

# Teaching Portfolio

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# Introduction

I'm a postdoctoral lecturer in the Department of Mathematics at Northwestern University. I was a postdoctoral fellow at the University of Western Ontario from 2019 to 2021. I obtained my Ph.D. from JHU in 2019 with a thesis titled *An application of the h-principle to Manifold Calculus*.

My academic responsibilities have included:

- coordinating and teaching multi-section courses
- teaching in-person and online courses with several hundred students,
- adapting large service courses for asynchronous education,
- creating advanced electives and short boot camp courses for small groups of students,
- managing TAs,
- hiring mentors for summer camps,
- supervising reading courses and reading programs,
- creating open education resources such as Webwork questions,
- creating polished course notes,
- formalizing mathematics in Lean theorem prover.

I particularly enjoy designing a course from scratch and experimenting with its various components. I have taught topics spanning calculus, linear algebra, differential equations, linear programming, discrete math, proof checking using computers, manifolds, and algebraic topology. My current focus is on incorporating technology into my courses and making the classes more helpful to students interested in applied fields.

# Chapter 1

## Teaching Statement

### Teaching Philosophy

I believe the best way to learn math is by making mistakes, getting confused, and struggling toward a solution. I consider myself a coach and a facilitator. I teach with the core philosophy that my primary goal is to provide my students with a welcoming and inclusive environment where experimentation is encouraged, and honest mistakes aren't penalized. I use active learning techniques in all my classes. I believe that a math classroom is a place for students, and even the instructor, to grow as mathematicians.

My teaching experience ranges from creating advanced electives and short boot camp courses for small groups of students to managing and teaching in-person courses with several hundred students, coordinating multi-section classes, and adapting large service courses for asynchronous education. I have taught topics spanning calculus, linear algebra, differential equations, discrete math, linear programming, proof checking using computers, manifolds, and algebraic topology. I have contributed to open source texts using technologies such as Webwork, Pretext, and RMarkdown. I'm involved in the long-term project of math-formalization using the Lean theorem prover.

### Use of Technology

Students retain their knowledge better when they engage with a subject through multiple modalities. I find technological tools to be perfect for accomplishing this. I created weekly Excel worksheets for modeling linear programming scenarios for teaching Optimization. For Discrete Math, I used an online textbook with (compulsory) interactive activities scattered throughout the text and made YouTube videos for each section embedded directly in the book. Student responses to these have been overwhelmingly positive. I intend to use modeling resources provided by SIMIODE\* to teach Differential equations in Spring.

I strongly believe in making education more accessible by creating open educational resources (OER). We now have the technological tools to make this possible. I have co-received an OER Faculty Grant for adding WeBWorK exercises to my colleagues' Linear Algebra OER textbook written in PreTeXt. I also intend to turn my Optimization course notes into an OER textbook. I already make all my course notes available on my website.

### Diversifying Assessments

Students often perform poorly on exams not because of a lack of understanding but because of exam anxiety and a lack of exam-taking skills. Traditional exams do not faithfully represent the challenges students are likely to face in real life either. As such, in every course I teach, I try to provide a variety of assessments explicitly catered to students' needs. In my Optimization course, students had to submit an Excel Workbook involving several modeling exercises instead of taking a final exam. For Discrete Math, taught during Covid,

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\*Systemic Initiative for Modeling Investigations & Opportunities with Differential Equations

we created a repository of new WeBWorK problems over the summer and replaced in-person exams with ones on WeBWorK and Zoom. Students also had to submit weekly short auto-graded assignments within the textbook, which provided immediate feedback. For the Algebraic Topology course, I replaced the final exam with an oral and written report as I was more interested in testing students' ability to approach a challenging problem than actually getting rigorous proof in a short amount of time.

## Course Design

I continually update my courses as every cohort of students is unique. I try to imagine the class from students' perspective and adapt it to their level of mathematical maturity while being vigilant of the expert blind spot. It is essential for me that my course is meaningful and intellectually fulfilling to students. I completely restructured my Optimization course to make applications and modeling a critical component. I created my own notes using RMarkdown as I did not find books with the right mix of theory and applications. I have designed and taught an entirely flipped Honors Single Variable Calculus course at JHU. At Canada/USA Mathcamp, I had to develop and teach a short five-day class every week for five weeks while being involved with other camp activities. I could not have asked for better training grounds for course design.

