Teaching Dossier

Alejandro Santacruz Hidalgo,
Part Time Faculty,
▦ MC #266,
Department of Mathematics,
Middlesex College,
Western University,

✉ asantacr@uwo.ca

Contents

Brief Biography

My first opportunity to teach came in 2016 while pursuing a Master's degree in Mathematics at the National University of Colombia, I was an instructor for introductory mathematics courses, mostly taken by first and second year engineering students. These courses were Calculus II, III and Differential Equations.

In 2019 I joined the University of Western Ontario as a graduate student and since then I have been a teaching assistant for several different courses, which include Calculus, Linear Algebra and Real Analysis, where I was in charge of marking assessments and conducting tutorials to aid students understand the topics previously covered in lectures. During my PhD studies at Western, I was a course instructor for a first-year Calculus course during the fall term of 2023.

After concluding my PhD studies, in the Fall of 2024, I am a course instructor at Kings' University College, an affiliated college of Western University, and I am currently teaching a course in matrix algebra.

My background and experience have helped me become a passionate instructor; I enjoy teaching and look forward to developing my skills further as I pursue a career in academia.

Teaching Philosophy Statement

My teaching philosophy has been defined by my years of experience with mathematics as a student, teaching assistant and instructor. These different roles enhance several distinct skills needed to listen and impart lectures, preparing assignments, presentations and exams, leading one-on-one and group tutorials, designing questions and exams. I truly believe that mathematics is one of humanity greatest creations, an art and science all in one, therefore I have been in constant seek of opportunities to share this passion with as many people as possible and aid the students in their personal and professional formation.

Throughout my teaching career, I have had the opportunity to share learning environments with a very diverse class of students. I have had the opportunity to interact with students within a huge range of ages, socio-economic and academic backgrounds. These interactions have aided me in understanding the role of the instructor in the learning process: although every student requires a specific approach towards the subject, there are common problems while learning mathematics, which allow me to model my teaching style in the most beneficial way; providing meaningful lectures, reading material and assessments for the students to understand the material. My goal is that students look at mathematics as a beautiful and insightful part of their academic upbringing.

It is my experience that many students share a similar mindset about mathematics: it is a hard subject, only accessible for geniuses or very bright students. Mathematics is useless in "real life" unless one wants to become a scientist, and even then, it is better to avoid it as much as possible. That mathematics is boring and uninteresting and pointless abstraction. My teaching philosophy stands on trying to change this view of mathematics, trying to see mathematics as worth doing, beautiful and greatly rewarding.

Teaching Responsibilities

Western University: Course instructor (Fall 2023, Winter 2025)

I was a course instructor during my final year as a Ph.D candidate at Western University. After graduating I have had the opportunity to teach as part time faculty.

- **Math 1229B: Methods of Matrix Algebra (Winter 2025)**

  First-year course offered to students at main campus and affiliated colleges. The main contents of this course are: equations of lines and planes, methods to solve systems of linear equations, introduction to matrices and determinants. At main campus, the course is offered as a blended course with online asynchronous instruction combined with in-person weekly tutorials. I was in charge of three groups, each of around 120 students. My main role was to prepare and present the tutorial material, design questions for assignments and midterms, and hold office hours twice per week intended to help students with questions from the lectures or problem sets.

- **Calculus 1000A: Calculus I (Fall 2023)**

  First-year course offered to any student in the university and affiliate colleges. The main contents of this course are: Review of limits and derivatives of exponential, logarithmic and rational functions. Trigonometric functions and their inverses. The derivatives of the trig functions and their inverses. L'Hospital's rules. The definite integral. Fundamental Theorem of Calculus. Simple substitution. Applications of integration, including areas of regions and volumes of solids of revolution. The course consisted of an approximate 200 students and the main lectures were held four times per week for 12 weeks. My main role was to prepare and present the lecture material. Design questions for assignments and midterms. Hold office hours twice per week intended to help students with questions from the lectures or problem sets.

King's University College: Course instructor (Fall 2024)

King's University College is a university college in London, Ontario, Canada, affiliated with St. Peter's Seminary and the University of Western Ontario. It is a Catholic, co-educational, liberal arts college. I was an instructor for:

- **Math 1229A: Methods of Matrix Algebra (Fall 2024)**

  First-year course offered to students at main campus and affiliated colleges. The main contents of this course are: equations of lines and planes, methods to solve systems of linear equations, introduction to matrices and determinants. The course consisted of approximately 40 students and the main lectures were held 2 times per week for 12 weeks. My main role was to prepare and present the lecture material. Design questions for assignments and midterms. Hold office hours twice per week intended to help students with questions from the lectures or problem sets.

