

An Investigation of the Conceptual Complexity of Exams Questions in an Introductory Programming Course

Pratibha Menon
menon@pennwest.edu
Department of Computer Science and Information Systems
Pennsylvania Western University, California
California, PA, 15419, USA

Abstract

Instruction in an introductory programming course is typically designed to introduce new concepts and to review and integrate the more recent concepts with what was previously learned in the course. Therefore, most exam questions in an introductory programming course require students to write lines of code that contain syntactic elements corresponding to the programming concepts covered during the instruction. This study investigates the number of concepts involved in the exam problems of an introductory Java programming course. In addition, this study compares how the increase in the number of concepts correlates with the ability of students to write error-free lines of code. The instructional method adopted in this study focuses on providing students with a problem-solving schema and a resultant programming plan that integrates many concepts to meet the problem's goal. Results from this study indicate that as the course progresses through the semester, students, on average, apply appropriate problem-solving schemas and programming plans to produce more error-free lines of code, despite an increase in the concept count in the problems. Furthermore, many exam problems seem to repeat the application of cluster concepts in all three exams. Repeating and building upon the applications of these cluster concepts several times through the course increases the likelihood that students will produce more correct lines of code as the semester progresses.

Keywords: Concepts, Introductory-Programming, Lines-of-code, Exams, Complexity, Program.

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