## Classroom Environment

I make great efforts to ensure that a course syllabus is welcoming and encouraging, being the first document that students see. While teaching online during Covid, my priority was to alleviate student anxiety and ensure students were not disadvantaged because of the lack of face-to-face meetings and technical difficulties. After each (auto-graded) exam, I went through all student responses to reassign any points lost due to minor typos and system errors. I also maintained an active discussion forum on Piazza to foster a sense of community. I have taught coordinated courses where I was the sole point of contact for over 150 students. This challenging experience taught me how to be more inclusive and considerate of students from very diverse backgrounds and ensure that even those with other priorities can benefit from learning math in whatever way possible.

I strive to get my students comfortable with the messy process of discovery in math. My classes are fun, interactive, and often flipped. I greatly value one-to-one interactions as it is important for me and valuable for students to see me struggle and make mistakes. I hold many office hours in a collaborative space that encourages group work. My office hours always have high attendance. I memorize all of my students' names so I can connect with them personally.

## Professional Development

I try to keep myself updated on the advances in pedagogical techniques and find it valuable to hear about other educators' experiences. I am a member of the Project NExT'20 cohort, a professional development program sponsored by the MAA for math educators at the university level. I have completed a certification course at the Teaching Academy at JHU. Here I learned about several pedagogical concepts such as inquiry-based learning, backward course design, and learning objectives, which I regularly incorporate into my teaching. I have regularly attended workshops and seminars organized at the Center for Teaching and Learning at UWO and NU and, most recently, MAA<sup>†</sup> Open Math Workshops and SIGMAA<sup>‡</sup> IBL workshops by MAA. In addition to providing me with new information and skills, these workshops also allow me to take on the role of a student and stay an active learner.

## Mentorship

I find it fulfilling to mentor students outside of the regular classroom setting. I am currently a supplementary instructor for the Causeway Postbaccalaureate Program, a yearlong experience in mathematics that seeks to increase the number of graduate students in the mathematical sciences from historically underrepresented groups. I am also a co-director of the Northwestern Emerging Scholars Program, a program similar to math

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<sup>†</sup>Mathematics Association of America

<sup>‡</sup>Special Interest Group of the Mathematical Association of America

circles but for first-year students. I have organized and participated in a Directed Reading Program that pairs undergraduate students with graduate students/junior faculty to undertake independent study projects as a mentor and a co-organizer. I started a DRP chapter at UWO here with the help of one of my colleagues.

My biggest influences have come from being a mentor (2017-20) and an academic coordinator (2018) at the Canada/USA Mathcamp, a summer program for high school students. Mathcamp allowed me to be a part of a loving and caring community, surrounded by people who love math and love to teach and excel at it. I took on the role of an academic coordinator to contribute back to Mathcamp, challenge myself, and learn more about teaching. The academic coordinators are responsible for designing and running all the educational activities, including inviting and hosting external visitors, planning a balanced five-week class schedule (nearly 60 classes), assigning (110) students to projects, and teaching.

### **Future Goals**

In the future, I wish to incorporate more active learning in coordinated courses without putting undue pressure on individual instructors. This is particularly challenging as most instructors are primarily researchers and often have very limited time to dedicate to teaching. I believe the solution is to provide enough structured resources (like online assessments, modeling first textbooks, programming assignments in SageMath, and IBL scripts) so as to incorporate active learning at no extra cost. I also wish to teach more interdisciplinary courses that involve student projects and real-world applications in the future. Finally, I am contributing to Open Education Resources. I want to expand these projects in the future with a focus on book publishing and online assessments, as these resources are bound to play a central role in successfully adapting courses to an online setting. I am especially interested in exploring and helping develop alternatives to Webwork, such as Numbas and Doenet.