Western University: Teaching Assistant (2019-2024)

During my graduate studies at Western University for both Ph.D and MSc I was a teaching assistant for undergraduate courses.

- **Mathematics 1600: Linear Algebra I (Summer 2024, Winter 2024, Summer 2023, Winter 2023, Fall 2022, Summer 2022, Winter 2022, Fall 2021, Summer 2021, Winter 2021, Fall 2020)**

  First year course offered for students intended to major in the Faculty of Science. This course is a first introduction to: properties and applications of vectors; matrix algebra; solving systems of linear equations; determinants; rank-nullity theorem; orthogonality; eigenvalues and eigenvectors. The course consisted of an approximate 500 students and the main lectures were held twice per week during 12 weeks. The students are divided into tutorial groups of approximately 40 students each. Each group meets one hour per week and I was in charge of running up to two of these groups. My main roles during these sessions were to review material from the course, answer questions from the students, and run practice problems. I was also involved in marking and providing effective feedback for each exam.

- **Mathematics 2122: Real Analysis I (Winter 2024, Winter 2023, Winter 2022)**

  Second-year course offered to students majoring in any of the Mathematical sciences serving as a rigorous introduction to mathematical analysis. The main contents of this course are: Sets and functions; logic and mathematical proof;

the natural and real numbers; completeness and its consequences; limits of sequences; limits of real functions; continuity and uniform continuity. The course consisted of an approximate 40 students and the main lectures were held twice per week during 12 weeks. My main role was to grade and provide effective feedback on the assignments sent by the instructor as well as the exams.

- **Calculus 1500: Calculus I for the Mathematical Sciences (Fall 2022, Fall 2021, Fall 2020)**

  The course is an enriched version of first year calculus offered to students pursuing a major in any of the Mathematical sciences. The main contents of this course are: Basic set theory and an introduction to mathematical rigor; the precise definition of limit; derivatives of exponential, logarithmic, rational trigonometric functions; L'Hospital's rule; the definite integral; fundamental theorem of Calculus; Integration by substitution. The course consisted of an approximate 70 students and the main lectures were held twice per week for 12 weeks. My main role was to grade and provide effective feedback on the assignments sent by the instructor as well as the exams.

- **Mathematics 2122: Intermediate Linear Algebra (Winter 2021)**

  Second year course offered to students pursuing a major in any of the Mathematical sciences. The main contents of this course are: abstract vector spaces; linear transformations and matrices; determinants; characteristic polynomial; eigenvalues and eigenvectors; and diagonalization. The course consisted of an approximate 70 students and the main lectures were held twice per week for 12 weeks. The students were divided in 2 groups, I was in charge of leading tutorial sessions for one of the groups in which I answered student questions and solved practice problems. My other roles were to grade and provide effective feedback to the assignments sent by the instructor as well as the exams and proofreading the questions prior the assessments.

- **Mathematics 1229: Methods of Matrix Algebra (Summer 2020, Fall 2019)**

  First year course offered to students pursuing a major in any of the social sciences. The main contents of this course are: vector operations; system of linear equations; basic matrix operations; determinants. The course consisted of an approximate 500 students and the main lectures held twice per week during 12 weeks. My roles were to mark the exams and hold office hours before each assessment.

- **Mathematics 1228: Methods of Finite Mathematics (Summer 2020, Winter 2020, Fall 2019)**

  First year course offered to students pursuing a major in any of the social sciences. The main contents of this course are: techniques of counting; probability; discrete

and continuous random variables. The course consisted of an approximate 300 students and the main lectures held twice per week during 12 weeks. My roles were to mark the exams and hold office hours before each assessment.

- **Mathematics 1225: Methods of Calculus (Winter 2020)**

  First year course offered to students pursuing a major in any of the social sciences. The main contents of this course are: limits; evaluate derivatives; the chain rule; optimization; basic techniques of integration; Lagrange multipliers. The course consisted of an approximate 250 students and the main lectures held twice per week during 12 weeks. My roles were to mark the exams and hold office hours before each assessment.

- **Mathematics Help Centre (Winter 2020, Fall 2019)**

  The Math Help Centre is a space offered by the Department of Mathematics for all first- and second- year students to get help with any course in mathematics. The help centre is available 5 days a week during the afternoon (1pm-5pm) and it is staffed by new graduate students. Students come to the help centre to deal with specific questions, review from lectures, or use it as a study space with help on hand when needed.

