IRM PRESS
701 E. Chocolate Avenue, Hershey PA 17033-1117, USA
Tel: 717/533-8845; Fax 717/533-8661; URL-http://www.irm-press.com
ITB7675

Chapter 13

A Personalized System of Instruction for Teaching Java

Henry H. Emurian
University of Maryland Baltimore County, USA

Ashley G. Durham[1]
Centers for Medicare & Medicaid Services, USA

INTRODUCTION

This chapter addresses the challenge of how to structure a learning environment to teach object-oriented computer programming to students who may need an introductory course in that discipline but who may lack the experiences to use symbol manipulations with confidence. In contrast to computer science students, information systems students sometimes exhibit these latter attributes, but they would nonetheless benefit professionally from acquiring rudimentary programming language knowledge and skill. To accomplish that objective, the Personalized System of Instruction (PSI), originally developed by Keller (1968), is described here to foster equivalent competence among students in an initial Java‰ coding assignment in an introductory programming course. The intent of integrating a Java tutoring system into the PSI framework as the first laboratory exercise is to ensure that all students in the class have at least this background experience in common prior to the introduction of advanced features of interface implementation that are taught during the remainder of the semester. Self-report and performance data are presented to support the use of this pedagogical approach in the classroom.

Previously Published in *Managing Information Technology in a Global Economy* edited by Mehdi Khosrow-Pour, Copyright © 2001, Idea Group Publishing.
This chapter appears in the book, Information Technology Education in the New Millennium by Mohammad Dadashzadeh, Al Saber and Sherry Saber.

The PSI methodology is based on the following five factors:

- ***unit perfection***, in which progress from one step in learning to another step requires perfect performance in the prior step;
- ***self-paced progression***, in which the student may move through a training experience at a self-determined rate;
- ***focus on the written word***, in contrast to traditional lectures, to transmit information to the student;
- ***repeated testing*** of concepts; and
- ***collaborations and discussions*** with peers and experts.

These five factors together constitute the PSI proposed by Keller (1968) and implemented by Ferster and Perrott (1968). Many studies support the effectiveness of the PSI (e.g., Kritch & Bostow, 1998), which contains features that are intended to meet the needs of the individual learner in ways that have long been known to overcome individual differences and to promote high achievement levels in all students (Bloom, 1984).

This chapter reports the outcome of the use of the PSI in a graduate-level course that contains instruction in implementing graphical user interfaces with the Java Abstract Windowing Toolkit (AWT). The data reported here will show the use of the PSI to teach a class of students to write a Java Applet. The study extends our previous work, which validated a web-based tutoring system for training in fundamental aspects of Java by documenting improvements in programming confidence and competence immediately after students used the tutoring system (Emurian, Hu, Wang, & Durham, 2000). The present study broadens the number of assessment occasions to include a third assessment that occurred after the fifth PSI factor listed above had been completed by all students in a classroom discussion and collaboration setting. Finally, to assess the durability of learning, the study includes a fourth and final assessment that was administered during the last class of the semester, which occurred over three months after the third assessment occasion.

Our pedagogical approach emphasizes a programmed instruction methodology for implementing the first four factors in the PSI by means of the web-based tutoring system for Java training. Programmed instruction technology for teaching offers specific guidelines to follow in the construction of procedures that manage the moment-by-moment progress of a student during study events that are structured within the framework of a behavioral theory of learning (Skinner, 1958). The theoretical assumption is that the steps involved in learning a complex task, such as constructing a computer program, can be specified with sufficient precision that reinforcement contingencies can be applied to the component units that lead to task mastery. These ideas and concepts are grounded within the experimental analysis of behavior literature (e.g., Holland, 1960). This principle-based