

Developing pedagogies to enhance excellence and diversity

A summer seminar sponsored by the Office of Institutional Diversity

Seminar Facilitator: Dr. David W. Concepcion

A pedagogical innovation for Introduction to Computer Science – CS 110

Approximately 44 students

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COURSE OBJECTIVES:

The student is expected to acquire knowledge of the development and use of computing technology, be able to make connections between computing technology and several other disciplines, and be able to identify and explain significant implications of widespread use of computing technology.

COURSE AUDIENCE:

This course primarily serves students majoring in Technology Education or Elementary Education (technology option), or minoring in Digital Forensics, Emergency Management & Homeland Security, or Educational Technology. Although this course is not a for-major course, many students who are testing the Computer Science water enroll in this course to discover if Computer Science is a good fit for them.

COURSE OVERVIEW:

This course is intended to provide a broad understanding of computers and computer science as well as provide a first exposure to computer programming and developing problem-solving skills.

PAST PEDAGOGY:

When I taught this course during the Fall and Spring semesters of the 2010-2011 academic year, I relied primarily on a lecture/lab format. New skills and information were presented in class (primarily via a Microsoft PowerPoint presentation). Occasionally, I had the students form groups of three to five individuals during class to work on a small programming challenge related to recently introduced skills. I reinforced skills in a weekly laboratory setting where the students were given a series of tasks to perform with assistance, if needed, provided by myself or a graduate assistant. Additionally, projects were assigned to provide further application of their newly-acquired skills and to develop their problem-solving skills. The last of the projects was completed by student-selected groups of up to five individuals. Small reading assessments for each chapter were administered via the Blackboard course management

system. Additionally each student was expected to contribute at least one entry to a Blackboard wiki that was intended to be a study guide. I provided an “empty” wiki with a page for each chapter, and the students added to each page those items they felt were important from that chapter. I reviewed the entries for accuracy. The i>clicker student response system was also used during the Spring 2011 semester.

PAST OBSERVATIONS:

I found that most students struggled with the programming concepts as well as general problem-solving. Given a task to solve programmatically, I noticed a significant minority of students seemed overwhelmed with the task and seldom broke the bigger task into smaller, more manageable steps. Additionally, there were the usual student struggles of learning unfamiliar information and concepts, generally outside of their field of study.

DESIRED STUDENT DIFFERENCES:

After a student completes this course (in addition to meeting the course objectives) I want them to feel more comfortable interacting and working with others and have fewer challenges solving problems.

NEW PEDAGOGIES, CONTENT AND COMMUNICATION ACTIVITIES:

I will introduce or change the following pedagogies into this course:

- In an effort to get to know the students better, I will invite every student to make an appointment to visit with me in my office for ten minutes sometime during the semester. During this time we will not discuss class content.
- Utilize a modified version of the peer tutoring “weekly expert” concept in the laboratory as described by Dewey in his article entitled *Teaching Computer Skills Using Peer Tutoring*. This will involve meeting with a few students each week to train them in the new skills so they can become proficient before the next lab. They will then be expected to complete the laboratory activities prior to lab that week and be prepared to assist their fellow students during lab. A small portion of their grade will be based on their preparation for this activity.
- Make more extensive use of groups in the classroom, making sure everyone feels comfortable participating. This should help prepare them for the final project which will be completed in a group setting.
- Take photos of students at the start of the semester and review them often to help learn the students’ names.
- Make better use of the i>clicker system to gauge student understanding, providing feedback to both the students and myself. Be prepared to adjust class activities based on the students’ level of understanding.
- Ensure that all work is graded and returned to the student in a timely manner. This will generally mean by the next class session. Although this was generally accomplished before, I will more carefully schedule when items are due so as to provide time to complete grading one item before another is due.
- The final group project currently requests a web page speaking about computers and society. I will expand the requirements for this page to include content that explicitly speaks about minorities, computers, Computer Science and their interaction.

GUIDING QUESTIONS (AND MY RESPONSES):

“Can any student come in here and learn?” “Are my pedagogies ‘universal’ or equally accessible to people with the widest variety of bodies and stories I can imagine?” (incorporates Universal Pedagogy; Bodies and Stories)

I believe the answer to be yes. With a variety of instructional methods, reinforcing activities and a strong willingness on my part to meet with students, I believe that any student who wants to learn the course material can learn the course material. I have often told a student that I’m willing to work at least as hard as they do to help them master the material.

“Where are my students novices and where are they advanced beginners?” “Is there sufficient ‘How To’ instruction for novices?” “When and where am I retaining and ceding cognitive authority?” (incorporates Metacognition; Cognitive Authority)

Most students enrolled in this course should be considered novices; some very much so. Course material is presented with the assumption that the students have no prior experience or knowledge of course-related material. However, there are the occasional advanced beginners who will sometimes struggle with the material because they do not make an effort to learn it, since they “already know the material.” My challenge as the instructor is to help them understand and accept there are often different (and sometimes better) ways to do things. In large part, I will be viewed as having the cognitive authority because I have the knowledge that the students need to succeed in the course. I always strive to be vulnerable however, by admitting that I don’t have an answer to a particular question that comes up. In this situation I encourage the students to work with me to find the answer – either right then, or outside of class. I feel this provides a good role model for the students of what to do when you run into the “brick wall” and need to find a way around it.

“In what ways are my students applying their learning of material from this course?” “Is there sufficient repetitive, deliberative practice so that students can really master what I am asking them to master?” “Do the activities produce intrinsic rewards?” “Will my formative feedback be timely?” (incorporates Transfer of Learning; Intrinsic Motivation)

Reading comprehension is reinforced with short Blackboard assessments (which are immediately and automatically graded), and further reinforced by classroom instruction and activities. Further application of new skills occurs in the labs (with immediate feedback) and ultimately in the projects. The final application of the semester’s newly-acquired skills comes in the final small group project which provides a chance for the students to collectively show off what they have learned throughout the semester. Projects and exams will be graded and returned within a week, often sooner.

“Are my assignments and lectures coordinated with the course objectives?” (incorporates Transparent Alignment)

I believe so. The lab activities and projects utilize the recently-introduced skills and build on top of previously-acquired skills. All course activities lead towards gaining a better understanding of computers, computer science and problem solving.

“In what ways do I want students to be different after their time in my course?” (incorporates my personal teaching pedagogies)

After a student completes this course (in addition to meeting the course objectives) I want them to feel more comfortable interacting and working with others and have fewer challenges solving problems. The presence of group work throughout the course and the variety of activities and projects should increase their comfort level in both areas.