National University of Colombia: Instructor (2016-2017)

During my graduate studies at the National University of Colombia for MSc I was awarded the teaching assistant scholarship, which consisted of being in charge of an undergraduate course each semester. I was responsible for all the preparation of the lecture material, assignments, quizzes, and assessment of the following courses.

- **Differential Equations (2017-I)**

  It is a fourth semester mathematics course for engineering students who have previously been introduced to the basic ideas of linear algebra and integral calculus. The main topics of this course are: first order linear, separable, and exact ordinary differential equations; second order homogeneous differential equations; variation of parameters; indeterminate coefficients; Laplace transforms; solutions via power series. Three midterm exams are held during the semester as well as a final exam. There was one extra mark based on weekly problem-solving by the students. I was in charge of preparing and delivering each lecture, designing and marking all the exams and practice questions.

- **Calculus in Several Variables (2016-II)**

It is a third semester calculus course for engineering students who have previously been introduced to the basic ideas of linear algebra and integral calculus. The main topics of this course are: partial derivatives, double and triple integrals; curves in space; line integrals; surface integrals; Green's-Divergence and Stokes' theorems. Three midterm exams are held during the semester as well as a final exam. There was one mark based on three written assignments. I was in charge of preparing and delivering each lecture, designing and marking all the exams and assignment questions.

- **Integral Calculus (2016-I)**

  It is a second semester mathematics course for engineering students who have previously been introduced to the basic ideas of differential calculus. The main topics of this course are: the fundamental Theorem of calculus, techniques of integration; applications of the integral; sequences and series; Taylor series. Three midterm exams are held during the semester as well as a final exam. There was one mark based on three written assignments. I was in charge of preparing and delivering each lecture, and designing and marking all the exams and assignment questions.

Evidence of Teaching Effectiveness
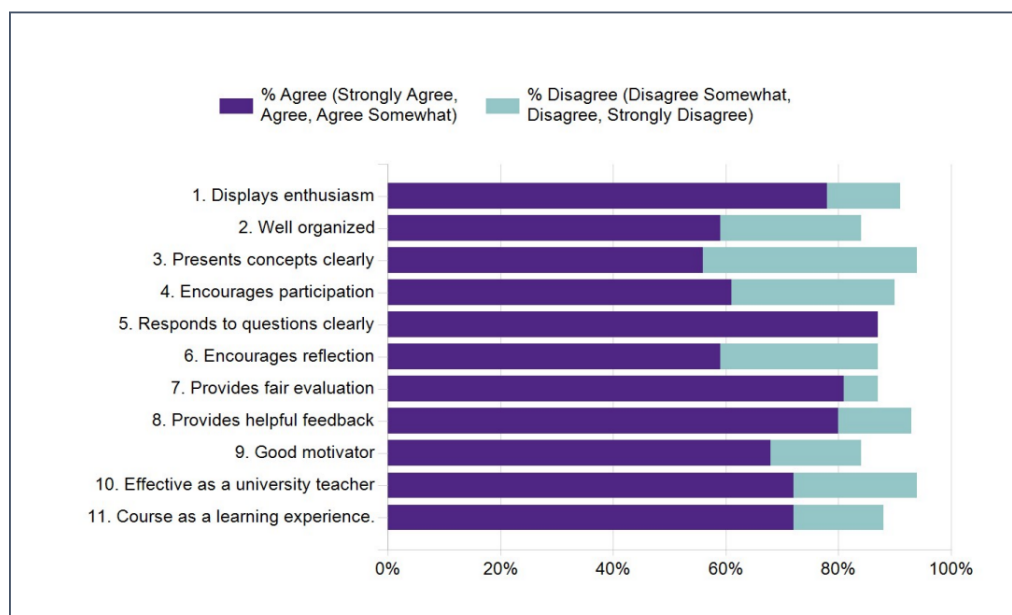
4.1 Formal teaching evaluations

4.1.1 Student evaluations

At Western University, students are able to evaluate their instructors' performance via an online polling platform. For the course Calculus 1000 in 2024, a total of 32 students filled the poll. Some of their comments were:

- Professor Alejandro Santacruz is a really good first year calculus teacher. He teaches the material in a effective way. He answers all questions pretty much whenever you ask. He is one of the few professors that encourages students to email him questions if there is not enough time to answer them in class. This shows his dedication in conducting the course, trying his best to prepare us for exams.

