Teaching Statement – Mark D.M. Leiserson

One reason I am a computer scientist is because of a great teacher. He opened my eyes to the joy behind tackling difficult computational problems with an open, inclusive classroom and engaging, interactive applications. One of my main goals as a faculty member will be to foster a similar environment in my own classroom. I have gained experience as a teacher during my Ph.D. through guest lecturing and mentoring students. From these experiences, as well as participating in a teaching certification program, I have developed a teaching philosophy as an educator and mentor.

My goal as an educator is to create an open environment in which my students can become active learners and engage with the material, such that they learn concrete skills from – and develop an appreciation for – computer science and computational biology. Formative assessment is a vital tool to create this environment, both for understanding student progress and improving as a teacher. I plan to use formative assessments to tailor my classes to my students by taking into account their interests and backgrounds. At the same time, I view teaching as a craft learned over time and enhanced through experimentation. In that vein, I am interested in exploring new or nontraditional teaching methods to reach my students, such as a flipped classroom.

My goal as a mentor is to help my mentees develop new skills and an understanding of the important ideas and problems in our field. Mentoring is a critical component of education that benefits both the mentor and mentee. A strong mentor has to think about research at a high level, which leads to new insights. Thus, strong teaching and research are often intertwined.

Teaching Philosophy

I aim to create an open, engaging learning environment in my classroom. Studies have shown that active learners – students who engage with the material and perform deep processing – retain far more information than those do not, regardless of their initial motivation. While helping students engage with the material is easier said than done, I have used several different strategies in my lectures to achieve this goal. One strategy I have employed is presenting real world examples to illustrate the utility and importance of the material we are discussing, such as how pattern matching techniques are required for metagenomics studies of the microbiome.

I also believe in the importance of communication between educators and students. Feedback is important for students to understand their strengths and weaknesses, but it is just as important for educators to determine what students are learning, what concepts need to be reinforced, and what teaching methods work. In that vein, I plan to utilize formative assessments in a number of ways. For example, as an interdisciplinary teacher, I plan to use brief surveys (e.g. with Google Forms) at the start of every teaching module to determine my students' backgrounds in the subject. This will allow me to tailor my class to my students' backgrounds and interests.

Development as an Educator

I have gained important experiences as an educator, but I recognize that teaching is a skill crafted from experience and experimentation. I have experience developing lectures from an existing curriculum and engaging a classroom of students through three guest lectures I gave in a Computational Molecular Biology course. I also completed a teaching certification program through the Brown University Sheridan Center for Teaching and Learning that introduced me to pedagogical concepts such as reflective teaching, and also gave me the opportunity to develop my own teaching style. The most important experience I had in the certification program was giving a short lecture with no visual aids on DNA sequencing technology to other students in the program. This drove home the importance of engaging my students with analogies, examples, and questions, because I could not rely on visual aids to tell the story for me. I look forward to putting what I have learned into practice, and continuing to develop as an educator.

Mentoring

The opportunity to advise and work with graduate and undergraduate students is one of my main motivations for pursuing a faculty job, and I am eager to build off what I have learned as a mentor as I start my faculty career. I have developed my passion for mentoring with extensive experience managing my research group's undergraduate research program for the past four years. During that time I advised five undergraduate and three graduate students on research, classes, and career paths, including students with interests ranging from medicine to software engineering. My students and I had some research success from these experiences, as two students are co-authors on three different publications.

My mentoring experience also led me to the insight that teaching and research are strongly linked: I had to think about my research at a higher level in order to guide my advisees, which led to a better understanding of the problem and new insights. For example, I was inspired to start one of the main projects in my thesis by working with Jason Hu, an undergraduate, on generating a website to view the output of HotNet2, an algorithm I was developing. Jason went above and beyond, and turned several existing visualizations into a unified, interactive user interface. Jason's innovation led me to realize the power of exploring different datasets with integrated, interactive visualizations, and I soon began building the MAGI web application. We published a paper about MAGI in *Nature Methods* in 2015, on which Jason is a co-author.

Teaching Interests

I am eager to continue to grow and improve as a teacher, as well as develop new courses. I am prepared to teach several existing introductory computer science courses, such as data structures or discrete math, and advanced courses such as algorithms. I am also prepared to teach an algorithms for computational biology course. As an interdisciplinary researcher, I will aim for my classes to be useful for students from computer science, statistics, biology, and other backgrounds. As such, I am eager to develop new classes, such as an advanced course on cancer genomics, or a hands-on data science course.