

Student-Developed Single-Concept Learning Modules

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Abstract: Surveys of college seniors will quite often reveal that, in their major courses, there were certain concepts that were difficult to master at the first encounter. By collecting this data, and then using graduate students to develop web-based learning modules for the most frequently appearing problem concepts, first encounters may be made easier to master. At Illinois Institute of Technology, this methodology has provided the beginnings of a series of single-concept learning modules available to all students.

Keywords: Single concept, Web-based, modules, instruction

1. Introduction

Peer tutoring has been found to be a very valuable asset to student learning. A recent survey of the tutors for Computer Science courses revealed that certain concepts appeared often as problem areas. Student after student appeared at the tutoring center stymied by the same lack of understanding of a basic concept. In the student-to-student tutoring/learning session, the tutor possibly best understands the problems associated with a difficult concept. Quite often the tutor had faced this same difficulty in the understanding of a concept when he or she first encountered it. At Illinois Institute of Technology peer tutoring has been used in many courses; in general, this technique has met with success. The biggest problem, limited hours of tutor availability, is what we have tried to solve with the use of web-based single-concept learning modules to provide help with difficult concept understanding.

2. Background

Most college/university professors consider their first teaching experience a disaster. They lecture for several weeks, then give a quiz or test and are shocked at the results. At Illinois Institute of Technology we offer two graduate courses that can make this first venture into the classroom a more rewarding experience for both the instructor and the student. Planning, developing and teaching a course requires three equally important components: 1) knowledge of the subject, 2) course content organization, and 3) presentation techniques. These three components have been determined by questioning many undergraduate and graduate students, and asking them to list single words which best describe the outstanding instructors they have encountered.

A sequence of two graduate courses are offered for Ph.D. students who are planning on a teaching career at the college or university level. The first (CS 560) in the sequence deals with organizational techniques for course planning, the second (CS 561) deals with the various presentation methods, from the whiteboard to multimedia approaches.

It was to CS 561 graduate students, in the spring of 1997, who were tutors and teaching assistants that the idea was born to prepare for the web what would be called Single Concept Learning Modules (SCLM). The topics of these Learning Modules would be obtained by interviewing undergraduates who had taken one or more required undergraduate Computer Science courses. Each of the graduate students was given a list of required

undergraduate courses and told to interview five to ten students who had taken each course. Each interviewee was asked to respond with two or three of the most difficult concepts encountered in each of the required courses completed. The concept was to be expressed in one or two words.

This information was gathered and summarized to find the most common problem concepts. Overall about 150 students were interviewed. The most common problem concepts were quite evident. The summary was then presented to the graduate students, and they, in turn, put the list in order of preference of concept they wished to develop. It worked out that each student received his or her first or second choice. There were no guidelines given as to length or style for the SCLM, the thought being that an unstructured approach would probably yield the best results.

The final version of their SCLM was due eight weeks into the semester. Preliminary versions were critiqued by all of the members of the class. The final versions were put up on a web page, and the information about the web page was then sent to all of the instructors of the courses involved. The instructors were asked to make the web page available to their students.

Some of the SCLM's are better than others, but student reaction overall has been very positive. Comments and criticism have been requested. These SCLMs are to be considered a dynamic entity. Each semester, these first versions will be examined again and new versions will be explored and added to the web page. Many semesters will have to pass before any profound statements can be made, but first reactions seem to indicate that the idea is sound. Student comments have been favorable. A quote or two: "The greatest thing about this is that the web page is available 24 hours a day."; "Why aren't there more concepts on the page?"; and "When will other courses be covered?"

The web page address is:

<http://www.csam.iit.edu/~cs561/>

We would appreciate any comments, good, bad or just so-so. Some of the SCLM's are general in content and others very specific. Also some team-effort SCLM have been added.

General concepts and concepts from individual course on the web are listed below:

General

- Searching
- Sorting

CS 200 Introduction to Computing II

- Functions
- Loops

CS 331 Data Structures and Algorithms

- Queues
- Recursion

CS 350 Computer Organization - Assembly Language Programming

- Fetch/Execution Phase
- Pop vs. Push
- Addressing Modes

CS 450 Operating Systems I

Deadlock
Disk Scheduling
Semaphore

CS 487 Software Engineering I

Teamwork
Dataflow Diagrams
Software Testing

3. Conclusion

We believe this SCLM approach could be used in any discipline and would be particularly successful in engineering courses where many new and sometimes difficult concepts are presented.