## Chapter 2

# Teaching Experience

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2023 Spring*	Elementary Differential Equations
2023 Winter	Foundations of Mathematics
2022-23	MENU Linear Algebra and Multivariable Calculus (Course Coordinator)
2021-22	MENU Linear Algebra and Multivariable Calculus (Coordinated)
2022 Spring	Introduction to Optimization
2022 Winter	Introduction to Optimization
2021 Fall	Single Variable Calculus (Coordinated)
2021 Winter <sup>†</sup>	Algebraic Topology
2021 Fall	Discrete Structures for Engineering (Online, Asynchronous)
2019 Winter	Calculus II for Mathematical and Physical Sciences (Coordinated)
2019 Fall	Calculus I for Mathematical and Physical Sciences (Coordinated)
2019 Fall	Topics in Category Theory
2018 Fall <sup>‡</sup>	Honors Single Variable Calculus
2018 Winter	Symmetries & Polynomials
2017 Fall	Honors Single Variable Calculus
2017 Winter	Hitchhiker's Guide to Algebraic Topology
2017 Summer	Differential Equations with Applications
2015 Summer	Differential Equations with Applications
2014 Summer	Online Linear Algebra
2017-20	Various Canada/USA Mathcamp courses
2018	Canada/USA Mathcamp Academic Coordinator

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Below I provide details about some of my courses.

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\*Northwestern University

<sup>†</sup>University of Western Ontario

<sup>‡</sup>Johns Hopkins University

## 2.1 Introduction to Optimization

*Northwestern University, Fall and Winter 2021*

I taught this quarter long course for two quarters in Winter and Spring 2021. The course was aimed at upper level undergraduates majoring in math and economics and covered the topics of linear programming, simplex method, duality theory, and KKT conditions along with applications. The class had on average 12, mostly final-year, students.

- **Class Notes:** Most textbooks I encountered were either too theoretical or too applied. I did not find a textbook that was a good fit for this course. As such, I wrote detailed notes for this course in RMarkdown which can be found here: [apurvanakade.github.io/Introduction-to-Optimization](https://apurvanakade.github.io/Introduction-to-Optimization).
- **Excel Worksheets:** I designed the course to have both a theoretical and a practical component. The lectures focused on the theory of optimization and the discussion sections focused on applications. Students had to model and solve optimization problems during the weekly discussion sections using the Solver tool in Excel. These were to be submitted at the end of the quarter and formed a significant assessment component.

## 2.2 Algebraic Topology

*University of Western Ontario, Winter 2021*

In Winter 2021, I taught a semester-long course at UWO on Algebraic Topology for graduate students and upper-level undergrads. This was a small class with 6 graduate and 6 undergraduate students. The main textbook for the course was Hatcher. The course covered topics such as the fundamental group, covering spaces, and singular homology. This was a fully online course delivered over Zoom. I used GoodNotes for course delivery. I replaced the final exam with an oral exam and a written report as I was more interested in testing students' ability to approach a challenging problem than actually getting a rigorous proof in a short amount of time. The course relied heavily on solving challenging homework problem sheets, which I paid meticulous attention to develop. The problem sheets for this course can be found here: [problem sets](#).

## 2.3 Discrete Structures for Engineering

*University of Western Ontario, Fall 2021*

This was a semester long four-credit course offered to second-year software engineering students. Students were introduced to fundamental concepts in discrete math, such as logic, combinatorics, modular arithmetic as well as proof-writing. I was the only instructor for this course. My class had nearly 200 students. I had to adapt the course to fit an online mode of delivery.

This has been most challenging teaching project so far as over the summer I had to adapt a regular course to an online asynchronous setting. While I was preparing for the course, my priority was to reduce student anxiety, simplify the course delivery as much as possible, and minimize the screen time for students.

- **Textbook:**

I decided to abandon the traditional textbooks and chose an online one, called Zybooks, which had interactive components and provided students with immediate feedback. The book is also extremely comprehensive and contains copious amounts of auto-graded exercises, in addition to several practice problems, which I assigned weekly to help keep students on track. Finally, the book is exceptionally configurable, both in terms of content and structure. The textbook can be found here: [learn.zybooks.com/zybook/UWOMath2151ANakadeFall2020](https://learn.zybooks.com/zybook/UWOMath2151ANakadeFall2020)

- **Video Lectures:**

To minimize the amount of required screen-time for students I made short videos for each topic instead of a long one for each lecture. Having a textbook that I knew would fill in the gaps left out by the



short lectures was crucial for making this choice. I embedded these video lectures directly within the textbook to provide a centralized resource to students, much like other online platforms such as Coursera and Kaggle. The video lectures are also available on YouTube at the following link: <https://www.youtube.com/playlist?list=PLXAOfwfSuiKm3cL-JftD9ndrjYi7fPcqN>

- **Exam:**

I decided to use WeBWorK to make exam problems. I chose WeBWork because it is robust and reliable, and it allows for both internal randomization within a question and randomization between questions. With my postdoc advisor and two students' help, we designed a repository of several hundred problems for discrete math on WeBWork. Having an extensive repository of questions enabled me to create unique exams for every student. This repository is easily portable and can be adapted to any discrete math course.

