Teaching Statement
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**Teaching philosophy** My teaching philosophy is to create an engaging, interactive, and memorable learning experience for students. Education, in my view, should be both hands-on and connected to real-world applications. The ultimate goal is to cultivate an environment in which students actively engage with the material and learn to apply their knowledge to solve real-world problems. I achieve this through innovative assignments, frequent student feedback, and an open, supportive classroom culture, which encourages them to actively participate and voice their observations, questions, and ideas.

**Address gaps in curriculum** My teaching philosophy centers around identifying and addressing gaps in current curricula to benefit both my students and the broader academic community. In line with this, I published a paper on teaching advanced HPC topics that are often left for HPC professionals to learn independently. For instance, in our publication on the HPC@Scale course, we highlighted the absence of structured courses nationwide that teach students how to scale the I/O phase of HPC applications, despite I/O being widely acknowledged in the literature as a critical component requiring significant consideration in HPC application development. Recognizing this need, I designed the HPC@Scale course at TXST to address this gap and provide students with essential knowledge that is typically missing from standard HPC curricula. My work in this course exemplifies my commitment to enriching the academic landscape and preparing students for successful careers in HPC.

**Leverage active learning strategies** To enhance retention, I employ several active learning strategies in my classroom. For instance, all my classes are taught using the inversion format, i.e., through flipped classrooms. This method, based on cognitive science principles, allows students to first engage with the material through video lectures, followed by in-class discussions using ABCD questions, and hands-on activities that reinforce concepts through problem solving. By incorporating visual, auditory, and kinesthetic learning channels, students experience the material in multiple ways, which has been shown to lead to better understanding and retention. For example, in my Compiler course, I ask students to watch prerecorded lectures on the FIRST and FOLLOW sets of grammars before class, so they arrive prepared to ask questions and work in groups on examples that reinforce the concepts.

**Make abstract concepts relatable through analogies** I believe in the power of analogies to bridge complex or abstract concepts to relatable everyday experiences, which significantly improves comprehension and retention. For example, when explaining the cache hierarchy in computing, I compare the L1 cache to pockets (quickly accessible but limited in space), the L2 cache to a purse (slightly slower to access but with greater capacity), and the main memory to a bank (with maximum capacity but slowest access). Similarly, in my linear data structure course, I use visuals such as lunch boxes to explain Abstract Data Types (ADTs), contrasting it with a pearl necklace to illustrate the structure of arrays. This approach not only helps students retain information by associating it with familiar experiences, but also sparks curiosity and makes abstract ideas less daunting. Evaluations consistently show that students recall these lessons better and engage more actively, as these analogies give them a concrete way to discuss abstract computational concepts.

**Foster interactive learning through structured group activities** In-class exercises and group activities are central to my designed classes. These exercises provide students with a peer-supported framework for discussing, testing, and solidifying their understanding of complex ideas. For example, in my CS-II course, in-class labs are designed as collaborative events, where students work in pairs or groups to solve problems and present their findings. This encourages them to consult the class materials, exchange ideas, and even explain concepts to each other, fostering both independent thinking and teamwork. The value of these exercises is clear: I often witness the transformative moment when a student moves from confusion to confidence. In a low-stakes, supportive setting, students learn to work together, strengthen their understanding of the course material, and develop skills that are essential in real-world collaborative environments. Feedback on this structure has been overwhelmingly positive, and students have noted that "these interactive and engaging class activities" support their learning and make abstract concepts tangible.

**Improve with each iteration** Continuous improvement is a key aspect of my teaching, as I consistently look for ways to refine course materials based on student feedback, peer suggestions, and the latest developments in the field. For instance, in response to mid-semester feedback requesting more code examples, I added additional code demonstrations in my Compiler Construction course. This feedback also led me to redesign my data structures class, shifting to a live coding approach where students actively code alongside me as I build programs from scratch. Furthermore, to better support students, I often revise course materials with enhanced animations, improved slides, and new assignments. For instance, in my Compiler Construction class, I created additional examples and in-class activities on how to compute the FIRST and FOLLOW set as students found the concept to be challenging initially. A quick in-class poll showed that these additional exercises helped students feel confident in their ability to solve similar problems in the future.

**Encourage real-world application of knowledge** I strive to connect course content to real-world applications to deepen student engagement and give them a clearer picture of how their work can contribute to larger goals. By bringing elements of my research into class projects, I expose students to real-world challenges and techniques that they may encounter professionally. In my Scientific Data Visualization course, for example, students have the opportunity to collaborate on information visualization projects for prominent organizations such as the International Center for Diarrhoeal Disease Research in Bangladesh and Lawrence Livermore National Laboratory. These projects are more than academic exercises; they allow students to develop practical skills, work on meaningful problems, and understand the societal impact of their work. This strategy also serves as a powerful tool for identifying promising students and creating a pipeline for undergraduate research, providing them with experience that can be instrumental in their future careers.

**Integrate my research in HPC+AI to enhance HPC education** I blend my research into the courses whenever I can to give students exposure to relevant real-world problems. Additionally, I also leverage my research in HPC and AI to enhance my teaching practice. For instance, I am currently developing an AI-powered educational tool specifically designed to teach performance optimization and HPC concepts to graduate students. Unlike standard platforms, this tool draws on a curated corpus of performance optimization literature assembled and verified by my team to provide students with precise research-backed guidance. Through AI models trained on vetted sources, the tool will offer an interactive learning environment for graduate students in my HPC@Scale class to independently explore and apply optimization strategies in code, all while receiving instant feedback on their approaches.

**Mentorship and leadership development** Mentorship is a cornerstone of my role as an educator, extending beyond the classroom to foster the holistic growth of my students. Universities have a responsibility to develop not only skilled graduates, but also ethical and responsible citizens. As a mentor, I encourage students to advocate for themselves by asking questions about their career paths, build transferable skills for their professional careers, and recognize their potential as future leaders. I co-founded a research and mentoring platform at my alma mater in Bangladesh, which has established a sustainable pipeline of mentors and mentees. This platform connects students across cohorts, creating a self-sustaining network of mentorship that guides and supports new students through academic and personal challenges. Teaching and mentoring, in my view, are invaluable avenues for helping students evolve into thoughtful and capable individuals who will go on to make meaningful contributions to society.