

TEACHING PORTFOLIO

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1 Teaching Philosophy Statement

“I bring coffee from home, and I want it to be as hot as possible when I arrive to work. Should I add the milk at home, or once I get to the office? Provide a non-technical explanation with your answer.” This was a homework question assigned to me when I was first learning about differential equations and thermodynamics. We were given all the information necessary to go through the mechanics and solve for the answer, but this simple question forced us to interpret the results from a different perspective and linked the mathematical equations to everyday life. As a student, the classes I found most influential and beneficial were taught by professors who emphasized the reasons why, not just how. As a teaching assistant, lead instructor, and participant in workshops on teaching pedagogy, I witnessed that students learn most effectively when they are involved in the learning process, motivated by realistic examples, and are asked to think about the bigger picture. I strive to incorporate these concepts into my teaching and course design.

I had the opportunity to be a teaching assistant of an introductory differential equations course during Brown University’s AAU STEM Project, Changing the Culture of Introductory Science. This initiative focused on including student-centered learning activities, such as problem-based recitation sessions, into introductory courses with the goal of improving student retention and performance. During recitation sessions, students completed worksheets in groups of three as myself and other TAs circled between groups. My role was to guide the students to the correct solutions without giving away the answers. Instead, I was trained to ask the students directed questions to justify their methodologies. I observed that in this low-stakes environment, students were more likely to take chances and explain concepts to their group members, which resulted in deeper levels of understanding. I employed similar techniques during office hours, which was well received by students with one commenting that I was “quite good at understanding and addressing points of confusion without giving too much away.” Motivated by my experiences as a TA, I participated in courses on inclusive teaching pedagogies offered by the Brown University Center for Teaching and Learning, which reinforced and expanded upon the practices I had learned.

In summer 2017, I was the lead instructor of Applied Ordinary Differential Equations at Brown University. In this role, I was responsible for setting course goals, designing content and materials, and assessing student learning. My experiences learning about inclusive and evidence-based teaching influenced the course structure; I used principles of backward design to identify key learning outcomes, created assignments to monitor mastery in these areas, and included activities to motivate and engage the students.

Problem-based recitation sessions were a fundamental part of class time each week, with questions selected to promote discussion of broader impacts of the course material. For the recitation sessions to be effective, the students needed to feel comfortable expressing their ideas and making mistakes. To create a safe and respectful learning environment, I learned each student’s name, greeted the class each morning, and talked with them during breaks. I modelled inclusive behavior and on the first day directly reminded students to respect the opinions and diverse backgrounds of their peers. I also handed out a questionnaire to get to know interests and reasons for taking the course, and asked that students not use cell phones in class to create a less distracting learning environment for their classmates. The class started out shy and quiet, but by the second week they were explaining the concepts to each other, debating the correct methods, and forming new friendships and study groups. Several students commented that “recitation sessions were very useful” and “problems were challenging but doable, helping us learn.”

One of my primary objectives was for the students to gain an appreciation of the usefulness of the course content. To meet this goal, on each homework assignment, recitation sheet, and exam

I included at least one application problem with topics chosen from engineering, physics, biology, immunology, and economics. I showcased the variety of applications, but also tailored the examples to the class interests based off responses to the first day questionnaire and other feedback. I found that many of my students shared my interest in mathematical biology, so I included a bit of my own research and biologically motivated questions into class discussions when applicable. For example, on the second midterm I provided relevant information and asked the students to write and analyze a model describing harmful algae blooms in the Great Lakes. I challenged the students to not only write and solve differential equations for the problem, but asked them to interpret what their results meant for the levels of toxic algae. Many students asked if the question was based in fact, so after handing back the exams I showed satellite pictures of algae blooms and we had a short class discussion examining the model validity and implications (see [sample exam problem](#)). In doing so, the students began to think about broader impacts of mathematics and how the course material applies to careers and active areas of research. One student commented that I “always made an effort to relate back to why, the point of learning these concepts, and how the material could be applied to real life problems.”