- **Rubric for proofs:**

This course introduced students to proof-writing in addition to logic and combinatorics. This was especially challenging to teach in an online asynchronous setting as it is not possible to provide students with immediate feedback. To remedy this, I decided to grade students on only the *writing* part of proofs. I designed the homework questions based on the textbook questions (for which detailed solutions were provided) and provided students with a rubric on which their writing was going to be graded.

- **Discussion forums:**

I realized early on that communication was going to be the key to this course's smooth running. For this reason, I choose Piazza as a discussion forum to answer student questions and encourage them to answer each other's problems. Piazza is very intuitive, easily searchable, and allows for anonymous posts. A demo of the discussion forum can be found here: [https://piazza.com/demo\\_login?nid=kd1r8nxc6z4b5&auth=f76e59e](https://piazza.com/demo_login?nid=kd1r8nxc6z4b5&auth=f76e59e)

## 2.4 Honors Single Variable Calculus

*Johns Hopkins University, Fall 2017, 2018*

At JHU, I got an opportunity to develop and teach Honors Single Variable Calculus for two semesters. This is an experimental full semester four-credit course offered at JHU to first-year undergraduates. The course covers all of the first-year calculus and introduces students to proof writing.

This is the first course I had to design from scratch. In the previous years, the course was mostly taught in a lecture format. I decided to transition to a fully inquiry-based format. For this, I took the suggested textbook for this course and converted it into weekly guided exercises. Because the classes were small, I often dynamically modified the course material to suit the class. Designing this course gave me insights into the process of student learning and helped me combat expert blind spot. The materials for this course can be found here: <https://apurvanakade.github.io/for-students.html#honors-single-variable-calculus>

## 2.5 Intersession Courses

*Johns Hopkins University, Winter 2017, 2018*

I taught two week-long intersession courses titled Hitchhiker's Guide to Algebraic Topology and Symmetries & Polynomials. I taught both of these courses in a flipped classroom format. I assigned students guided exercises, which they solved to learn more about the subject. What was both challenging and fun was that the students were not math majors; I had to remove all the mathematical jargon and could not even expect them to know how to write proofs. I had to design my course around concrete examples and find easily accessible concepts.

For Hitchhiker's Guide to Algebraic Topology, I asked the students to read and present applications of algebraic topology to other fields of science of their choosing. We had several exciting conversations about

things like applications of knot theory to protein folding and data science. The notes and the student presentations can be found here: [apurvanakade.github.io/courses/2017 h2g2 alg top/index.html](https://apurvanakade.github.io/courses/2017%20alg%20top/index.html)

## 2.6 Canada/USA Mathcamp

I taught at an intensive, residential, five-week summer camp for mathematically talented high school kids for five summers. The academic day at the camp is filled with classes, talks, and office hours with more than 100 courses offered each summer, covering material typically only encountered in college or grad school. My non-teaching duties included living in the dorms with students as an RA, being an academic advisor, and advising students on which courses to take. More information can be found here: [https://www.mathcamp.org/jobs/grad\\_students/](https://www.mathcamp.org/jobs/grad_students/)

- **Mentor:**

I designed and taught week-long courses on advanced mathematical topics such as linear algebra, manifolds, Riemann surfaces, representation theory, computer-assisted theorem proving, and mentored several reading and coding projects. A defining feature of Mathcamp is that each student designs their own schedule (with the guidance of an academic advisor). As such, the courses need to be designed to be both interesting and challenging. This year I had the added challenge of doing this online. For this, I decided to create a hybrid coding/math course that introduced students to computer-assisted theorem proving. For my more traditional courses, I taught using Jamboard, which allowed students to scroll through the previous pages. Notes from my Mathcamp classes can be found here: <https://apurvanakade.github.io/teaching.html#canadausa-mathcamp>.