- I love the lectures, very clear, and concise, sometimes have a couple of hiccups in doing problems on the board, but overall, these are minimized. seems well–revised in material and is always ready to answer questions. Started out in the beginning of the course, more quiet and reserved, but now displays confidence and extreme proficiency in the subject. overall, great professor!

- Professor Santacruz has taught me very well and has set me up well for the course. He moves very quickly, which for some students may be difficult, but I believe that the pace is perfect. He answers questions well, and is open to answering any and all questions either during the lesson or directly afterwards. I think that he was a fantastic professor and I hope to have him again for Calculus. If not, then I would strongly recommend him to other first year students.

The following graph summarizes the evaluations. To see the complete evaluations click here.

Percentage Agreement and Disagreement for the Core SQCT Questions

At the National University of Colombia, students are able to evaluate their instructors' performance via an online polling platform. For the course Differential Equations in 2017, a total of 17 students filled the poll. Some of their comments were:

- He is an instructor who makes sure that his students know the origin of the topics he explains.

- He gives plenty of opportunities to get a high mark and makes an effort to make sure that the material is understood.

- He concerns about his students learning the material and makes sure that each concept is clearly understood.

- Very good teacher who explains the material clearly, presents it in a simple way, and does not make it look impossible.

- He respects the deadlines and wants the student to learn.

The complete evaluation can be read in the table below

Question	Yes	No
Did the instructor help you find connections between the subject and other courses or your study plan?	94%	6%
Did the instructor transform your way of thinking feeling or acting?	88%	12%
Did the instructor enhance your interest in the course material?	82%	18%
Did the instructor promote critical thinking?	71%	29%
Did the instructor help you aquire tools for self-learning?	82%	18%
Did you learn the course material with enough depth?	88%	12%
Would you take another course with this instructor?	100%	0%

Question	Always	Frequently	Sometimes	Never
Did the instructor prepare each session or activity properly?	100%	0%	0%	0%
Did the instructor spend enough time solving your questions?	88%	12%	0%	0%
Did the instructor show enthusiasm for his academic duties?	71%	29%	0%	0%
Was the instructor respectful with you and tolerant with your viewpoints?	88%	12%	0%	0%
Did the instructor make an effort for you to learn the material?	63%	37%	0%	0%
Did the instructor modify or adequate his teaching methods according to your needs?	38%	50%	12%	0%
Did the instructor respect the rules and deadlines for assesments?	94%	6%	0%	0%
Was the instructor fair and impartial during assessments?	100%	0%	0%	0%
Did the assesments aid you in improving your knowledge?	69%	24%	6%	0%

Question	V. High	High	Low	V. Low
What was the overall performance of the instructor?	44%	56%	0%	0%

4.1.2 Teaching assistant evaluations

The following table contains an average out of 3 evaluation forms, filled out by the course instructors.

Category	Average score (out of 5)
Teaching Assistant's Marking performance	5
Teaching Assistant's Teaching Performance	5
Effectiveness in completing assigned tasks	5
Promptness on arriving to the classroom, exams, office hours, etc.	5

The full evaluations are accessible here which include additional comments from the instructors.

4.2   Informal Teaching Evaluations

4.2.1   Peer Evaluations from Class Observations

I have received two recommendation letters from my colleagues as part of the teacher mentor program (TMP) offered by the Center of Teaching and Learning (CTL) at Western University. Receiving outstanding recommendations from colleagues in different fields demonstrates my ability to effectively teach class material to students of different backgrounds. To provide some context, the TMP involved other graduate teaching assistants observing my tutorials for the course Math 1600, a class which I was a teaching assistant for, to assess my teaching.

Part of this evaluation is as follows:

- "Alejandro is such a talented and dedicated educator, and he impressed me with his excellent teaching skills. It is a great pleasure for me to be an observer of his tutorial lesson on the topic of "Linear Algebra", which is an afternoon lecture occurred on March 16th, 2022. When it comes to studying Mathematics, most students would easily feel bored and lose interest in learning. However, Alejandro utilized a lot of active teaching strategies to keep students focused on the class. Alejandro is such an approachable lecturer in the class, students find it easy to seek support and ask for clarification from Alejandro. And he also used concise and easy-to-understand language to explain each question about Linear Algebra. The order of information presented is clear and logical. The pace of the lecture is good, with sufficient time provided for students to think and express their thoughts." Mingyao Zhu. Master of Professional Education in TESOL Program. (2022)

- "The lesson was well-organized, with the content and goals clearly outlined with adequate time to engage with all content planned. The lesson progressed logically from simple to complex concepts, with each concept explored actively via questions for individual and small-group work. His students were actively engaged with the material and with one another to build their understanding, while Alejandro circulated to address in-the-moment questions and facilitate his students learning. His technical knowledge and skill were evident throughout both conceptual instruction and activity summary. He not only conveyed the required content and correct answers, but also took time to clarify conceptual nuances, special circumstances, or common errors that students may encounter, and how to address these effectively." Melissa Knott, Instructor, School of Occupational Therapy, Western University (2022)

The complete review letters can be accessed here.

