Teaching Statement: Redefining the Value of the Mathematics Classroom in the Age of Artificial Intelligence

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As a researcher in mathematics with a Ph.D. in Mathematics and Applied Mathematics, I have cultivated extensive experience in undergraduate education at Southern Methodist University (SMU) and Dartmouth College. From leading help sessions and meticulously grading assignments as a teaching assistant to independently instructing a multivariable calculus course as a postdoctoral fellow, my teaching practice has consistently revolved around a central question: *How can we most effectively guide students to genuinely understand and master the rigorous and elegant discipline of mathematics?* In recent years, the rapid advancement of Artificial General Intelligence (AGI), particularly the leap in the capability of Large Language Models (LLMs) like ChatGPT to solve mathematical problems, has posed a profound challenge to traditional pedagogical models. This has compelled me to conduct a deeper examination and reconstruction of my own teaching philosophy. In the following, I detail my pedagogical philosophy, practical methods, and vision for the future of mathematics education.

My teaching philosophy is rooted in a student-centered approach, grounded in the conviction that the ultimate goal of education is to cultivate students' abilities to think independently and solve problems. This philosophy was forged during my time as a teaching assistant at SMU. While leading help sessions, I observed that the most effective learning often occurred during the vibrant exchange of ideas among students. Many students spontaneously formed study groups after class, reporting that this discussion-based approach gave them a much deeper understanding of the course material. This reinforced my belief that the role of an instructor is not to be an authoritative provider of answers, but rather a facilitator of the learning environment, a guide for discussion, and a catalyst for the cognitive process. Furthermore, in grading homework and exams, I have always adhered to the principle of feedback over scores. I am never content with simply marking answers right or wrong. Instead, for every error, I provide detailed written comments that identify its nature and offer specific suggestions for correction. This invaluable experience laid a solid practical foundation for my subsequent independent teaching—the success of teaching should be measured not by whether students have merely memorized formulas, but by whether they have learned how to learn.

My experience teaching multivariable calculus at Dartmouth College placed me directly at the center of a paradigm shift in education. I had the unique (perhaps fortunate, perhaps unfortunate) opportunity to teach during two distinct periods: before and after the breakthrough of tools like ChatGPT in mathematical problem-solving. Before the widespread use of AI, student learning, though reliant on group collaboration, demanded that the discussion process itself involve the application of acquired knowledge for judgment, reasoning, and validation. However, the situation changed dramatically once AI was able to provide step-by-step solutions. Students' homework grades improved across the board, presenting a superficial image of success. Yet, on a carefully designed exam—with a difficulty level comparable to the previous year's and questions simpler than the homework—grades fell significantly. A common complaint was that the exam was too difficult. This phenomenon starkly revealed a critical issue—when AI can effortlessly generate correct answers, many students substitute the process of learning with the act of acquiring an answer. This experience had a profound impact on me, and forced me to confront an urgent question of our time—*In the burgeoning era of AGI, when obtaining an answer has become unprecedentedly cheap, what is the value of mathematics education—a discipline that fundamentally requires active and deep student engagement? How must educators*

redesign their courses to ensure that students are genuinely learning?

My reflections on these questions form the core of my future teaching direction. I firmly believe that the advent of AI, rather than diminishing the role of the instructor, places higher demands on us. We must transition from being transmitters of knowledge to becoming designers of learning journeys, coaches of critical thinking, and guardians of academic integrity. My strategy will revolve around the following pillars:

1. **Transforming AI into a learning tool and *not* an answer machine**: Rather than banning AI (an often futile endeavor), I will guide students to use it responsibly and critically. I will explicitly teach and model how to use AI to handle tedious computations, allowing students to focus on formulating the problem and interpreting the results. Students will be encouraged to leverage AI for concept validation. When a student has an idea for a solution, they can ask AI to quickly generate an example to test its feasibility, but the student remains responsible for understanding the underlying principles. I will intentionally use AI to produce solutions containing subtle errors or logical flaws and assign students the role of "grader" to review, critique, and correct AI's work. This exercise has the capacity to powerfully develop critical thinking skills.

2. **Prioritizing in-class interaction and collaboration**: The greatest value of the physical classroom lies in the interpersonal dynamics and the spontaneous intellectual sparks they generate. My classroom will therefore focus more on problem-based learning, conceptual exploration and fostering an academic community. Class time will be primarily dedicated to solving challenging problems, where students learn math through group discussions, and blackboard presentations. I will guide students to ask why, not just how. We will delve into the intuition, and philosophy behind theorems and formulas. I will encourage the formation of study groups to create a supportive and collaborative atmosphere, transforming learning into a social and mutually reinforcing experience.

In summary, my teaching philosophy is dynamic. It is rooted in traditional student-centered pedagogy that values collaboration and feedback, and it has been refined and strengthened by the challenges of the AI era. I am convinced that the focus of future mathematics education must shift from the transmission of knowledge to the cultivation of thinking. The role of the teacher is no longer that of the sole intellectual authority, but rather a guide, a coach, and a partner in the student's journey. Our purpose is to help them learn how to think, how to question, and how to create in a new era of human-AI collaboration, thereby becoming independent thinkers equipped with robust mathematical literacy and a capacity for lifelong learning. I am eager to put this philosophy into practice, guiding my students not only to succeed in a single course but also to travel further and more confidently on their future academic and professional paths.