- Lean at MC2020
- Crash course on linear algebra
- Galois correspondence of covering spaces
- From high school arithmetic to group cohomology
- Cohomology via sheaves
- How curved is a potato
- Would I ever lie group to you?
- Riemann surfaces
- All things manifoldy

- **Academic Coordinator:**

In the summer of 2017, I was one of the two academic coordinators at Mathcamp. The academic coordinators are responsible for designing and running all the educational activities, including inviting and hosting external visitors, preparing a balanced five-week class schedule (more than 100 classes), assigning (110) students to projects, teaching, and being a part of the hiring team. More information can be found here: <https://www.mathcamp.org/2018/staff/>

## Chapter 3

# Grants & Awards

This website is under construction and should be up-to-date by the end of September.

### 3.1 Open Educational Resources Faculty Grant, NU 2022

I received a \$10K Open Educational Resources Faculty Grant, joint with Aaron Greicius, at Northwestern University. The grant is for adding interactive WeBWorK and Sage exercises to Aaron's open-source Linear Algebra textbook available here: <http://linear-algebra.northwestern.pub/frontmatter-1.html> We hope to make the textbook self-contained and a complete replacement for a standard linear algebra text.

### 3.2 Undergraduate teaching awards

- **William Kelso Morrill Award for Excellence in Mathematics**, JHU 2019

Awarded each year to the graduate student who best displays love of teaching, love of mathematics, and concern for students

- **Finalist for the KSAS Excellence in Teaching Awards**, JHU 2019

The award honors the best graduate TAs in the School of Arts and Sciences for the care and concern they take with their subject and their students.

- **Prof. Joel Dean award for Excellence in Teaching in Mathematics**, JHU 2016

Annual award to recognize graduate students and faculty who have exhibited extraordinary performance in teaching undergraduates

### 3.3 AMS Graduate Student Travel Grant 2019

I was awarded a \$250 travel grant by AMS for giving a talk at AMS Sectional Meeting

## Chapter 4

# Mentoring

### 4.1 Causeway Postbaccalaureate Program

I am a supplemental instructor for the Causeway Postbaccalaureate Program at Northwestern University for the 2022-23 academic year. My duties include meeting with the participants weekly as a tutor in addition to holding office hours and liaising with course instructors to provide additional examples, exercises, and review for the students.

The Causeway Postbaccalaureate Program is a yearlong experience in mathematics that seeks to increase the number of graduate students in the mathematical sciences from historically underrepresented groups. Beginning in July 2021, Causeway participants will undertake a rigorous program of study in foundational coursework; work closely with Northwestern faculty on an appropriate research project; and receive career mentoring while serving as mentors for other groups themselves.

### 4.2 Northwestern Emerging Scholar's Program

I am a co-director of the Northwestern Emerging Scholar's Program. My duties include coordinating weekly math-circle sessions for first year undergrads and various administrative tasks such as preparing problem sheets and advertising etc.

### 4.3 Directed Reading Program

I've helped *start* and organize the DRP at UWO and in the past have co-organized the DRP at JHU. The Directed Reading Program is a program in which undergrads are paired with a graduate student/postdoc whose interests align with theirs and they study a topic of their choice for one semester. It is intended to help motivated students explore topics in more depth than possible in a classroom setting.

### 4.4 Topics in Category Theory

In Fall 2019, I supervised a topics course on topics in category theory for graduate students at UWO. We covered topics from Weibel's Homological Algebra and Emily Riehl's Category Theory in Context textbooks.

## Chapter 5

# Professional Development

### 5.1 Project NExT

Mathematical American Association's Project NExT (New Experiences in Teaching) is a professional development program for new or recent Ph Ds in the mathematical sciences. It addresses all aspects of an academic career:

- Improving the teaching and learning of mathematics
- Engaging in research and scholarship
- Finding exciting and interesting service opportunities
- Participating in professional activities

This program provided the opportunity to connect with and learn from other math educators from all over the country. Since participating in the program, I've joined various MAA communities and actively learned from others' experiences.

### 5.2 JHU Teaching Academy Certification

I have obtained a teaching certification from the Teaching Academy at JHU. The Teaching Academy's Certificate of Completion program is designed to help prepare Ph.D. students and Post-doctoral Fellows for academic careers and assist in acquiring a foundation for the teaching responsibilities associated with their first faculty appointments. This program exposed me to teaching as a scholarship and interested me in my current career as a math educator.

