

Teaching Statement – Faisal Shah Khan

I see mathematics and science as forms of enterprise: disciplines that do not just explain systems, but help build and improve them in business, technology, and public life. My goal as a teacher is to help students engage with these fields not only as abstract structures, but as practical tools for understanding and shaping the world.

In my courses, I emphasize conceptual clarity and intuitive structure. Rather than beginning with formal definitions, I start with context — a decision under uncertainty, a system under strain, a dataset with something to say — and build the mathematics from there. Students often engage more deeply when ideas emerge within the narrative, not alongside it.

Teaching in Practice

For example, in a mini-course on financial strategy I teach at SKEMA Business School, students work with live market data through Bloomberg Terminal to evaluate real-time scenarios. We explore how bidding behavior, market equilibria, and hedging strategies are shaped by game theory and optimization — concepts that intersect with my own research. Rather than separating theory from application, I aim to show students how mathematical ideas inform the systems they already interact with.

Accessibility is essential, especially in foundational courses. I once had a calculus student ask me, with genuine confusion, whether what she was learning would ever apply to her engineering work. I was flabbergasted. The question struck me as naive — but on reflection, I realized the issue was not with her curiosity, but with how I had framed the material. I had introduced limits in the abstract, without linking them to the kinds of constraints engineers actually work with. Later in the course, when we explored optimization problems involving area and constraints, her interest sharpened. That experience taught me the value of early, concrete anchoring: students connect more readily to mathematical ideas when they see their relevance before the abstractions fully set in.

Another lesson echoes a moment from my own undergraduate days. A skeptical friend studying engineering once challenged the value of a math degree by posing a (macabre) puzzle: a butcher has 40 sheep to butcher over seven days but must butcher an odd number each day. How can it be done? While others tested combinations, I reframed the problem mathematically and used basic number theory to show that the problem had no solution as the sum of seven odd numbers must itself be odd — and 40 is even. That quick result revealed how abstraction and proof turn confusion into clarity. I aim to bring that same sense of insight into the classroom.

Integrating Research and Teaching

I also draw connections between advanced mathematics and real-world systems. To explain the relevance of abstract algebra, I often discuss error-correcting codes built on finite fields, which are essential for reducing memory bit-flips caused by cosmic radiation. Without these codes, such errors might occur every few weeks; with them, the failure rate drops to once every several thousand years. Students grasp the stakes when they understand that such errors can crash aircraft or financial systems.

Research-based teaching shapes much of my pedagogy. I have mentored undergraduates whose projects in graph theory, quantum finance, and game theory led to peer-reviewed publications and conference presentations. These experiences confirmed that undergraduates can contribute to original work when supported by strong conceptual foundations and structured research environments.

Reflection and Growth

Finally, I treat student feedback as a critical part of my own learning. When evaluations suggest a need for better scaffolding, improved pacing, or clearer visuals, I adapt. Teaching is iterative, and each course is a chance to refine how I present complex ideas with clarity and care.

My goal is not just to teach mathematical methods, but to help students see through them — to use them as lenses for analyzing systems, questioning assumptions, and designing better outcomes. When students leave a course not only more capable, but more curious, I know the teaching has worked.