

MATH 8001

2 November 2012

Writing and delivering lectures

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Writing and delivering lectures to a large class of precalculus or calculus students for the first time

We'll save these discussions for later:

- 16 November: teaching a summer course (which includes lecturing)
- 30 November: giving general math talks

Assignments

due today: notes on observations

due 9 Nov: lecture notes, described below

due 16 Nov?: WeBWork demo

Any issues arising in your current teaching?

Plan for today:

- Tips on crowd control
- Mathematical content issues
 - preparation
 - organization
 - theory/examples
 - pacing

Golden rule: Be yourself.

Students keenly detect discomfort.

On the other hand, they recognize when you are trying out ideas for the sake of improving the class and their learning.

First day

- It is important to create a good first impression and set a business-like tone.
- It is easier to relax a business-like environment later than it is to rein in an unruly environment.
- For the beginning (only) of the first day, write out a script. Then it will be easier to talk extemporaneously when you are in the flow of the mathematics.

Crowd control

1. “Own the room”. Walk to the back before class.

Fill the room with your voice. If necessary, use a microphone, and in that case, bring batteries every day. Imagine speaking with a person in the back row.

Crowd control

2. Be prompt so that the students will too.

- Start at the official time everyday, using a room clock or a laptop clock. There are 15 minutes between classes, so there should be plenty of time to prepare technology and boards.

- “It disrupts the other students if you leave before the end of the time.” Emphasize their obligation to each other, not your irritation with them. Tell them to inform you before class if they intend to leave early, and ask them to sit in the back row.

- If you are in the middle of something at the end of the time (something you should try not to do), say “I need one minute to finish this idea” or “I will return to this example at the beginning of next time” (and then do it).

Crowd control

3. When students are anonymous, they are less likely to feel personal responsibility for their behavior.

- Choose a handful to names to call at the beginning of class.
- Urge them to visit your office hour, if only briefly.
- Stop by your students' discussion sections.
- Chat with students before class.

Crowd control

4. Electronic distractions

- Make clear on the first day that cell phones, music players, and laptops should be turned off, and be willing to enforce it.
- I find that meaningful eye contact is most effective in curbing this behavior; students do not like to be singled out in class.

Crowd control

5. Eye contact

- Lack of eye contact indicates nervousness.
- Make eye contact with people in the back row – everyone will see that you are making eye contact with someone. Do not stare at the ceiling.
- These eye contact breaks allow you to check how students are keeping up with your pace.

Content considerations

1. PREPARE. Make it worth the students' time to attend.

- In particular, try not to work out solutions for the first time on the spot. The most common loss of time and loss of focus of students is due to trying to fix solutions gone awry. If you do get lost – and it will happen – say that you will move on and provide that solution later.

Content considerations

2. I recommend using slides from a laptop or on an overhead projector.

- Not complete details (the pace will be too fast for note-takers)
- Instead, use slides to give an outline and statements of definitions, theorems, examples, and exercises. Write details on the board.

Content considerations

3. Write with the large chalk (if in a room with chalkboards). Bring this with you every day – there is a supply in the mail room. Or, bring fresh dry-erase markers every day.
- Walk to the back of the room to check that your writing is legible. Also, this breaks the barrier with the students.
 - Include only the most important information in a graph, and draw graphs as large as possible.

Content considerations

4. Asking questions

- Questions like “Does everyone understand?” don’t elicit responses, and easy questions that require numerical answers don’t either, and can be viewed as insulting.
- Better to ask questions like “What do I do now?” or “Why wouldn’t approach x work here?”
- Be willing to wait what seems like a long time for someone to volunteer the answer. This can be a good time to walk up the aisles. It also gives careful note takers time to catch up.

Content considerations

5. Soliciting questions

- “Does anyone have any questions?” Wait for responses.
- Walk to the person asking the question.
- Most important: REPEAT THE QUESTION for the whole audience to hear (paraphrasing if necessary to clarify or focus the question).
- Be willing to tell a student “That’s an important question, but it is too [...] to spend time on during lecture. I will be happy to answer your question after class.”

Content considerations

6. Change the pace and activities to improve attention
 - One suggestion: halfway through class, give a short exercise, and ask students to compare solutions with their neighbors.
 - Asking a student to come to the board to give a solution is rarely effective, but it can be useful (once) to demonstrate that you welcome students' input. Only after a student volunteers an answer aloud. I don't recommend cold-calling students in lectures (or anywhere, really).

Content considerations

7. We overestimate students' tolerance for lists of theorems, mathematical formalism, \forall , \exists , \in , etc.

Content considerations

8. Look for one take-home idea to emphasize at the beginning and end.

Students want to know, practically and mathematically, “Why is this important for me to know?”

Content considerations

9. Near the end of the period, it is better to summarize than to start a new idea or example that you can't finish.

Content considerations

10. Organization: “top to bottom” or “bottom to top”?

Start with examples to motivate general idea.

Showing applications of a theorem before providing a justification for the theorem.

Content considerations

11. Help students who are taking notes and not processing any information: give clear markers for the beginning and end of examples, use boxes for important ideas, extended pauses to make transitions.

Assignment, due Friday 9 November

Write a set of lecture notes for one 50-minute lecture on a text-book section that your current course will be covering next week.

Write notes that you would take to give the lecture, but make sure they're detailed enough that you would make them available for students afterward.

Pay close attention to length – mark where you are likely to finish.

Include at least one “motivating example” – an example after which a general idea appears.