

# Cindy Grimm: Teaching statement 2009

## Teaching statement

Active learning, to me, means the students are actively engaged in not just learning the material, but in learning *why* they need to learn it. As a simple example, consider teaching the shortest-path algorithm. Traditionally, the problem is introduced with some motivating example (such as finding the cheapest flight home) and then the algorithm is presented, along with an example or two. The active learning approach begins with the sample application and an example, and the students are asked to work on a solution. The instructor's role is to help students when they are stuck, to periodically put different solutions up on the board for the class to critique, and to make suggestions on where to go next. Even if the students do not arrive at the complete solution on their own, by the time the solution is shown to them they have little difficulty understanding it.

I believe that it is important for students to take an active role in their education, and to be pushed beyond what they think they can do. All of my classes are designed with this in mind. I provide multiple options and extras on assignments, both in problems and solution methodologies, and let the students pick and choose what interests them. I make the assignments and exams difficult, but also provide many opportunities to re-do or make-up work they perform poorly on, so any one who is willing to work does well in the class and has plenty of opportunities to learn the material. I also reserve a number of class-sessions for in-class exercises and student-picked topics. This, combined with a very interactive teaching style (I rarely make it through more than ten minutes of lecture without some form of student interaction) means most of the students are engaged in class.

The computer science department at Washington University is entering the second year of its CPATH grant (NSF CISE Pathways to Revitalized Undergraduate Computing Education). The original grant was awarded to Dr. Kenneth Goldman, but I am now PI while Dr. Goldman is on leave (I was a co-PI originally). The primary goal of this grant is to transform the entire undergraduate curriculum to an *active learning* and studio-style teaching approach — moving away from the standard lecture-based interaction model. My role as PI is to help facilitate this change, which involves working with faculty and outside advisors to determine, for each course, how best to adapt each course.

Active learning keeps students engaged, but teaching communication, design, and self-evaluation skills requires a studio-based approach. This approach is based on a teaching style that is used in art and architecture courses — students put their work up and other students and faculty critique it. Computer science courses that involve design and programming are particularly well-suited to this style of teaching. Essentially, students (working alone or in groups) are expected to present and critique their designs and their implementations to other members of the class.

I currently teach a course (CSE220/CSE320) which is modeled entirely around this approach. Students pick a project, then design and implement it, do usability studies, then re-work their project based on the studies. Every step of the process involves peer review and presentation to some or all of the class. I am offering this class for the third time this spring, and current enrollment numbers are nearly double what they were last year. Last year's class projects can be found here:

[http://classes.engineering.wustl.edu/cse320/index.php/Main\\_Page](http://classes.engineering.wustl.edu/cse320/index.php/Main_Page)

In summary, I believe teaching should be an interactive collaboration between the instructor and the students. This often (at least initially) makes students very uncomfortable because they are not use to providing input on what they should learn, how they should learn it, and what it means to “do well”. Once they adapt, however, the majority of students say that not only is the interactive approach more fun, they also feel like they learned the material better (and this has been shown to be true in several studies).

## Summary of Teaching Evaluations

I have taught CSE 200 (Introductory MatLab), CSE 241 (Algorithms and Data Structures), CSE 220/320 (Software design studio) CSE 452 (Computer graphics) CSE 450/451 (Video Gaming I and II) and CS 552 (Advanced Graphics). The average evaluation scores for my classes is between 7 and 8 out of 9 (they have changed evaluation systems twice in the last eight years, making direct evaluation difficult). Class sizes have ranged from 50-60 (CSE200 and cse241) to 20-40 (CSE452) to 10-20 (CSE220/320, CSE450, and CSE552).

The following quotes are selected from student course evaluations ([evals.wustl.edu](http://evals.wustl.edu)).

### Software design studio

“The professor maintained a good balance between letting us learn on our own, and being a mentor and guide to our groups.”

“Join a team and work a semester long programming project complete with deliverables, reviews, and presentations.”

### Video Games

“It provides an excellent opportunity if you are serious about becoming a game developer (or just very interested in game development). It will help you improve your coding, design, and team skills.”

“It is a ton of work, but if you are willing to do it, it is also a lot of fun, and a great learning experience.”

“If you have an interest in video games and you have a wide range of knowledge in CS, this course would be perfect for you.”

### Computer Graphics

“This is one of the few classes where I have actually wanted to start the labs as soon as they are handed out. The material was interesting, and I found myself extremely motivated all semester.”

“It will consume your life. Orders of magnitude more work than any course, graduate or otherwise I’ve taken in my academic career. At the same time, this was probably the most satisfying and educational course I’ve had. In short, it will ruin your life for a semester, but at the end, you’ll be a better person for it. No one should graduate without it.”

“It is very time-consuming and involves a lot of linear algebra. However, you will learn a lot.”

### Advanced Graphics

“Students are not punished for making a bad grade, but instead, invited to prove themselves worthy of a better grade by doing more work. This is how it should be, and more professors should adopt this policy.”