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Chapter IV

Making Way for Java in an Information Technology Masters Program

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ABSTRACT

The object-oriented programming paradigm has gained popularity in industry and academia, and Java is becoming the language of choice. Yet, it can be a difficult language to learn, with many hurdles for novice programmers. This chapter describes our experiences transitioning to Java as the first programming language in an information technology Masters program. Careful consideration was given to a variety of factors, including when to introduce object-oriented concepts, which integrated development environment to use, and how to support students with minimal prior experience. The impact of these choices on the learning experience is described, and the factors that led to the successful implementation of Java as a first programming language are presented.

INTRODUCTION

Object-oriented technology (OOT) is becoming increasingly prevalent throughout the system development process (Jordan, Smilan, & Wilkinson, 1994). Students must be knowledgeable in OOT in order to adequately prepare for their future careers. The ACM/AIS 2000 model curriculum includes object-oriented concepts within several courses, including analysis and design, software engineering methodologies, databases, and programming (Gorgone & Gray, 2000). The Java™ programming language, which became generally available in 1995, has achieved a high level of adoption in industry and in the classroom. Information systems programs have also begun to integrate OOT in general, and Java in particular, into their course offerings (Lim, 1998).

The Master of Science in Information Technology (MSIT) at Bentley College, introduced in the fall of 2001, is built upon the object-oriented paradigm, with Sun's Java platform providing the technical foundation. Formerly, the first programming course was taught in Microsoft® Visual Basic® 6.0, an object-based language. This paper focuses on the transition to teaching the first programming course in Java.

Many of our students have little or no programming experience. Java can be a difficult language to learn for several reasons, including the complexity of its extensive class libraries; the instability of the Java platform, which is updated on a regular basis, often with significant changes to the language itself; the lack of standard methods for reading keyboard input; and a hard-to-use graphics model (Roberts, 2001). Yet, Java is in many ways less complex than C and C++, to which it bears a strong surface resemblance. This is largely due to the lack of pointers, which is a major stumbling block for students (Mehic & Hasan, 2001). Advantages for students learning Java include automatic garbage collection and the use of String objects rather than the null-terminated arrays of characters found in C/C++. In addition, Java was designed from the start as an object-oriented language and has all of the advantages inherent to this paradigm, including the reusability of objects, flexibility and extensibility from inheritance and polymorphism, and enhanced reliability and modifiability from encapsulation.

Proactive ways were sought to combat the anticipated high level of frustration for novice programmers enrolled in this course. Choices made concerning the course Web site, the student support structure, course content, how to deal with increasingly complex topics, and the frequency and difficulty of programming assignments, were critical to the success of this course.

This chapter describes the choices that were made and presents their effects. The next section describes key issues associated with introducing Java to the curriculum and summarizes related research on this topic. This is followed by a description of the object-oriented programming course introduced at Bentley College in the fall of 2001. Results of a survey given to all the students in this course were presented and compared to results from a similar survey given to students in the predecessor course taught in Visual Basic. Survey results are then discussed, followed by concluding remarks on the successful transition to Java in a first programming course.

BACKGROUND

The Java object-oriented programming language was developed at Sun Microsystems in 1991 for use in consumer electronics devices, such as television sets and VCRs (Lemay