### 5.3 SIMIODE Workshop

I attended a week-long MAA Open Math workshop in Summer 2022 about teaching differential equations using a modeling first approach. This workshop was based on SIMIODE (Systemic Modelling Opportunities with Differential Equations) resources. The workshop was highly relevant as I will be teaching this course in Winter 2023. I intend to redesign it to make it more applied and incorporate projects in assessments. I also plan to use the newly published SIMIODE textbook as the primary textbook. The workshop was also well-organized, and I learned a thing or two about how to run an excellent online program.

### 5.4 SIGMAA IBL

I have been participating in SIGMAA IBL (Special Interest Group of the Mathematical Association of America for Inquiry-Based Learning) since joining Project NExT. IBL SIGMAA aims to bring practitioners

and others interested in IBL together to share teaching resources and experiences, encourage and publicize research related to IBL, and promote the proliferation of IBL in Mathematics through conversation and professional development. I regularly attend their monthly talks about IBL teaching resources and experiences.

## **5.5 Critical Issues in Math Education Workshop**

I attended the CIME workshop at MSRI in Summer 2022. The workshop brought together teachers and researchers from universities, community colleges, and K-12 schools. The goal was to explore the reasons for and processes by which change in university mathematics departments is initiated, promoted and sustained and lessons learned from change efforts in K-12.

## **5.6 Northwestern Excellence in Teaching Alliance**

In 2021-22 I participated in Northwestern's teaching alliance program. The program provided reading resources and guides through a Canvas course hosted by the Searle teaching center at Northwestern. We met in small cohorts monthly to engage in conversations led by a faculty peer around teaching and learning.

## **5.7 Mastery Grading**

In Summer 2019, I participated in a workshop on mastery grading. During the workshop, we learned about standards-based grading, and we heard about how it has been implemented across a variety of courses.

## **5.8 Science of Learning Symposium, JHU**

I attended a biennial Science of Learning symposium at JHU from 2014-18. The event brought together experts in cognitive science, neuroscience, education, and other fields to explore different perspectives on the cognitive and neural bases for learning and motivation. I found the insights about the physiological basis of learning to be very helpful. I have since read more about these topics and even completed the "Learning how to learn" course on Coursera.

## Chapter 6

# Teaching Evaluations

### 6.1 Student Evaluations

The following table lists *median* scores for the questions of “Instructor Effectiveness” and “Course Experience” from end-of-course student evaluations. Detailed student responses can be found here: <https://github.com/apurvnaakade/PDFs/tree/main/teaching%20evaluations>

		Instructor Effectiveness	Course as a Learning Experience
2022 Spring	MENU Linear Algebra and Multivariable Calculus	6/6	5/6
2022 Winter	MENU Linear Algebra and Multivariable Calculus	6/6	5/6
2021 Fall	MENU Linear Algebra and Multivariable Calculus	6/6	6/6
2022 Spring	Introduction to Optimization	6/6	6/6
2021 Fall	Single Variable Calculus (coordinated)	5/6	4/6
2021 Fall	Discrete Structures for Engineering	7/7	7/7
2019 Fall	Calculus I for Mathematical and Physical Sciences	6/7	6/7
2018 Fall	Honors Single Variable Calculus	5/5	4/5
2017 Summer	Differential Equations with Applications	5/5	4/5
2015 Summer	Differential Equations with Applications	4/5	4/5
2014 Summer	Online Linear Algebra	3/5	3/5

#### 6.1.1 Selected Student Feedback

- This[Optimization] was the best math class I’ve taken so far at Northwestern. For the first time, I feel like I will carry the material I learned in class for years and years, as it’s so applicative to real world problems.
- Optimization is a really useful and practical math course that all math majors should take. It isn’t very proof-heavy and focuses more on computation.

