

Personal Statement

Matthew Kowalski

My path towards a PhD in mathematics has been shaped by the exceptional encouragement I received at every stage of my education. From Mrs. Goff's gifted classes in elementary school to Professor Schenker's reading courses as an undergraduate, I have been fortunate to be supported by individuals who sacrificed their time to foster my passion for mathematics. Their guidance not only strengthened my academic growth but inspired me to pay it forward. During my PhD program, I have sought out opportunities to mentor students, striving to pass on the guidance that was instrumental in my education.

Currently, I mentor students of various ages through three main avenues: teaching a class for the Olga Radko Endowed Math Circle (ORMC), organizing and participating in the Directed Reading Program (DRP), and volunteering with children and early-stage graduate students. These experiences have reinforced my desire to pursue a career as a professor, where I can continue to investigate mathematics through research while advising and teaching future students. As the next step in this process, I will be applying for postdoctoral research grants and positions. Receiving the Dissertation Year Award would enable me to fully pursue these career aspirations without compromising my ongoing commitments to mentoring students.

ORMC. My early love of mathematics was fueled by the challenge of solving complex puzzles. Now, as a lead instructor for the Olga Radko Endowed Math Circle (ORMC), I get to share that same excitement with younger students. The ORMC is a free weekly program that brings together elementary, middle, and high school students to explore advanced topics in mathematics and foster a community of mentors and peers. As a lead instructor, I have the privilege of working with high school and accelerated middle school students. With my fellow instructors, I design weekly lessons that go beyond the standard high school curriculum.

In my lessons, I take pride in presenting challenging mathematical topics without shying away from their complexity. My students are incredibly capable (far more than I was at that age) and I strive to push them accordingly. Just this year, my students have tackled topics in abstract algebra, linguistics, and complexity theory. Even as I write this statement, I am developing a lesson on special relativity that uses spacetime diagrams to introduce the theory, highlight practical consequences, and explore famous paradoxes.

Every Sunday evening, students at ORMC engage with these advanced topics in small groups, while the lead instructors provide guidance and answer questions. Beyond the mathematics, we also support students in navigating their upcoming college applications, providing insight into schools and majors.

Engaging with these talented students is a highlight of my week. Their unique perspectives challenge me to rethink my own understanding and their enthusiasm for mathematics is infectious. I often leave class with the feeling that I learned as much from them as they did from me.

DRP. As an undergraduate, I became passionate about research when I began independently studying topics through reading courses. To offer these same opportunities at UCLA, I became actively involved in the Directed Reading Program (DRP) as both a mentor and an organizer. The DRP provides undergraduates with the opportunity to engage in independent mathematical study under the guidance of a graduate student mentor. As part of the DRP committee, I help pair roughly 20 students per quarter with graduate mentors, help facilitate project planning by providing ideas or resources, and organize the student-led colloquium at the end of the quarter.

A key goal of this program is to encourage students to consider graduate education in STEM by giving them experience with research-style learning and providing insight into academic career paths. Beyond the academics, I am proud to see that the DRP has inspired many students to teach or mentor students of their own. In fact, many of our current mentors were once students in the program!

Beyond my role as an organizer, I have personally led five DRP projects in topics ranging from Fourier analysis to numerical methods for partial differential equations. Currently, I am continuing my work with Shawn, a senior applied math major, after working with him last quarter. Our project explores quantum computing—a subject of personal significance as it was the focus of my first reading course. We started with the basics last quarter, progressing from the fundamentals of qubits and quantum gates to more advanced topics like Shor’s algorithm. Now, we are diving into quantum error correction. As the exciting culmination of this project, Shawn will implement Grover’s algorithm—a $O(\sqrt{N})$ search algorithm—in IBM’s *Qiskit* and run the code on one of IBM’s quantum computers.

Mentoring the same student across multiple projects has allowed me to provide deeper, tailored guidance. Having built trust with Shawn, I have been able to offer insight on classes that complement his upcoming career. Watching his growth has been incredibly rewarding and I’ll be proud to see him graduate this spring.

Volunteering and Additional Mentorship. Outside of these recurrent programs, I participate in volunteer opportunities to mentor students throughout the year. For example, I recently participated as a guest judge at a middle school science fair. I had the opportunity to listen to 20 students excitedly present their projects and engage them in questions about their methods. I am also currently mentoring a first-year graduate student, meeting regularly to answer questions about qualifying exams and the process of finding an advisor.

Future Plans. These experiences have only reinforced my excitement for academia and my desire to become a professor. In the next phases of my career, I am eager to take on larger leadership roles in programs like ORMC, expanding opportunities for young students through my expertise or funding. As a professor, I look forward to leading my own research projects with graduate students. Much like my advisors did for me, I hope that I can encourage my future students to continue the cycle of academic mentorship.