Teaching Strategies and Innovations

5.1 Course design

During my time as instructor, I prepared independently problem lists, assignments, and assessments considering the topics covered in the lectures and considering the most beneficial questions for the students to prepare for examinations. In particular, I gave each week a short problem set for the students to solve and explain to the class, that allowed me to constantly see the common difficulties that they had with the material and adjust the lectures and assessments accordingly.

I have a prospective Syllabus for a course in noncommutative Fourier Analysis that I am looking forward to delivering for future graduate students interested in Harmonic analysis.

5.2 Self-Reflection on teaching mathematics

Mathematics is an area in which it is challenging to engage the student with the abstract and often difficulty involved mathematical proof, it is not easy to create a student focused learning method. However, proofs is an essential part on learning the materials, as it develops reasoning skills and problem solving strategies, integrating short proofs on introductory courses is important in starting the students in this path. However, they should be participant in this process as much as possible; mathematics is an alive subject, therefore encouraging group discussion both in and out of the classroom is key for success.

Professional Development in Teaching

During my PhD studies, I pursued the Western Certificate in University Teaching to enhance my teaching career. Its goal is to enhance teaching skills for graduate students and postdoctoral fellows at the University of Western Ontario, and to prepare them to become future faculty or for their professional careers.

6.1   Courses and programs on teaching

- **Teaching mentor program (Winter 2022)**

  The Teaching Mentor Program is a cohort-based hands-on learning experience, wherein participants work with a group of 5 interdisciplinary (Education, Engineering, Linguistics, Health science, and Mathematics) graduate students and postdoctoral scholars to observe and offer feedback on one another's teaching. Our group met multiple times throughout the semester and attended as students in each other teaching demonstrations. An example of the feedback letters that I provided to my peers can be accessed here.

- **Teaching assistant training program (Winter 2022)**

  The Teaching Assistant Training Program is a hands-on, twenty-hour blended program comprised of both asynchronous and synchronous learning, designed for new TAs embarking on their teaching careers. In this program, candidates learn about fair grading practices, diversity in the classroom, lesson design, and giving students feedback on written work and get real-time, hands-on teaching experience through micro-teaching sessions with a small group of peers and receive helpful, constructive feedback.

  A complete file with the feedback for the micro-teaching sessions is accessible here.

6.2   Teaching workshops and conferences

- **Own your future: May conference in teaching (May 2022)**

  This is a special one-day event for doctoral students at the University of Western Ontario. Participants are invited to join one or more conference sessions to enhance skill areas related to teaching, set personal goals for growth as instructors,

and connect teaching experiences to their overall professional development as graduate students.

- **Future Prof 2022: Spring perspectives of teaching (May 2022)**

  This is a full-day conference designed to showcase teaching innovations at Western and introduce instructors to best practices in student-centered instruction which can enhance the student experience. Approximately 300 faculty, graduate student instructors, and staff participate in each Perspectives on Teaching conference.

- **Research on teaching and learning symposium (April 2022)**

  The Research on Teaching and Learning Symposium showcases research on teaching and learning projects being done here at Western. It also provides the opportunity for faculty members, librarians and archivists, postdoctoral scholars, and graduate students who wish to learn more about research on teaching and learning or who have considered doing such a scholarship to hear about colleagues' projects and ask questions.

Workshops

- Decolonizing the Academy: Finding your role (October 2022).

- Creating a critical thinking reference guide for your classroom (October 2022).

- Decentering English in your classroom (May 2022).

- Accessible online learning (December 2021).

- Digital classroom management strategies (December 2021).

- Explaining difficult concepts in science (December 2021).

- Facilitating discussion online (December 2021).

- Fostering respectful and inclusive online environments (December 2021).

- Humanizing your virtual classroom (December 2021).

- Introduction to grading using OWL (December 2021).

- Preparing students for online learning (December 2021).