An Online Problem-based Model For The Learning Of Java

Andy Chak Wun Tsang, Hong Kong Institute of Vocational Education (KC), Hong Kong
Nelson Chan, Hong Kong Polytechnic University, Hong Kong

ABSTRACT

To enhance student learning effectively, problem-based learning appears to be an efficient pedagogy. This paper proposes a model for Problem-Based Learning (PBL) via a commonly used communication infrastructure, the Internet. The model is called the Online Problem-Based Model of Learning Java. There are three components, namely, Communication Module, Visual Module, and Supporting Module. All components are posted onto a departmental Web site for student access. The Communication Module consists of a class chat room, a group chat room, a discussion forum, and e-mail facilities that are used to reduce the resources required to deliver the PBL activities and to provide a convenient collaboration environment. The Supporting Module contains an Object-Oriented Concept Module and a Problem Case Module. The Object-Oriented Concept Module equips students with basic Java language concepts, while the Problem Case Module requires students to use a PBL methodology to solve a given problem case. The Visual Module is designed with both a Top-Down methodology and a Problem-Solving approach (Whitten, Bentley, & Dittman, 2001).

Keywords: problem-based learning; top-down methodology; WWW

INTRODUCTION

Many teachers find it difficult to motivate their students in learning. Student learning motivation also appears as a major problem in the Hong Kong Institute of Vocational Education. Borne (1993) stated that motivation becomes even more difficult when the content to be delivered involves a programming environment. Problem-Based Learning (PBL) is a natural learning process that can motivate students in learning. It offers a number of benefits. Morales-Mann and Kaitell reported, in a synthesis of all evaluative research (Venon & Blake, 1993), that implementation of PBL in the classroom led to increases in students’ mood, faculty attitudes, class attendance, academic process, and a sense of humanism (White, 1996). Albanese and Mitchell, as reported by Morales-Mann and Kaitell, stated that in a medical school where PBL was implemented, students felt more nurtured, and both faculty and students felt more satisfied with their teaching–learning experience (Albanese & Mitchell, 1993). It appears that the most effective approach can be achieved by form-
ing small groups within a cooperative, self-directed, self-assessed, and interdependent PBL environment. Why isn’t everyone doing it? Probably, it is because of “fear of the unknown and resource” (Duch, Groh, & Allen, 2001). This approach requires a huge amount of resources from the point of view of the institution and causes fear of the unknown from the student’s point of view.

In order to have less concern on “fear of the unknown and resource,” an Online Problem-Based Model of Learning Java is proposed. In the context of the proposed model, the first concern can be relaxed with the aid of modern computing technology. The second concern can also be relaxed with the aid of a Visual Module and a Problem Case Module.

To give an overall view of the Online Problem-Based Model, the definition of PBL is presented and followed by descriptions of the Communication Module, the Visual Module, and the Supporting Module. The Communication Module outlines facilities such as chat room, discussion forum, and e-mail. The Visual Module describes how to deliver teaching materials interactively by using PBL methodology and top–down methodology. Two components are associated with the Supporting Module, namely, the Basic Concept Module and the Problem Case Module. The former aims to provide students with the fundamental knowledge of the Java language, and the latter requires students to make use of PBL methodology in order to tackle a problem case that is similar to the case in the Visual Module. The Frequently Asked Questions (FAQ) and data mining are then discussed and followed by an evaluation of a prototype of the proposed model. The prototype is in the form of a Web-based Computer-Assisted-Learning package for students to use to master the learning of Java language.

PROBLEM-BASED LEARNING (PBL)

PBL and other forms of cooperative or active learning provide platforms for learning and teaching. In particular, a key feature of PBL is that content is introduced in the context of complex real-world problems. In other words, the problem comes first (Boud & Feletti, 1991). PBL is different from other teaching strategies, because it attempts to develop students’ higher-order thinking and problem-solving skills through ill-structured problems (Yip, 2002). In PBL, students work in small groups and must identify what they know and what they do not know, and must learn how to tackle a problem. These are basic techniques in understanding a problem as well as in making decisions as required by a problem. The nature of the problems should be student-centered rather than teacher-centered. Students must go beyond the classroom to pursue knowledge from other resources. The primary role of the teacher is to facilitate the group process and learning, not to provide direct instructions. Different forms of assessment, such as presentation and demonstration, can be used.

The model for PBL comes from a few medical schools, notably McMaster (Barrows & Tamblyn, 1980), where, more than 25 years ago, they questioned how well traditional preclinical science courses trained physicians to be problem solvers and lifelong learners. Lectures presented by a series of medical experts to large student audiences seemed disconnected from the practice of medicine that required integration of knowledge, decision making, teamwork, and communicating with patients. The curricula of several medical schools now include problem-based, preclinical science courses. The effectiveness of PBL in the medical school environment
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