

Develop a personal teaching style

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Preface

- **Teaching style is personal:** What do you envision your tags on www.ratemyprofessor.com to be: charming and knowledgeable, funny and relatable, direct and strict, fair and easy, etc.?
- **Teaching style changes with audiences:** Are you working with high school students, undergraduates, graduate students, colleagues, academics, etc?
- **Teaching style changes from subject to subject:** Are you teaching mathematics, sciences, liberal arts, etc?
- **Teaching style is a unifying group** that includes interconnected elements of in-class lectures, off-class interactions, homework and exams (how they are assigned and graded), etc.

The following is a note on the personal teaching style that I have developed while teaching mathematics to undergraduates and graduate students in colleges.

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1 Before the first meeting: Preparation

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- Prepare the course (in addition to choosing a textbook, etc):
 - Where is the course in the whole curriculum?
 - Are homework assignments online or on-paper?
 - Is there a course coordinator?
 - Is there a common final?
- Prepare for the class:
 - How many students are in the class?
 - What are their backgrounds (majors, prerequisites, etc)?
 - Are there any names difficult for you to say?
 - Are there any former students and why do they take a course with you again?

Goal: Design an overall theme of the course.

1 Before the first meeting: Preparation

Calculus I: A skill-based course

- It is the first course of the college *Calculus* sequence of *Calculus I*, *II*, *III*, and *Differential Equations*. The whole sequence is required for most majors in mathematics, science, and technology.
- Usually there is a course coordinator who writes the common final (among other responsibilities).
- Few students are highly motivated; most are uncomfortable with the subject or even “hate” mathematics.
- A significant portion of the students may be inadequate in their mathematics knowledge.

The overall theme is to focus on the basic *skills* of computing derivatives and integrals. The set of skills is defined by the common final and is also required to survive the whole calculus sequence.

1 Before the first meeting: Preparation

Mathematical Analysis:

A skill- and understanding-based course

- It is the abstract mathematical theory of *Calculus*, that is, use the ε - δ language to rigorously study limits, differentiation, and integration. It is fundamental in the mathematics major and prepares the students for all future courses in abstract mathematics.
- Students are mostly juniors/seniors and are well-prepared in computational *Calculus* (i.e., computing derivatives and integrals).
- Most students are highly motivated and know each other.
- All students experience a “culture shock” in the transition from computation-based mathematics to proof-based mathematics.

The overall theme is to focus on *acquiring the skill of writing mathematics proofs and understanding the concepts*. Encourage students to share their works with you and among themselves.

1 Before the first meeting: Preparation

Real Analysis: A understanding-based course

- It is an advanced course on the abstract theory of Lebesgue measure and integration. It is fundamental for further training in analysis, differential equations, statistics, etc, and is also required in the preliminary examination for all graduate students.
- Audiences are graduate students and advanced undergraduates. They have sufficient experiences in writing mathematics proofs.
- All students are highly motivated and are ready for challenges. However, there are also students who prefer, say, algebra much more than analysis and only want to pass the course.

The overall theme is to focus on *transforming the understanding of mathematics theories into proofs*. The theories should all contribute toward a grand project (e.g., the Lebesgue measure and integration).

2 During the first meeting: Introduction

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Spend quality time to introduce all parties and the course:

- **Personal aspects** include hobbies, pets, siblings, and anything one is willing to share. Listen, comment (on both enjoyment and frustration), and relate if possible (but do not force it). – Convince them that you have the good and bad times just as they do.
- **Professional aspects** include majors, progress toward graduation, career prospects, etc. Listen and connect their backgrounds to this course or other courses you have taught. – Convince them that you are helping them professionally and they are in good-hands.
- Succinctly layout the course plan and grading policies according to the syllabus. Be strict in the beginning of the course and leave room for relaxation later on; don't do the opposite!

2 During the first meeting: Introduction

- **Introduce yourself with a personal touch.** I have two kids and relate to all kinds of family situations. I closely follow basketball and European soccer for the past 20 years. I know little about American football and nothing about baseball, car mechanics, animation, or hip-hop. – Let students talk to each other.
- **Design a theme in the introduction,** for example, let everybody including yourself mention one (good or bad) experience with mathematics instructors. – No names need to be mentioned but we can learn from these experiences (or just laugh about it.)
- **Some students need confidence boost** (especially among minorities). “My name is lame and my family is lame.” “Oh yeah, so is Xiaolong!” – I try to present an image of a confident minority.
- **Start to steer the classroom towards openness and positivity.** – We are open to discuss anything but will pay more attention to the relevant ones for the well-being of all parties in the class.

