

# A Customized Learning Objects Approach to Teaching Programming

Ananda Gunawardena  
Carnegie Mellon University  
5000 Forbes Av.  
Pittsburgh, PA 15213  
+1-412-268-1559  
guna@cs.cmu.edu

Victor Adamchik  
Carnegie Mellon University  
5000 Forbes Av.  
Pittsburgh, PA 15213  
+1-412-268-8121  
adamchik@cs.cmu.edu

## ABSTRACT

We will discuss a unique content-creation, delivery and maintenance model for designing and teaching programming courses. This approach is based on the idea of creating customized learning objects, each of which is uniquely described by an XML document and presents an interface for future search, retrieval and update, as well as a potential connection to external assessment tools. We will demonstrate the electronic *Adaptive Book* that serves as an interactive, continuously up-to-date learning environment for students as well as an authoring tool for the instructor.

## Categories and Subject Descriptors

K.3.1 [Computers and Education]: Computer Uses in Education – *collaborative learning, computer-assisted instruction, computer-managed instruction.*

## General Terms

Design, Experimentation, Human Factors, Standardization.

## Keywords

Learning objects, authoring environment, adaptive book.

## 1. INTRODUCTION

Programming courses often consist of students of diverse backgrounds. It is possible to address this diversity by creating customized learning environments that meet the needs of individual students and as well as groups. These knowledge-transfer environments are assembled using a repository of learning objects. We focus on two aspects [1]:

- presenting all course related materials by exploiting customized learning objects;
- creating a unified and interactive platform for students to markup, share and archive the learning materials.

In this new content-centric environment, all learning components are integrated in order to maximize and facilitate the learning experience.

## 2. CUSTOMIZED LEARNING OBJECTS

We define a customized learning object (CLO) as an integrated

module containing the core text, code examples, review questions, and other supplemental material. A CLO is authored by the Adaptive Book authoring toolkit and uniquely described by an XML document that includes metadata and semantic relationships between CLO components. Moreover, the CLO provides an open interface for a connection to other components. Each CLO is developed according to IMS/SCORM standard [2] that assures the interoperability and reusability among all learning platforms.

## 3. ADAPTIVE BOOK

The Adaptive Book [3] is a new technology platform under which CLOs are developed, distributed, and discussed. The AB serves in various ways, such that it

- allows instructors to customize the core content to fit into their courses;
- allows students and instructors to create independent learning profiles and share them with others;
- creates a collaborative learning environment for students.

Unlike typical course management systems, AB allows creation and transformation of knowledge under one unified and interactive platform. The AB's markup manager contains tools to markup the content using highlights, annotations and links. Furthermore, these markups can be organized, shared and even modified to fit the specific learning needs of the individual. The AB will be the first software application that merges the process of teaching and learning into one system.

## 4. REFERENCES

- [1] Adamchik, V., and Gunawardena A. A Learning Objects Approach to Teaching Programming, in the *Proceedings of the International Conference on Information Technology: Coding and Computing*, (ITCC 2003, April 28-30, 2003, Las Vegas, Nevada), IEEE Computer Society, 96-100.
- [2] Advanced Distributed Learning Network, <http://www.adlnet.org>
- [3] Adaptive Book, <http://www.textcentric.com/products>

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