Understanding and grasping the importance of theoretical concepts and abstract language is frequently the hardest challenge for young mathematicians. Students can often complete problems, but lack the understanding of why methods work or why the theory is necessary. In my teaching, I aim to show students the purpose of the theoretical material. During class, and in posted course notes, I summarized and decoded complex theorems and proofs, emphasizing why we care about the material and how it relates to other concepts within and outside of the course. To reinforce the why, I included open-ended problems on exam review sheets, such as “State the definition of the Wronskian and comment on its implications in this course.” Students from the courses I TAed and taught commented that in exam reviews I “was able to concisely summarize many concepts while also talking about the reasons behind certain concepts” and “[put] together review questions to walk us through the material outside of class when studying.”

I assessed the students’ learning through both direct and indirect methods. The recitation session worksheets included periodic check-in points, during which I asked the students to first summarize their results with group members, then summarize results with me. To ensure participation and check for understanding, I asked each group member to explain a small portion of the problem. The recitation sessions and check-ins satisfied three objectives: they provided a reinforcement of the methods used to solve the problems, allowed the students to talk about the big picture ideas, and provided me with an immediate and informal assessment of the class understanding. If I observed confusion about a topic, it was addressed during the next meeting. Exams and weekly homework assignments provided formal assessment of learning. I used principles of backward design while creating the assignments to identify and monitor comprehension of important learning outcomes. I saw mastery of the course objectives through their performance on the assignments, midterms, and comprehensive final exam, but the growth of their answers also reflected an increase in deeper understanding, mathematical maturity, and confidence.

Every course will have a different atmosphere due to the unique students, class size, and content. Therefore, as an instructor, the most important aspect of planning for me is getting to know the students. Based on their interests, their reasons for taking the course, and what their learning goals are, I strive to structure the course and include a variety of teaching pedagogies to best benefit all learners.

2 Teaching Experience

Undergraduate Courses Taught

- **Applied Ordinary Differential Equations, Brown University, Summer 2017**

I was the lead instructor of Applied Ordinary Differential Equations which provides an introduction to the behavior and theory of scalar and systems of Ordinary Differential Equations and their applications. There were 14 students of a variety of backgrounds in this summer course, which had a condensed 7-week schedule but still covered all topics of the regular 16-week fall/spring version of the course. The course format consisted of lectures and student-centered problem-based learning recitation sessions.

I was responsible for all portions of the course, including leading lectures, facilitating and designing recitation sessions, holding office hours and exam reviews, creating and grading assignments and exams, and assigning final grades. The course content was based on the notes from when I was a teaching assistant for the same course in Fall 2015, however I did modify the course outline, assignments and worksheets, and created new exams. Examples of course materials that I used and designed are included in the [Sample Course Materials](#) section.

Teaching Assistant Positions

- **Applied Ordinary Differential Equations, Brown University, Fall 2015**

This undergraduate course provides an introduction to understanding the behavior of scalar and systems of Ordinary Differential Equations and their applications. There were more than 60 undergraduate students in the course; with concentrations primarily in applied math, math, physics, and other STEM fields. The course format consisted of weekly lectures and problem-based recitation sessions.

As a TA, my role was to facilitate recitation sessions, hold weekly office hours, exam review lectures, and grade assignments and exams. This course was part of Brown University's AAU STEM Project, Changing the Culture of Introductory Science, which focused on incorporating student-centered problem-based learning sessions to increase student performance. As part of this program, I received training to lead effective recitation sessions and office hours, and weekly feedback on my interactions with students (see [AAU STEM Project](#) section for full details).

- **Methods of Applied Mathematics I, Brown University, Spring 2016**

This undergraduate course provides an introduction to first and second order Ordinary Differential Equations, including how to solve equations, the Laplace Transform, and basic numerical methods. The course content is tailored to engineering applications. The more than 40 undergraduate students in the course were studying a variety of STEM fields, with most students concentrating in engineering.

As a TA, my role was to facilitate problem-based recitation sessions, hold office hours and exam review lectures, grade assignments and exams, and write homework solutions. I was the lead TA and created the worksheets for the weekly recitation sessions using principles of backward design, studies from active-based learning, and my experience as a TA in the Brown University AAU STEM Project. I also guest lectured for two regular class sessions.

Other Teaching Experiences

Guest Lectures, Brown University

- Applied Partial Differential Equations II, Fall 2016
Two lectures on topics from complex analysis. Material based off of instructors notes and course text.
- Topics in Chaotic Dynamics, Spring 2018
Three lectures on phase plane dynamics, conservative and reversible systems, and period-doubling bifurcations. Material based off of instructors notes and course text.

