic write-code problems. First, I conducted field experiments to evaluate the design of these problems for active learning during lecture. Second, I redesigned these problems and tested hypotheses about cognition and learning to understand cognitive, behavioral, and affective learning outcomes impacted by these design changes. And third, I explored access and equity issues for neurodiverse learners.

## **ALISE RESEARCH TAXONOMY TOPICS**

Education; Online learning; User interfaces

### **AUTHOR KEYWORDS**

Introductory Computer Programming; Parsons Problems; Cognitive Load; Help-seeking; Adaptive Scaffolding.