

Best Practices in Teaching Mathematics

1. Learn the students' names early in the semester, in the first week for sections ≤ 45 students.
2. Arrive to the classroom several minutes early to every class. Never be late. End class on time.
3. Prepare for class. (See the comments given later about what to prepare and not to prepare.)
4. Show respect for students at all times. Never speaking in a demeaning or sarcastic way. Avoid cynical or sarcastic humor. Remember that they may feel attacked by comments or jokes that you think are harmless – be careful.
5. Speak with a loud enough voice so that everyone in the room can hear.
6. Write on the board clearly.
7. Reduce distractions. Close the door to keep hallway noise out. Don't permit students to read the newspaper in class or use electronic devices in ways unrelated to class. Don't permit students to be distracting to their classmates. Call on offenders by name and involve them in the discussion without embarrassing them.
8. Make regular eye contact with each student.
9. Encourage questions and answer the students respectfully. If answering a question would derail the lecture, indicate so and offer to provide an answer to the student at a future time (perhaps during an office hour).
10. Return graded exams and assignments promptly, the next class period. (Be firm with your homework grader about this.)
11. Avoid mannerisms that would be distracting to the presentation or that might embarrass others.
12. Hold office hours at reasonable times and always be there during those times. Make the students feel welcome when they come to you for help. Encourage student consultations. Keep your office neat and clean.
13. Don't attempt to work through a complicated example or proof without having gone through the details in advance. You should give a lot of motivation for complicated proofs and make sure that students can see the big picture of the argument.
14. If you use technology to make a presentation, learn how to set up the equipment and practice the technology before attempting to make a presentation with it. Class time should not be spent fumbling with a projector or having issues with software not working. If you use software, limit its use to the more familiar titles such as Mathematica or Maple.
15. Look for opportunities to incorporate concepts from previous chapters/sections in the context of new material. This keeps students fresh on the older material and helps them see how concepts build upon one another.
16. Find opportunities to incorporate humor in your presentation (however, never at a student's expense).
17. If you have a superior method of presenting/motivating a concept, explain the advantages of your method. If possible, find something good to say about the method used in the text.
18. Watch for confused or distracted looks. Call on those people by name and ask what their confusion is.
19. Do an anonymous course evaluation in the middle of the course. Tell the students that you don't get to see the real ones until the end of the semester. This way they can provide feedback

- that you can act upon right away. Ask only two questions: 1. What about the class is most helpful to your learning? 2. How could I better help you learn?
20. Regularly ask students (both in class and in office hours) how you could make the course better so they will learn more. They see you care about them, but they also see that the point is to learn more, not just to have fun.
 21. Tell your students, well in advance, what kinds of questions and topics will be on the exams so that they may effectively prepare for the exams.
 22. Prepare a study guide so students can see what is most important, otherwise they may not realize that Theorem 4.1.4 is more important than Theorem 4.1.3. You know Pappas is less important than the Mean Value Theorem, but they may not realize that yet.
 23. Verify that every exam problem can be solved using the methods taught in the text or by using supplementary methods that you have introduced to the class. If you use notation that does not match the notation in the text, have a good reason and explain that reason (along with the differences in notation) to the class before the exam.
 24. The questions on your exams should correlate with the course objectives and with your study guides.
 25. Hold review sessions for exams in a classroom instead of your office. Students who are intimidated by office hours will come to a review session.
 26. Curve exams immediately – during the semester, never wait to do this.
 27. Provide students with clear assignments and with a reasonable schedule for completing their work. Clearly explain your grading policies on the first day of class.
 28. Collect homework every time you meet. Never let students go more than three calendar days without doing some work; they procrastinate and then feel overwhelmed. They also aren't prepared for class without working.
 29. If possible, plan some slack time in the schedule for the term. Use the slack time to review. Don't give them a complete break – use the time productively to review or supplement.
 30. Emphasize the importance of work over native intelligence. Repeat this in various ways for at least 10 seconds every class period.
 31. In lower courses like calculus, have them put down their pencils periodically and give them a problem they can do in their heads. Some are actually surprised to find they can think without a pencil or calculator. It introduces them to the habit of thinking in class.
 32. When you ask them a question -- wait at least 10 or 15 second until you get an answer, and don't necessarily accept the first correct answer you get.
 33. Focus on the shy ones (gently) until you get them to confirm or deny the answer given.
 34. Reward them for catching your mistakes.
 35. Tell students that if they have a question about a homework problem, then they should write the problem number on the side board before class. If the problem number is already written on the board, then they should put a check next to it. Then when class begins, you can look at the side board and have a feel for how well the students did on the homework and which problem caused the students the most difficulty. If there is a problem with a lot of checks next to it, discuss that problem in class.
 36. When students can see that you care about what you are teaching, they are more likely to care about it too.

What to prepare and what not to prepare

The wrong kind of preparation can be worse than no preparation. What is important is the following:

1. Students should feel that your class is organized. They should know what you are doing and why, almost all the time.
2. Complicated arguments should be broken down and outlined in such a way that students can see how each part contributes and why it is important. They should see the big picture of what the main ideas are and not feel bogged down in minor details. Students can't distinguish between minor details and key steps without your help.
3. Students need to see and remember why you are proving this theorem, how it connects to the rest of the class, and what its implications are BEFORE you get into the details of the proof, as well as being reminded again in the middle of the proof, and again at the end.

What you should NOT prepare are:

1. Intricate details that even you can't follow without staring at your notes – if you can't look up from your notes, they can't follow you.
2. Too much material to allow questions and discussion.
3. Technology demonstrations that don't contribute much more to student understanding than you could have done by hand. Technology always takes time to set up, get displayed, explain and troubleshoot. All that time could have been used to explain something – be sure it is worth it.
4. Many overhead or PowerPoint slides. They almost always make you rush, make it hard to take notes, make it hard to see student's faces, and make it hard to answer questions on the fly. Only use slides for pictures or diagrams you can't draw quickly – rarely for text or equations!
5. Elaborate lecture notes when you already have a textbook.
6. So much preparation that you sacrifice your research time.