- Apurva is phenomenal! He broke down key concepts with ease, and homework questions went over a variety of different examples. Optimization is interesting as a whole due to its wide applicability in other fields, but I felt this was an enjoyable course because of Apurva
  - Dr. Nakade is the best teacher for second-year software engineering. Your recorded lectures are very clear and make me happy as I actually understand after watching them. You seem like a very hard-working professor that truly cares about their students. Thank you! The zybook and PA and CA are just perfect for making me on-track. I'm never behind in this class because of the PA and CA.
  - The PAs and CAs are helpful and fun and an interactive way that helps me learn the concepts better. I like that I am not punished for when I get an answer incorrect and am instead presented with the solution so I can better understand it while learning. The webworks assessments are also a good and fair evaluation of my understanding (Also, thank you for not using Proctortrack because the idea of it really stresses me out.)
  - The use of ZyBooks to teach discrete math was an absolute genius move, as the online textbook paired with the instructor videos were extremely clear in explaining and testing knowledge of mathematical concepts. I recommend using it for future years
  - Apurva is the best Professor. Though his lecture notes can have minor mistakes, he is a very nice guy and you can ask him questions without being intimidated. His office hours are very helpful and talking to him about non-math things are also a lot of fun.
  - Professor Nakade is so kind and enthusiastic about helping his students learn. This quarter of MENU was definitely challenging (like the other two), but there is a strong system of support from office hours and studying with MENU friends that makes the course doable.
  - Apurva is very encouraging when you are struggling with a problem and you can really tell that he was excited about math and teaching!
- 
- He is really passionate about the subject and explains things well. He is very funny and approachable in class, and he gives a lot of opportunities for students to “check their understanding” by participating in class, working through problems as a class, etc. He also would always stay after class for questions if anyone had any.

## 6.2 Peer Evaluations

In Winter 2020, I participated in the Teaching Mentor Program at UWO. The Teaching Mentor Program is a cohort-based hands-on learning experience, wherein participants work with a group of 4-5 interdisciplinary graduate students and postdoctoral scholars to observe and offer feedback on one another's teaching. Groups will meet multiple times over the course of the semester, to act as students in one another's teaching demonstrations. My group had four participants whose feedbacks are attached here.



Dr Kevin Granville  
Postdoctoral Associate  
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London, ON N6A 5B7  
Canada  
kgranvil@uwo.ca

March 25, 2020

Dear Colleagues,

I am writing this reference in support of Dr Apurva Nakade, a fellow postdoctoral associate working at Western University. As a part of the Teaching Mentor Program offered by the Centre for Teaching and Learning, I observed Dr Nakade conduct a Calculus 1501B lecture for approximately 100 students on February 24, 2020.

Dr Nakade made use of a whiteboard in his lecture. Through the combination of clear writing, coloured markers, and good board practices (e.g., separating important information within boxes, separating portions of boards with vertical lines), I found his material very easy to follow. Something that stood out to me was that he carried no personal notes and everything he wrote for the students was from memory or improvised, clearly showing his mastery of the subject matter.

Dr Nakade also demonstrated great interactions with his students. Frequently throughout the lecture he would pause and prompt the class for any questions that they may have had. Despite the large size of his class, he responded to students by name, which was very impressive. After answering a particularly important question, he wrote the answer down on the board so that nobody in the class would miss it. Throughout the lecture, when Dr Nakade asked his students questions, there were no issues having them participate and provide their thoughts. Following the conclusion of the lecture, he remained in the classroom to answer any remaining questions from his students.

Having personally taken dozens of courses in Mathematics and Statistics, it is my impression that Dr Nakade is off to a strong start as a lecturer and will continue to improve as he continues his career in academics. If you have any further questions, please do not hesitate to contact me.

Sincerely,



Kevin Granville



Date: 19 March 2020

Dear Colleagues,

I am writing this letter to comment on the teaching practices of Dr Apurva Nakade. I observed Dr Nakade give a lecture as part of first year level Calculus course on the 5<sup>th</sup> March 2020. This lecture was part of the Teaching Mentor Program that is offered through the Centre for Teaching and Learning at Western University. The lecture was presented to a class of approximately 100 students, who were in their 1<sup>st</sup> year of undergraduate degree.

Dr Nakade employed an excellent combination of teaching methods, including the use of the white board to solve equations. The lecture content was organized in a very logical and easy to follow format, with seamless transition between theory, examples and answering student questions. I was especially impressed by the level of student engagement and how much students were encouraged to ask questions. Furthermore, Dr Nakade showed excellent interaction with the students, as seen by him referring to them by name and being clearly familiar with their level of knowledge. I was especially impressed by how Dr Nakade used his familiarity with the students to ensure questions are answered by different students and more people in the class had the opportunity to participate.

I observed a great relationship between Dr Nakade and his students, with open communication and feedback on how equations should be solved. He also clearly embraced suggestions for alternative solutions, but also emphasized the benefits and drawbacks of the alternative methods. I was delighted to see Dr Nakade bring in previous lectures and specific examples of equations that are needed for the current material to be analysed and focusing on key concepts.