3 Sample Course Materials

Example syllabus, goals, worksheets, and problems for an introductory course on ordinary differential equations. Material was used in, or adapted from, 2017 summer course that I taught at Brown University.

Course Syllabus

Syllabus follows Brown University guidelines and has been updated to reflect the timeline of a fall/spring semester course rather than a condensed 7 week summer schedule.

APMA 0350: Applied Ordinary Differential Equations

Class Time:	MWF, 9-10 AM
Instructor:	Stephanie Dodson, Stephanie_Dodson@Brown.edu
Office:	170 Hope Street, Room 213
Office Hours:	Tuesday 1-2 pm, Thursday 3-4 pm
Course Website:	Canvas

Course Description

This course provides a comprehensive introduction to the qualitative and quantitative theory of ordinary differential equations. Students will see how applied mathematicians use differential equations to solve practical problems in biology, chemistry, economics, and physics. The course will focus on building the rigorous theoretical foundations of differential equations, and using these concepts to interpret differential equations and their results in the context of applications. Specific topics include techniques for solving linear systems of differential equations, integrating factors and separable equations, numerical approaches to solving differential equations, and phase-plane analysis of nonlinear systems.

Differential equations is a main branch of mathematics and is widely used to study and analyze topics from a variety of fields. In this class, we will start with fundamental principles and work up to analyzing models used in current research. Additionally, we will provide introduction to numerical methods commonly used in research to analyze solutions of differential equations. The course will consist of lecture, group-based problem sessions, weekly homework assignments, two midterm exams, and a final project.

Learning Outcomes

By the end of the course, students will be able to:

- Discuss existence and uniqueness of solutions to ODEs
- Analyze qualitative features of ODEs by finding and classifying equilibria
- Identify and solve scalar and linear systems of differential equations with analytical techniques
- Construct and interpret phase portraits of linear systems
- Apply techniques of linear systems to nonlinear systems
- Use numerical approaches to solve differential equations
- Write differential equations and interpret solutions in the context of applications.

Prerequisites

- Full calculus sequence
- Linear algebra (can be taken concurrently)
- No coding experience required

Class Time

I *highly* urge you to attend all classes. Class time will include lectures and active learning problem-based sessions, and will give you the opportunity to see the material first hand. Math is best learned by doing! The problem-based sessions are ungraded, but will help you

- *In this class* by enhancing conceptual understanding of the material, providing extra practice for assignments and exams, and helping you form study groups.
- *Outside of this class* by promoting effective communication skills of technical concepts (useful in presentations and job interviews).

Homework

Weekly homework assignments will allow you to practice the course concepts, and allow for the most direct and individualized feedback about how you are progressing as a learner.

- Assignments will be available online every Wednesday, and are due the following Wednesday at the *beginning* of class (9 AM).
- Late assignments will not be accepted without a legitimate excuse and prior approval.
- Students are encouraged to collaborate on homework assignments, but assignments must be written up separately and individually.
- Homework assignments must take the form of a single, *stapled* packed with your name and neatly written (or typed) solutions labeled with problem numbers. Solutions should show all work, not just the final answer. Assignments that do not meet these requirements will receive a 20% deduction.

Exams

Midterm exams will be two hours and be given in the evening from 6-8 pm. Midterms will not be given at any other times than these scheduled times, except in classes of illness or emergency. If a serious conflict arises, you need to contact me as soon as possible prior to the midterm, and documentation verifying the excuse will be required.

The **final exam** will be cumulative and held during the time scheduled by the registrar. You must see a Dean in the Dean of the College's office for final exam excuses.

Assessment

Anticipated Grading Scale

Homework	30%	A	90-100%
Midterm Exam 1	20%	B	80-89%
Midterm Exam 2	20%	C	70-79%
Final Project	30%		

The grading scale above is subject to adjustment, however the minimum grade cut-off will not be raised. Especially in borderline cases, adjustments may take into account class and problem session participation as well as improvements in performance over the semester.

Course Materials

There is **no required textbook**. Course notes and homework will be posted on the course webpage. Optional text resources that will complement the course material are

- Differential Equations, Blanchard, Devaney, Hall, Published by Brooks Cole, 2011. Prices range from \$30 eBook and used to \$250 new.
- Elementary Differential Equations and Boundary Value Problems, Boyce and DiPrima, published by John Wiley & Sons Inc, 2012. Prices range from \$12 used to \$130 new.