3 Lecture-homework-exam: Unification

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In a skill-based course such as *Calculus* and to a lesser degree *Mathematical Analysis* and *Real Analysis*, **repetition** is absolutely key for anyone to learn.

- **Identify the basic skills** (e.g., computing derivative and integrals) and refer to these skills constantly throughout the course. Keep the focus. (I always use the analogue of basketball fundamentals.)
- **Repeat the same materials** in the lectures, homework assignments, and exams. You can even go over the identical questions on multiple occasions. Explain step-by-step grading in lectures.
- **Review the prerequisite** (e.g., fractions, trigonometry) throughout the course at which the students may be weak.
- **Cover questions of all difficulty levels** and do not leave the most complicated ones to students without demonstration in class.

3 Lecture-homework-exam: Unification

Dos and don'ts

- **Mention your experience in the course to build trust with students.** – “I have studied all the common finals for the past ten years and know every possible question that may appear.”
- **Show your expertise in the field** (mathematics, science, etc) but always be clear about what is required in the course. – “If you are interested, I will explain a bit where this formula comes from; if not interested, feel free to drift off for the next five minutes.”
- **Passion is contagious.** Show your passion (or disinterest) of the field but take it easy if others are not at all impressed. – “As a mathematician, I prefer theory over numbers; I rarely work with numbers greater than 100 so let us keep it under 100 in class.”
- **Evaluate students' abilities or inabilities based on their progress in your course.** Do not blame on students' backgrounds, previous instructors, or the whole education system.

3 Lecture-homework-exam: Unification

Favorite students in the class

- Every instructor has favorite students in teaching. But do not play favoritism *publicly* in class.
- My favorites are capable students, as well as students that make great progress in the course.
- Questions from all students (favorites or not) in class are treated equally and with respect. Walk to the person when listening.
- Send short private messages via email, homework, and exams such as “It is always a delight to read your work,” “A perfect display of consistent excellence,” “Wow, great improvement!”
- *After the final lecture*, I would not hesitate to say to an individual for being one of my favorites, again, *in private*.

The whole class atmosphere is usually dictated by very few students. Work with your favorites *subtly* to build a positive teaching-learning dynamics.

3 Lecture-homework-exam: Unification

Irritating students in the class

- Every instructor can be irritated by certain students in teaching. However, do not show any signs of irritation *publicly* in class.
- Students that irritate me are the disruptive ones, as well as the ones who constantly ask tangential questions leading to digression of the course.
- Find professional help from school authorities for disruption.
- Questions from all students during lectures are treated equally and with respect. *Early in the course*, answer the tangential questions. This shows your command of the field. – “Is fractal related to *Real Analysis*?” “Interesting question, indeed it is...”
- Some students simply want to show their vocabulary in mathematics. Steer away these questions *later in the course* and keep the main theme undivided. – “If you want to discuss more about this terminology, we can talk after class.”

4 More tips

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- Always show respect and compassion. – “Thank you for your service to the country. We can arrange a make-up exam.”
- Apologize, for things you are also affected but cannot control. – “I apologize for the inconvenience to conduct an exam on campus during the pandemic. However, I am sure the school administration is making a difficult decision on this matter.”
- Find a common enemy (e.g., course coordinator, publishing business). – “*Calculus* has not changed for 100 years. Charging \$200 for a 12th edition *Calculus* textbook is evil and criminal.”
- Include students to important decisions. – “There is no surprise in the exam. Anyone can write one exam: Question 1 is ...”
- Do not hold your course as a holy subject. Students will do well with their lives without *Calculus*. Don’t you worry for them.

4 More tips

- **Place yourself with the students.** – “I appear better than you in *Calculus* because I have more experience. When I first learned it, I also struggled.” “Some of you are really quick in number computation. If you are slow like me, it is gonna take more time.”
- **Do not be afraid of making mistakes.** – “I hope I have not made any mistake in the solution. Let us compare our works and see if we are both correct.”
- “All we do in a relationship is to overthink. This is *Calculus*, not a relationship. So do not overthink. Identify the skill you need to apply, then get on and compute the derivative or the integral.”
- “A great mathematician is a person with a healthy level of insecurity. If you do not feel completely secure, then go back and double check your work.”

Thank you for your attention!