TEACHING STATEMENT

Guohua Liu

1 Goal

My goal in teaching computer science consists of four essential components: (1) to motivate and help students to build a solid knowledge of the field; (2) to help students develop their problem-solving skills; (3) to assist students in improving the communication and collaboration skills necessary for academic projects; and, (4) to help students become independent learners.

2 Methods

I use overall pictures and concrete examples to impart fundamental knowledge effectively. Knowledge forms the basis for skills and is important for students' future careers. I use overall pictures of a course to motivate students, that is, I show students the overall goal of the course and the components that we will explore to achieve that goal and emphasize why the goal is interesting and why the components are indispensable to the goal. When explaining specific content, I use concrete examples to make it absolutely clear. For example, when teaching a computer algorithm, I always trace it using a small but meaningful sample problem on the whiteboard interactively with the students. In other words, I encourage the students to give the result of each step of the algorithm in turn; I may provide hints along the way. To ensure the effectiveness of my teaching, I try to identify and fix misconceptions as early as possible. I encourage students to ask questions by establishing a psychologically open environment in the classroom; for example, I never hesitate to empathize with the students confusion and share some of my own previous points of confusion about the algorithm in question, which helps them feel more comfortable in discussing their concerns or uncertainties about what I said. The principle "do not hide any questions!" is applicable to me as well as to the students. I also use quizzes to follow up on the discussion of each major topic. The quizzes are not graded, but they help the students recognize just how well they understand the key points of the class. To cater to different style of learning, I maintain regular office hours to answer questions in a manner specifically suitable to individual students in a more relaxing environment.

For problem solving, I encourage students to follow their intuition and make progress by fixing mistakes. My experience is that a fear of making mistakes limits students' creativity; thus, it hinders the overall development of their skills for problem solving. This fear is exactly what I try to remove through my teaching. I once taught a programming language, which was somewhat unusual in that the objective of the language was to specify what is a solution of a problem, not how to get it as that of C or Java. This switch in programming styles is intimating for many students and they are reluctant to use the language for coding. To resolve this difficulty, I demonstrated a real-time, problem-solving process guided by intuition and mistakes in one particular class. I gave the students a problem to solve and encouraged them to propose the code based on their own intuition without worrying about whether it was correct or not. Then, we ran the program and observed the output. For the incorrect output, I encouraged students to locate the bugs in the code, put forward corrections, and reran the program. We did this repeatedly until we obtained the correct results. Each step was displayed on a screen and I typed the code as the students instructed. The idea was to resolve the fear of making mistakes by showing that they can

be corrected one by one and to get students used to a reasonable problem-solving process: if the first intuitive solution fails, then fix it, and keep retrying until you are successful.

I encourage students to practice communication and cooperation by providing them with numerous opportunities. I co-organized and chaired a traditional summer trainee seminar for our department. For this one-day event, we had 18 presentations that are grouped into 4 sessions, and more than 40 attendees, including professors and students. The students used this opportunity to present their summer research and exchange ideas with professors and their fellow students.

My research experience can contribute to creating independent learners. For junior students, my emphasis is on inciting their interest in related fields. I once designed an optional question for a home assignment, where students were asked to challenge my solver by creating test instances that were as difficult as possible. I recommended research papers to help students approach this task and further explore the difficulty of certain problems that are extremely interesting from a research standpoint. For more advanced students, such as graduate students, I plan to give advice on the following skills based on what I learned from my supervisors. The first part of this has to do with analysis and planning, that is, on dividing an overall goal into a set of sub-goals and figuring out how to achieve each of the sub-goals step by step. The overall goal could be a specific research project or the ultimate objective of a student completing his or her graduate studies. The second part involves critical thinking, that is, evaluating the existing works in a field and proposing novel ideas to advance the state of the art. The third part has to do with mastering the tools of the trade. Beside the tools available in literature, students will be encouraged to develop their own tool kit to facilitate verifying any new ideas in a timely and systematic fashion.

3 Improvements

As a new teacher, **I would like to learn, pay attention, and continue to grow as a result of my teaching.** Course evaluations offer a good means for learning about the strengths and weaknesses of my teaching. Although it is natural to assume that the responses from the students for a particular course may seem contradictory–half of them might say one thing and the other half the opposite–I would not rush to the conclusion that there is no way to satisfy everyone and then just ignore the feedback. Imposing some structure on the evaluations may help me gain some meaningful feedback from them. For example, sorting out the evaluations according to the overall course rating may provide a context for understanding the ratings of specific aspects of the course. If possible, I would also like to ask advice from teaching consultants or colleagues who receive high ratings in the area of consideration. Besides the evaluations, the quizzes and observations made in class are also indicators of my teaching effectiveness. Spending several minutes after a class to reflect upon them or writing about them quickly in a teaching journal will be helpful for improving my next lecture and teaching skills in the long run. While these approaches aim at developing my teaching skills, the focus is rightly on students–enabling them to learn more effectively.

4 Why

Teaching gives me great pleasure, as I believe it contributes to a better world in a productive way, that is, I believe that it helps students develop their knowledge and abilities and offers them more opportunities. I am interested in teaching any courses in computer science and engineering.