Accommodations for Students with Disabilities

If you need accommodations for classes, assignments, or exams, please contact me and [Student and Employee Accessibility Services](#). Website: <https://www.brown.edu/campus-life/support/accessibility-services/>.

Diversity and Inclusion Statement

I strive to create a learning environment that supports a diversity of thoughts, perspectives, experiences, and honors your identities. To help accomplish this:

- As a participant in class discussion and problem-based sessions, you should strive to honor the diversity of your classmates and differing viewpoints the diversity contributes.
- If you have a name and/or set of pronouns that differ from those that appear in your official records, please let me know.
- Please come talk with me if you feel your performance in the course is being impacted by your experiences outside of class, including, but not limited to, religious holidays, family emergencies, jury duty, and long-term health problems.
- I will do my best to incorporate applications from a variety of fields in the sciences and humanities. If you would like to see applications to specific fields that I have missed, let me know and I will work to include those.
- If something was said in class (by anyone) that made you feel uncomfortable, please talk to me about it.

Additional Course Policies and Expectations

- Please create a respectful learning space for your peers by arriving before the start of class and not using cell phones or computers during class time without prior approval.
- All announcements will be posted on the course webpage. It is your responsibility to check the webpage periodically for assignments and notes.
- All students are expected to comply with and uphold the principles described in the [Brown University Academic Code](#).
- I am here to facilitate your learning; let me know if you have questions! I can always be reached by e-mail, and can schedule additional office hours.

Course Outline

Section 1: First-Order Scalar Differential Equations

- Qualitative methods
- Existence and uniqueness of solutions
- Separable equations
- Linear-first order equations and integrating factors
- Applications/writing scalar differential equations
- Numerical methods: Matlab and dfield

Midterm Exam 1: Wednesday, October 3, 6-8 pm

Section 2: Linear Systems of Differential Equations

- Existence and uniqueness of solutions
- Linear constant-coefficient systems of differential equations
- Linear algebra review
- Classification of equilibria and phase plane dynamics
- Applications/writing systems of differential equations
- Matrix exponential
- Linear independence of solutions and the Wronskian
- Numerical methods: Matlab and pplane

Midterm Exam 2: Wednesday, November 14, 6-8 pm

Section 3: Nonlinear Systems of Differential Equations

- Jacobian of nonlinear systems
- Classification of equilibria
- Applications to infectious disease (SIR) and Predator-Prey Models
- Numerical methods: Matlab and pplane

Final Project: Due Friday, December 14, 5 pm

Course Goal

One of the major course goals is for students to be able to write a system of differential equations to model a given word problem and analyze the results in the context of the application (primary learning objective of section 2). To achieve this larger goal, the students will need to master a series of smaller skills, including writing a first-order system of linear differential equations for a given problem, understanding qualitative behaviors of the system by finding and classifying the stability of the equilibria, solving a first-order linear system of differential equations, and interpreting the results in the context of the application. From my experience, turning the words into math is the hardest part for students, but it is also the part that engages and excites the students the most. I have seen that students who have met this goal leave the course with a better understanding and appreciation for math.

The example problems that follow are part of the assignment sequence designed to test mastery of these learning objectives.

Active-Based Learning Worksheet

During recitation, I ask students to complete worksheets in groups of 3 at a white board or group of desks. Meanwhile, I circle between the groups and provide hints when necessary. The students check in at the end of each problem and each group member explains a component of the answer. Below is an example worksheet, which would be assigned when the students are first learning to solve linear systems of differential equations and interpret phase planes. The questions are a bit above what the students could complete on their own at this point, but they are able to solve them when working together. The example worksheet contains two types of problems: one which steps the students through how to solve a linear system and plot the phase portrait, and one which asks the students to write, discuss, and analyze a differential equation. Recitation sheets are ungraded.

Recitation

Problem 1

Consider the following differential equation system.

$$\dot{x} = \begin{pmatrix} 4 & 2 \\ 2 & 1 \end{pmatrix} x$$

1. Find the eigenvalues and eigenvectors of the the system.

2. Write down the general solution.

3. How does the solution evolve along each eigenvector? Why?

4. Sketch the phase plane for the system.

5. Discuss your solution with your group, and then your instructor.

Problem 2

A small car rental company has just two distributors; one in Providence and one in Boston. Travelers are allowed to rent a car in one city and return it in the other. The company wants to determine how to distribute their cars optimally among the two cities. Assume that 60% of the cars rented in Providence are returned in Providence, and 80% rented in Boston are returned in Boston. (Thank carefully about how a car rented and returned in Providence changes the number of cars at the Providence location.)

1. Construct a differential-equation model that describes the number of cars the rental company has in Providence and Boston. Be sure to define all variables you use. It might be helpful to draw a diagram.

2. What assumptions does this model make? Are they realistic?

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Homework Problems

The homework problems range in difficulty and ask the students to think on different levels by remembering, applying, and extending their knowledge of concepts.

Problem 1 (10 Points)

Find the general solution of the differential equation

$$\frac{dx}{dt} = \begin{pmatrix} 5 & 3 \\ 3 & 5 \end{pmatrix} x, \quad x \in \mathbb{R}^2$$

and sketch the phase portrait.

Problem 2 (10 points)

Classify and sketch the phase portrait of the system

$$\dot{x} = \begin{pmatrix} -1 & a-4 \\ 1 & 3 \end{pmatrix} x$$

depending on the value of the parameter a .

Problem 3 (15 points)

Consider two ponds, A and B, with volumes 2,000 gal and 1,000 gal, respectively. The two ponds are connected by two streams, each of which flow a rate of 200 gal/day. Stream 1 flows from pond A to pond B, and stream 2 flows from pond B to pond A. There is a factory on the shores of pond A which dumps 10 lbs of pollutants into pond A each day. Additionally, plants and soil remove pollutants from each pond at a rate of 3 lbs/day.

1. Draw a compartment model diagram that describes the connected ponds and flow of pollutants.
2. Write a system of differential equations to model the pounds of pollutants in each pond. Be sure to clearly define any variables you introduce.
3. Write your system from part (2) into matrix-vector form.

Exam Problem

This problem could be used on the second midterm or final exam, and provides a formative assessment of the students' ability to write, solve, and interpret a system of differential equations. The grading is based on a rubric, includes a lot of partial credit, and is focused on how the students approached the problem and correct reasoning.

Problem 1 (20 points) Lake Erie provides drinking water for over 12 million people, however harmful algae blooms continually threaten the water quality. The algae blooms create neurotoxins that kill fish, wildlife, and can paralyze humans, and are the biggest threat during the hot summer months. Health and environmental groups are concerned about the algae growth in Lake Erie and the potential of algae spreading into nearby Lake Ontario.

Uncontaminated (algae-free) water flows into Lake Erie at a rate of 10 cubic-miles/week. The Niagara River flows from Lake Erie to Lake Ontario at a rate of 10 cubic-miles/week. Additionally, water leaves Lake Ontario at a rate of 10 cubic-miles/week and flows into the Atlantic Ocean. Higher water temperatures in the smaller Lake Erie (volume of 100 cubic-miles) allow the algae to grow at a rate of 20% per week. In the colder water of Lake Ontario (volume of 400 cubic-miles), the algae grows at a rate of 10% per week. Let

$x(t)$ = amount of algae in Lake Erie at time t (lbs)

$y(t)$ = amount of algae in Lake Ontario at time t (lbs).

1. Write a system of differential equations to model the amount (lbs) of algae in each lake. It may be helpful to draw a diagram.
2. Determine and classify the equilibria of the system.
3. Find the general solution.
4. In an effort to rid the lakes of algae, scientists are working on creating an algae eating bacteria. What is the minimum rate at which the bacteria need to eat the algae in order for both lakes to become algae free? Assume the algae eat bacteria in both lakes at the same rate. Justify your answer.

Alternative Final Exam Option

Instead of a final exam, one option is to assign a final project which takes the form of open-ended questions. The students will be graded primarily on their math, logic, and correct interpretations of their model. Prior to this assignment, the students will have completed several similar problems, although the previous problems would have guided the students through which pieces of analysis to complete. The open-ended nature of this problem allows me to see if the students know what types of analysis are appropriate and necessary in order to justify their answers.

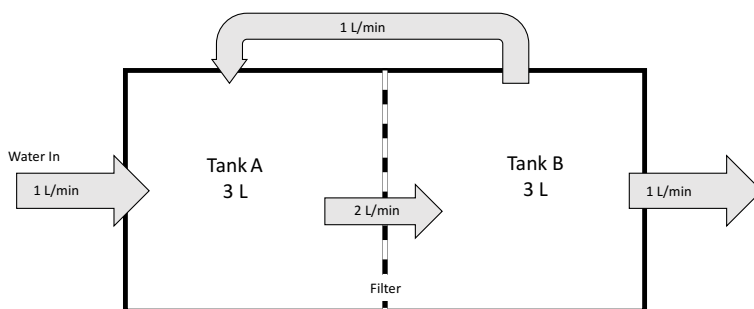
Below is an example question, with the complete final project having 2-4 total questions.

Final Project

Instructions: Complete the following problems. These problems are open-ended, so be sure to explain your work. For each problem, include one paragraph justifying your methods, any assumptions you make, and your final answer.

1. The state of Maine has a problem with toxic arsenic in the ground water (naturally occurring due to the bedrock formation). As a result, many homeowners need to install pricey filter systems to make the water safe to drink. The Division of Public Health has set safe levels of arsenic in drinking water to be below $10\mu\text{g}/\text{L}$.

A new filter has entered the market, which is cheaper and claims to be effective at reducing high arsenic levels to a safe level. The filter works by filtering some of the water twice, and on each pass, the filter is able to remove $5\mu\text{g}$ of arsenic from each liter (L) of water. You work for an independent third-party consulting company that needs to validate that this product works and provide safety recommendations to the customers. Using concepts learned in this class, determine the highest level of arsenic that the filter can reduce to safe levels.



4 Evidence of Effective Teaching and Student Learning

Below are summaries of student evaluations of my performance as an instructor and as a teaching assistant. Full teaching evaluations available upon request.

Instructor Course Evaluations

Applied Ordinary Differential Equations (APMA 0350), Brown University, Summer 2017

A total of 9/15 students completed the evaluation, and were asked to rate the instructor effectiveness given options “Very Effective,” “Effective”, “Somewhat Effective”, “Ineffective”, and “Very Ineffective” (see Figure 1).

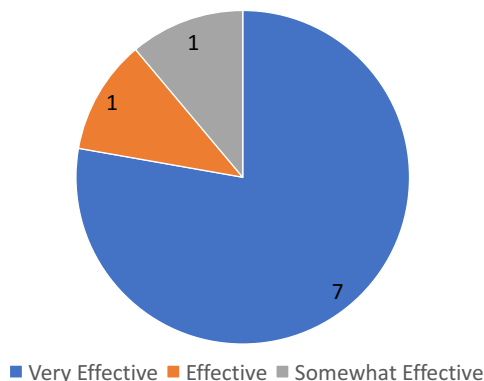


Figure 1: APMA 0350: Instructor Effectiveness

Students were asked to comment on the effectiveness of the course (including their own learning and what knowledge or skills the course helped them to develop), and on the effectiveness of the instructor. The majority of student commented on the their learning of writing and solving differential equations, and the clarity of my explanations and course organization. A selection of student quotes are included below.

Comments on effectiveness of the course and student learning:

“I learned new topics of math which I am really interested. I developed skills essential for my learning such as thinking and communicating.”

“This course helped me write differential equations to model systems and analyze them.”

“1. basic introduction of ODE 2. several interesting ways to solve them 3. interesting examples”

Comments on instructor’s overall effectiveness:

“The instructor really went above and beyond to teach well and I feel that she succeeded in making learning effective and easy.”

“Her recitation sections were very useful, and teaching with proofs is very good.”

“She was a very clear lecturer and took the appropriate time to explain concepts thoroughly. She was easily accessible outside of class in case of questions as well.”

“Stephanie was always very prepared for class. She was clear and effective at explaining comments – at times much more so than math professors who have taught me at Brown. Her lectures were clear, and the problem sets were doable based on what we learned. She was also helpful during recitation sections, rotating between groups to check in and offer hints at the more difficult problems. She was also prompt with posting solutions to the homework, which made studying easier. Her practice review problems for exams were also extremely helpful. I enjoyed her choice to incorporate a bit of matlab in the work. She always made an effort to relate back to why/ the point of learning these concepts, and how the material could be applied to real life problems. Although at times I have considered changing my major, Stephanie really motivated me this summer to stick with applied math.”

Teaching Assistant Course Evaluations

A total of 110 students filled out teaching assistant evaluations for me, and all students who filled out the evaluation selected that they would recommend me as a TA to other students. Additionally, for rating “teaching assistant’s overall effectiveness,” no students selected “Ineffective” or “Very Ineffective.”

Applied Ordinary Differential Equations (APMA 0350), Brown University, Fall 2015

A total of 69 students filled out the evaluation.

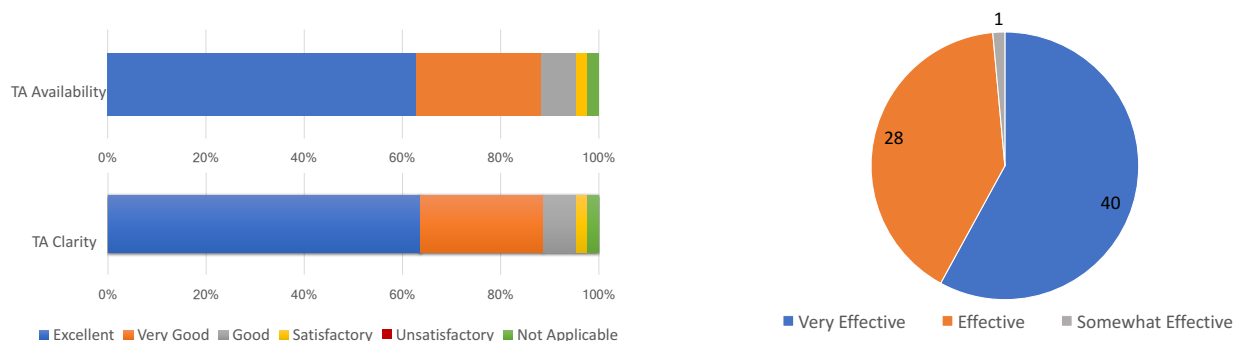


Figure 2: APMA 0350: (left) Teaching assistant availability and clarity. (right) Overall effectiveness of teaching assistant; number of student responses indicated in each wedge.

The majority of students commented on the clarity of my explanations, my preparation, and helpfulness during office hours. A selection of student quotes are included below.

“Steph is really helpful in sections and office hours. She helps me with categorization and generalization of scattered knowledge and has been very helpful in response to my questions.”

“Great TA - always came prepared with lecture notes - prepared good problems for practice - and always available to answer questions of students. Also explained material in a very clear way.”

“Stephanie was approachable, knowledgeable about the subject matter, and quite good at understanding and addressing points of confusion without giving too much away about how to solve homework problems. She was particularly good about following up via email after office hours (on a few occasions people would ask questions that were related to outside sources, which she would send to the people present as office hours via email).”

“Stephanie is brilliant. She really knows what she is doing and was a huge help to many students, including me. I can tell she prepared beforehand and was able to answer nearly all the questions students asked, which was impressive. She was clear and effective.”

Methods of Applied Mathematics I (APMA 0330), Brown University, Spring 2016

A total of 45 students filled out the evaluation.

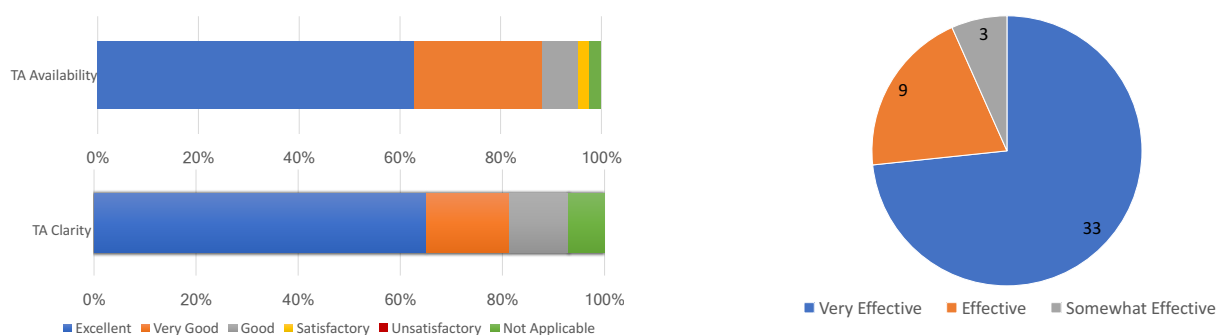


Figure 3: APMA 0330: (left) Teaching assistant availability and clarity. (right) Overall effectiveness of teaching assistant; number of student responses indicated in each wedge.

The majority of student comments commended on my organization, the clarity of my explanations, my preparation, and helpfulness during exam review lectures. A selection of student quotes are included below.

“Stephanie was extremely helpful and was always available for the students. Her explanations of complex mathematical concepts were exceptionally clear, simple and to the point. She went way beyond the expectations of a teaching assistant and always put the students’ needs before her own.”

“Stephanie did midterm reviews and she was able to concisely summarize many concepts while also talking about the reasons behind certain concepts.”

“The best TA I’ve ever had. She prepared excellent review material and was always available.”

“She’s amazing. She would prepare us for every exam so well by (1) giving a very clear, well planned-out review lecture, and (2) putting together review questions to walk us through the material outside of class when studying. I didn’t go to her recitation sections but I’ve heard that she teaches them very well too.”

5 Pedagogical Training

Sheridan Center for Teaching and Learning

The [Sheridan Center for Teaching and Learning](#) at Brown University offers semester-long certificate programs and individual workshops to promote effective teaching practices. I have participated in three certificate programs (described below) and attended additional workshops to learn about inclusive classroom design and improve my teaching practices.

Reflective Teaching Seminar, Fall 2015

This introductory seminar highlighted evidence-based inclusive teaching practices, student engagement, principles of learning design, and reflection upon my own learning experiences and teaching practices. As part of this certificate, I was observed while giving a lecture about my research and received feedback on how to improve the structure and clarity of my presentation.

Teaching Consultant Program, Fall 2017-Spring 2018

In this certificate, I was trained to become a Teaching Consultant for the Sheridan Center. I learned how to observe and provide constructive feedback on the teaching practices of diverse classrooms and subject areas. I had the opportunity to observe courses across the STEM fields and humanities, and was trained to focus on the instructor's interaction with the students and classroom environment. During the observations, I also reflected on the differences in teaching practices across the disciplines and considered how non-standard teaching practices and assignments could benefit math classrooms. In the spring semester, the seminar focused on documenting our teaching methodologies, including writing teaching philosophy statements.

Course Design Seminar, Spring 2018

This certificate focused on composing realistic course goals and using principles of backward design to create effective forms of assessment. As part of the seminar, I developed a series of assignments for an introductory mathematics course that monitored mastery of specific learning outcomes and crafted a detailed syllabus. I also had the opportunity to reflect upon my own teaching practices and forms of assessment that I used during the 2017 summer course.

Brown University's AAU STEM Project

As a teaching assistant for Applied Ordinary Differential Equations in Fall 2015, I was part of Brown University's [AAU STEM Project](#), Changing the Culture of Introductory Science. This initiative focused on incorporating student-centered learning activities, such as problem-based recitation sessions, into introductory STEM courses with the goal of improving retention and student performance particularly in underrepresented groups. I received training on how to facilitate effective recitation sessions and office hours.

During the recitation sessions, students completed worksheets in groups of three as myself and other teaching assistants circled between the groups. My role was to guide the students to the correct answers without telling them the answer. Instead, I was trained to ask the students directed questions and ask them to explain their methodologies. I observed that in this low-stakes environment, students were more likely to take chances and talk with and help their group members, all

of which resulted in deeper levels of understanding. I used similar techniques during office hours to lead the students to the correct answers.

I was observed and received weekly feedback about my interactions with the students from a STEM education postdoctoral research associate involved in the study. I found the feedback very helpful, and it gave me the opportunity to reflect upon and better my teaching practices. The results of the project indicate the inclusive teaching practices benefited the students, and I witnessed the increased student understanding as a TA. Because of my participation in the project, I chose to incorporate student-centered problem-based learning sessions into the Methods of Applied Mathematics course that I TAed (Spring 2016) and as an instructor in Applied Ordinary Differential Equations (Summer 2017), and will continue to include similar inclusive teaching practices in future classes that I teach.