Overall, I found the lecture I attended to be very well planned and executed, with a great balance of active learning components and real-life applications.

Sincerely,

A handwritten signature in black ink, appearing to read "Mariya Goncheva".

Dr Mariya Goncheva  
Postdoctoral associate  
University of Western Ontario



March 24, 2020

To whom it may concern,

I am writing this letter to comment on the teaching practices of Dr. Apurva Nakade. I attended a lecture that Dr. Nakade taught on Calculus, a basic algebra lecture. This lecture was presented during a peer-review process as part of the Teaching Mentor Program that is offered through the Centre for Teaching and Learning at Western University. The lecture was presented to a class of about 50 undergraduate students.

Dr. Nakade employed an excellent combination of teaching methods, mainly usage of the board, as the most appropriate way to teach mathematics. He created a learning environment that was very engaging and supportive, properly for undergraduate students. The lecture content was organized in a very logical and easy to follow format, with an excellent transition between theory, examples and answering questions. I was especially impressed by his ability in knowledge transformation and his comfort with the topic. It was amazing how he explained a new abstract concept in simple words and with many examples, which were quite understandable for the audience.

Dr. Nakade very well handled many questions after every step. His responses were very clear step-by-step solutions. So, he ensured each student received an opportunity to contribute in a very welcoming atmosphere without getting anxious. In other words, Dr. Nakade made the subject understandable and interesting to those with little formal or technical training in algebra.

Overall, I found the lecture I attended to be very well planned and executed, with a great balance of active learning components. I believe he would be an asset in any teaching role.

Sincerely,

A handwritten signature in black ink, appearing to read "M. Soltanlou".

Dr. Mojtaba Soltanlou  
Postdoctoral Associate  
University of Western Ontario

**Western University, The Brain and Mind Institute, Western Interdisciplinary Research Building (WIRB)**  
London, ON, Canada N6A 5B7, [mojtaba.soltanlou@uwo.ca](mailto:mojtaba.soltanlou@uwo.ca)

## Chapter 7

# Sample Course Materials

- Course notes for *Introduction to Optimization* course: <https://apurvanakade.github.io/Introduction-to-Optimization/>
- Syllabus for *Introduction to Optimization* course: <https://canvas.northwestern.edu/courses/164403/assignments/syllabus>
- Video lectures for *Discrete Math* course: <https://www.youtube.com/playlist?list=PLXAOfwfSuiKm3cL-JftD9ndrjYi7fPcqN>
- Textbook for *Discrete Math* course: <https://learn.zybooks.com/zybook/UWOMath2151ANakadeFall2020>
- Discussion forum for *Discrete Math* course: [https://piazzza.com/demo\\_login?nid=kd1rr8nxc6z4b5&auth=f76e59e](https://piazzza.com/demo_login?nid=kd1rr8nxc6z4b5&auth=f76e59e)

## Rubric for homework - Math

Trait	Does not meet (0)	Attempted (1)	Approaches
<b>Quality of upload</b>	None of the 3 criteria are met.	1 of the 3 criteria are met.	2 of the 3 criteria
<b>Interpretation of Problem</b>	Complete misinterpretation of what is given or what is to be shown. In this case, you get a 0 in all of the traits below.	Correct but incomplete interpretation of the problem. May overlook significant details in the statement of the problem.	Correct interpretation of the problem but the hypothesis (given) conclusion (to show) not clearly stated.
<b>Details</b>	Virtually no relevant details are present. In this case, you get a 0 in all of the traits below.	Additional relevant details are needed to develop most points.	All points are developed but some may need additional relevant details or some excess may be present.
<b>Reasoning (proof)</b>	The logical connection of the argument is weak, leaving the argument or explanation unclear. A "proof by example" falls here.	The reasoning offers apparent support for the argument, but the argument or explanation is weak.	Collectively, the logic offers adequate support for the argument, but the argument or explanation remains unclear or incomplete.
<b>Word Choice and Terminology</b>	Word choice or terminology is consistently inaccurate or inappropriate; many words or terms are notably misused.	Word choice or terminology is vague, limited, or repetitive, reflecting a weak grasp of the language appropriate to the proof.	Word choice and terminology is generally accurate, but reflects a partial or inconsistent grasp of the language appropriate to the proof.

- Rubric for grading proofs for *Discrete Math* course: