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THE TORCH OR THE FIREHOSE



A GUIDE TO SECTION TEACHING



ARTHUR P. MATTUCK

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Getting an education at MIT is like trying to drink from a firehose. —folk saying



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Acknowledgements

The first edition of this booklet on section teaching has had a wide distribution, both at MIT and other universities, since it first appeared. For the second edition, all of the chapters were revised; there were new illustrations and cartoons; sections were added addressing problems faced by teachers from other countries, “invisible” students, and those looking at incomprehensible blackboards. A summary and index were also provided. Only minor changes were made for this third edition.

Thanks are due first of all to Pawan Sinha, for this visual chronicles of the hopes, dreams, and tribulations of TA Melvin and his students. Thanks also to Chris Doerr for permission to reprint from The Tech some for the episodes of his comic strip “Nick.”

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Thanks to all of these people, name and unnamed. Finally, our gratitude to two institutions: the MIT Teaching and Learning Laboratory, under whose auspices the booklet was prepared, and the Margaret MacVicar Faculty Fellowship Fund, which paid for its first publication. The suggestions in the booklet are based on a few hundred hours of classroom observation and videotape watching.

Arthur Mattuck
MIT

**MIT Teaching and Learning Laboratory
Margaret MacVicar Faculty Fellowship Fund**

Printed copies of this booklet may be obtained by contacting:

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<http://web.mit.edu/tll/teaching-materials/torch-hose.html>

Prologue

You're down on the list to teach Recitation 09 of a large course, Introduction to Applied Science. The 400 students enrolled will hear—or at least sit through—three lectures a week by a big name in the field still hoping for a Nobel Prize. Those students lucky enough to have been assigned to Recitation 09 will have you as their recitation teacher for two additional classes a week; it's to you they will consign their weekly problem sets, their hour exams, and their hopes for an A.

Twice a week you walk through the classroom door to be greeted by thirty upturned faces—there were twenty to start with, but your spreading renown has attracted others—and a clamor of questions about the week's lectures and problem sets. Suavely and with unfailing good humor, you deal with these, providing the needed insight with a few deft words. Now and then you delve into your experience to provide a striking example that animates what had seemed to be just dead knowledge, or a lively anecdote that places the subject in a human context. If the week's lectures have been difficult, you may spend part of a period offering to your students your own view of the material: it is penetrating and clarifying, and your students interrupt you with perceptive questions and comments. Grading their problem sets and exams is a joy as you chart their steadily growing competence. They badger you for literature references, and at the term's end crowd around you to find out what you are teaching next semester and what the best sequel to the course would be. No evaluation is needed: the glow in their eyes tells all...

Wake up, we're back on Earth: it's the first day of classes, and in just two hours Recitation 09 will materialize as a bunch of interested but appraising faces. What happens from then on is partly up to them, but mostly up to you.

In this booklet we'll talk about some common problems in teaching, and offer a variety of ideas you can try. We're concerned primarily with the teaching of recitations that accompany large lectures, so you won't be reading about how to design a course or how to lecture. But don't put the booklet in the circular file just because you're teaching your own small class by yourself: maybe three-fourths of what's in here applies to you, too. Even you three-star generals who give the large lecture classes might look at this booklet because generals need to be in touch with the problems faced by their second lieutenants; if they ask for your advice on some teaching problem, you can tell them you'll think it over and then crib an answer from the booklet.



Right now, however, we'd like to say a few words to the new teachers—important things that might otherwise be submerged in the sea of suggestions we're coming to.



If you're just starting out as a teacher, you may find all this advice a bit bewildering and hard to keep in mind. A lot of it will only come alive after you meet your students and have had a few sessions with them. We suggest you read the booklet through quickly now and come back to it from time to time as the term goes on. There is no single "right" way to teach; your task is to develop your own natural teaching style, choosing and adapting suggestions to fit your own personality. Don't follow advice that makes you really uncomfortable—you need to be relaxed to be effective. But shy teachers sometimes have to push themselves a little.

No two recitations are alike. Popular and experienced faculty having two recitation sections of the same subject will report that one is regularly a joy to teach, the other like pulling teeth all semester. The mix of students, the time of day, some subtle interaction between your personality and theirs—who knows? Remember this if things are sometimes difficult. Remember too that you are not solely and personally responsible for the success or failure of your students. They have many other resources—lectures, books, tutoring sessions, friends. Just do what you can.

By the same token, you have resources to help you improve as a teacher and the most important are your colleagues. Make every effort to meet other recitation teachers and regularly share classroom experiences with them, trade material and discuss different explanations with them, exchange classroom visits with them. Have a videotape made and ask them to watch it with you. A recitation instructor should talk to the lecturer, too; at staff meetings you can provide important feedback from the students—how they like the course, and what troubles they are having. In this way, not only you, but the course itself will improve.

How This Booklet Is Organized

Chaotically, according to the critiques of the first edition of the booklet.

Irretrievably, according to those searching for some bit of advice they dimly remember seeing somewhere in it.

Actually there is a guiding principle: put the most common problems first so that readers in a hurry can still get something of value from it.

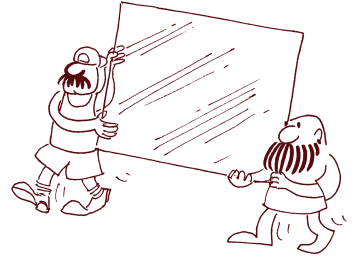
But this doesn't address the two organizational complaints. So a summary has been added to the end of the booklet, arranged, we hope, in some mildly logical order, with page references to the text of the booklet. Consult this if it's five minutes before class and you need a quick fix. For further help in retrieval, an index has been added.



The Glass Wall: Encouraging Interaction

The number one problem in teaching recitations is the “glass wall”—the teacher on one side doing a passable job of explaining, talking, and writing, but rarely interacting with the student on the other side. Listen to an undergraduate describe it:

We're usually all there when he walks in. He looks sort of embarrassed, stares down at the desk and asks if we have any questions. There's an awkward silence, like at a party where nobody can think of anything to say. Then he starts to work a problem from the homework. He talks to the blackboard in a steady, even way. You can hear, but you can't tell what's important and what isn't. I can't follow one of the steps, but I'm afraid to say anything. Every now and then he says, "Okay?," but it doesn't mean anything and he doesn't stop. After a while you don't really understand much and wonder why you're there. I copy the stuff into my notebook—I'll probably be able to figure it out at home—but if it wasn't for the exam I know I'd never look at it.



I guess I keep going because I know that otherwise I'd just waste the hour some other way. He knows his stuff all right, but it's as if he's up front and we're back there, and there's a glass wall between us.

A recitation without interaction—what problem could be more basic? Without the ease of communication that's supposed to be fostered by small groups, why have recitations at all? An extra lecture or two each week devoted to problem-solving would do just as well and save many teacher-hours.

The lack of interaction is bad for you: it makes it hard for you to know the difficulties your students are having. You can't tell if your explanation is opening the door, or whether you need to try another key in the lock. How can you grow as a teacher if you don't get feedback from your students?

It's bad for your students who already have sat through many lectures and don't really want another one from you. They need a chance to talk and express themselves, to clarify their own thinking, to share their difficulties with each other, to experience the feeling of a group working together on mutual problems. This is what recitations are about, and getting it to happen in yours ought to be your number one priority.



Breaking down the glass wall



Achieving real communication with your students isn't always easy. Think of all the situations in ordinary life where two people find communication difficult; add to them the extra complications that arise when one of them is an authority figure, and the other must talk with an audience of peers listening. You're going to need some tact and skill; here are some suggestions.

Get Them Thinking

Your students have just arrived and are sitting there thinking about life's problems, about the class they just came from, or most likely about nothing at all.

"Any questions?"

Questions? They can't even remember what the current topic is. They thumb through their notebooks, but it's hard to start out cold.

Your first task is to get their mental sap flowing. Remind them first of any formulas they will need, then ask some easy review questions (very easy, if you suspect they are far behind). If you are handing back a problem set, give them a typical mistake and ask what the error is. You could give them a few minutes to work by themselves or in small groups on two problems you give out, while you walk around the room seeing where they are and giving individual help. When most students have finished the first one, ask for the solution and act as a scribe at the blackboard. A class comes to life when everyone has just thought about the same problem -- in fact, seatwork (alone or in groups) is so effective that many teachers use it several times in every class meeting.

Problems and questions get thinking going. But since so many teachers experience difficulties asking and answering questions and doing it well is so important to the success of your recitation, we will devote the next chapter to this. For now, let's go on to consider some things that can hinder interaction in your class.

Peer-group Pressure

If things seem sticky—you are asking good questions, but get only nervous looks in return—you're students may be afraid of saying something that will make them look foolish in front of the others. Sometimes you will see students silently mouthing an answer they don't dare to say out loud. Perhaps you have felt this way yourself in advanced courses or seminars. If so,

you will appreciate that it is a difficult problem to deal with. The ultimate solution has to be for them to feel comfortable with each other, but this won't happen right away. Meanwhile you can help a lot by being supportive of wrong answers and non-responses:



"That's not exactly correct, Jennifer, but you're on the right track."

“That’s a mistake everyone makes. I’m actually glad you made it because it gives me a chance to clear up a common confusion.”

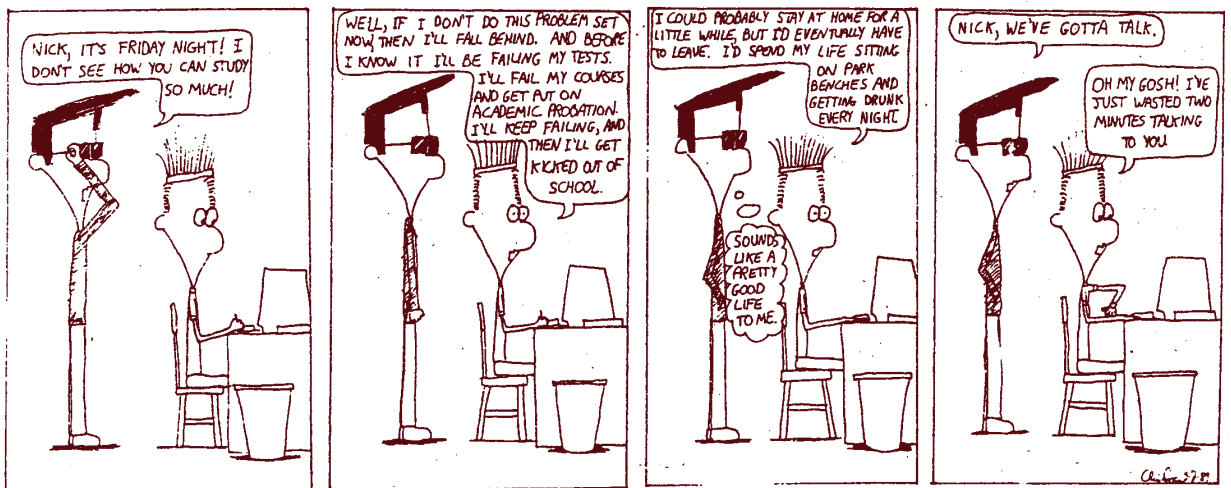
“Don’t worry, Bill, I know it’s hard to get in gear.”

Responses like these will go a long way toward convincing them that it’s all right to hazard an answer.

Of course, you need to be supportive of their questions as well, but we’ll talk about this in the next chapter.

Student Time-Delay

It’s one of the greatest stumbling blocks to interaction: students always seem to be behind. If there’s a weekly problem set, many will not start studying for it until the night before it is due; before that they will understand very little of what’s been said in lecture during the week. No wonder they are silent.



You can deal with the problem in three ways: ignore it, accept it, or fight it.

If you ignore it by pretending they are up-to-date, you’ll find yourself doing most of the problem-choosing and talking, with class participation limited to just the few students who are prepared.

If you accept the situation, you’ll probably feel it is your duty to teach them what they haven’t yet studied. It’s a bad habit to get into, but if you do this, at least avoid straight lecturing—try to teach interactively, with questions and work they can do either together as a class, or individually or in small groups, with you walking around and helping.

It's best of all to get your students to prepare for the recitation: best for the class as a whole and best for them as individuals. Some instructors give a very simple short weekly quiz that anyone can do after having looked at the week's readings. Students can grade each other's papers and gain additional insight that way, since you will be discussing common mistakes. Other teachers announce at the previous recitation a few problems that will be gone over at the next meeting. Often just a clean statement of what you expect from your students and what your plans are for the next section meeting can work wonders in encouraging them to prepare for class. Try it.

What else stifles interaction?

The Steamroller

It's common to see recitation teachers carefully prepare a lot of problems and a lecture review for the hour, then realize it's a bit too much. So they shift into high gear and deliver it all as a fast lecture.

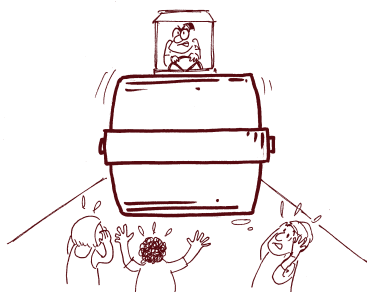
Could you explain that last step?

If you're going to interrupt me with questions we'll never be able to cover the material.

—math lecture

The TA goes through blackboards like a baby does diapers.

Such tactics "cover" the material, but your students will quickly give up trying to participate (though you'll be so busy you probably won't even notice). Instead, relax and don't worry if you don't cover everything you've prepared; it's better to have a less tense atmosphere. The best way to prepare is to decide on your priorities—what you want to be sure to do, and what you can let go if there isn't time.



Actually, there's another reason why instructors turn into steamrollers—they feel ill-at-ease, and giving a fast lecture is the easiest way to cover this up. If this is you, the best ice-breaker is question-and-answer dialogue: prepare it just the way you prepare the too-much-material. See the next chapter.

Communication 101: look, listen, say, write

If you think you're doing everything right, and yet the class just sits there, maybe there's something amiss in your basic communication skills. Student can be driven into permanent silence by any of these things:

- a teacher who never looks at them;
- a teacher who doesn't listen, often giving elaborate answers to questions that weren't the ones actually asked ;
- a teacher whose voice makes concentration difficult—soft, sing-song, monotone, depressed-sounding, unintelligibly accented—or one who talks only to the front row;
- sarcasm and put-downs;

- a teacher who talks over their heads (or under their feet), addressing imaginary students several years older or younger than the ones actually sitting there;
- a teacher who never writes anything down, or does it so chaotically or incoherently that they can't follow;

To correct problems like this, it usually takes someone else to point them out, but alas, even your best friend won't tell you. Two later chapters will be devoted to the diagnosis and treatment of these communication difficulties. We're signaling them early on because they are such frequent causes for a silent class.

Listening to the instructor was like listening to the hum of bees buzzing in a meadow out in Missouri.

Feedback Time

If despite your best efforts interaction is still sluggish, try taking ten minutes off at the end of a period, putting your feet up, and asking the students in a general way what they think of the recitation. A good discussion can help a lot in clearing the air and pointing to the difficulties. Maybe there's something you didn't know.

If they seem reluctant to talk, ask them to write down their thoughts anonymously, and the next time you meet report back to them what the sentiments were.

Knowing Your Students

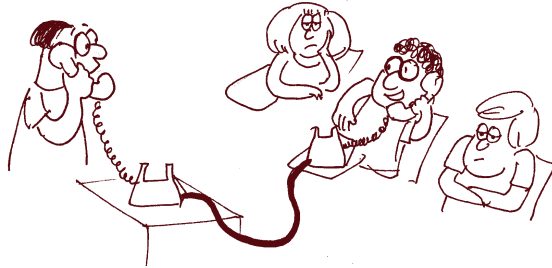
Sometimes you'll be lucky—your recitation will have a few students who seem to spark everybody. But more typically, your class will just sit there in the beginning and won't seem too keen on talking. Don't worry about it. Communication is easier with people we know better. As the students get to know each other's quirks and yours too, and as you start recognizing them in the halls, you'll find yourself relaxing and interaction will improve.



The chapter of this booklet entitled "Off to a Good Start" has some suggestions on how to get to know your students and make them comfortable with each other. The important thing is to be patient and keep trying—they will respect your efforts and sooner or later will start responding.

Questions: Theirs and Yours

Their questions and your answers, your questions and their answers: that's the way most interaction takes place in the classroom, or the way it ought to. But with all the possible pitfalls, many teachers just give up and lecture. What goes wrong?



The private line

Students mumble their questions. If they could, they'd send the question to you over a private wire, so no one else could hear it, just in case it turns out to be a poor one. You answer it while the rest of the class (which didn't hear it) waits patiently.

Frequent-question-askers often sit in the front row. The rest of the class is put on hold while you and the student up front have a nice chat. Even experienced and popular teachers fall into this trap. For the other students, who hear only you, it's like listening to one end of a telephone conversation.

Ships that pass in the night

The instructor gives an answer, sometimes a long and elaborate one, but alas, not to the question that was asked.

What we have here is a failure to communicate.

—Cool Hand Luke

Perhaps the question wasn't posed very clearly; perhaps it was misinterpreted. Regardless, only the bravest or most irritating students will say "That's not what I meant." Usually they just remain silent, and after this happens a few times, they will stay permanently silent.

The problem is particularly common in the sections taught by non-native English speakers who usually understand written English better than spoken English. They catch a few words, make a wrong guess what the question must be, and launch into an explanation. Their students switch to other classes, probably complaining about the teacher's accent, even though the trouble really lies elsewhere.



The solution: echolalia

Both problems have the same solution. It's the way every student question (even the "could you work problem 10 on page 256?" kind) should be greeted: with echolalia, then with clarification.

"Did everybody hear that? Would you repeat it, Susan?"

"That's a good question, Joe. Do you mind if I repeat it for the benefit of the back row?"

"Let me see if I understand what you're asking. You want to know (blah, blah)...Have I got that right?"

"Does everyone understand the question now?"



The purpose of all this delay is to make the question public, to guarantee you've understood it, to give yourself some time to think about how to answer it (assuming you can walk and chew gum at the same time), and to give the students a little time to think and wonder about it too.

And now you are ready to answer it, and they are ready to hear the answer. Maybe some of them can answer it themselves. If so, you might let them try, and with a little luck, stir up a debate.

The art of bluff

But what if you can't answer the question? Choose one of the following responses:

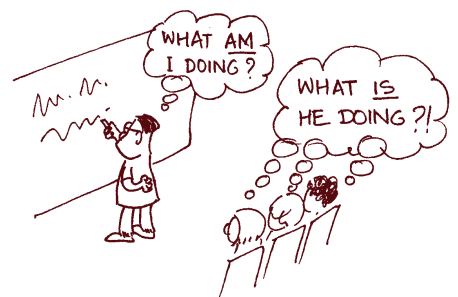
"I'm not going to answer this question directly, since I think it would be a good exercise for you to figure it out yourselves after I talk about something closely related." (*Followed by a long, irrelevant digression.*)

"We'll be coming to that later in the course; we'll talk about it then."

"That sort of thing won't be on your next exam, so I'm not sure it would be profitable to spend time in class on it."

"That's a good question; can anybody help Susan with it?"

"Hmm...I don't see how to answer that right now. Does anyone have a suggestion? (*long, long pause*) Well, it looks like we're stuck. Let me think about it and I'll talk about it next period (or I can see you in my office, Tom, before then if you'd like)."



(Warning: The first three fool nobody and the fourth is very risky.)

The welcome mat

Remember in the last chapter about peer-group pressure making students hesitant to risk answering your questions? It stifles their questions too. To counteract it, phrases like "That's a good question, Bill" or "I'll bet others of you were wondering about that point," will go a long way toward relieving anxiety and convincing others that they should not be afraid to speak. Don't be insincere, but try to find something nice to say. Alas, how many teachers respond instead with:

"Didn't we cover that last time?"

"Is there anyone else who couldn't do this problem?"

Answers like these with their undertone of criticism discourage questioners. Put out the welcome mat instead.

The T.A. was so nice he answered all the stupid questions too.

Soliciting questions

Maybe at this point you're thinking, "All the stuff in the chapter up to this point is a joke: if I ever got a question, I'd jump for joy and handle it lovingly, but nobody ever asks anything; they just sit."

Well, did you ask them if they had any questions? *Really* ask? Miles of videotape show instructors finishing an explanation, asking (or mumbling) "Any questions?" and almost in the same breath continuing, "Well, if there are no questions, let's go on with..."

If you do this, most likely it is to avoid the awkward silence you are afraid will follow "Any questions?" But the effect is to convince the students you really don't want to be interrupted (that old steamroller again), and they will be only too happy to oblige you.

So wait a decent length of time. Suggest things that might not be clear. Show from the way you solicit questions that you really want them: the tone of your voice, your body language, your eyes looking around the room are all important.

Don't browbeat them for not asking. Don't say, "Well, if there are no questions, we can all go home" and dismiss them; your students will feel for the rest of the term that you don't care about them. In fact, to ask a decent question, a student has to be reasonably up-to-date and willing to risk looking foolish; not many of your students fit into both categories.

And remember that giving them something to think about is the best way to get questions: a seat-work problem, a micro-quiz. Of course, having a problem set due the next day doesn't hurt either.

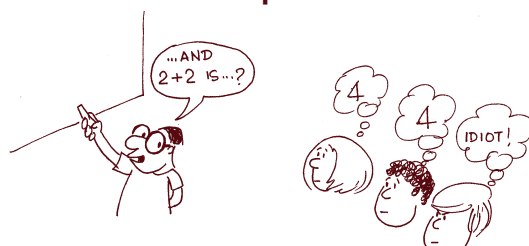
You didn't get any spontaneous questions, and they just sit, avoiding your eyes, when you try to solicit some.

Asking them questions

Then it's up to you to do the asking.

Are-you-with-me?

The simplest thing you can do to try to promote interaction and get some idea of where they are is to ask "are-you-with-me" questions. You pause in the explanation and ask them to supply a detail ("And the derivative of $\sin x$ is?" "Now we need the expression for torque; what is it?") This doesn't require any real understanding of what's going on, so anyone can answer, and you get to hear the sound of voices other than your own.



In the hands of instructors with a lively enough manner, the class can get really swept along by this. For others, however, it's like pulling teeth. The students just don't see why they should bother answering; if they don't, you will supply the answer anyway. Some students feel such easy questions are insulting; at any rate, answering them doesn't chalk up any credit either with you or their peers.

Do it anyway, and try to be upbeat enough to carry it off. They start supplying the answers because they like you, and it seems to make you happy. They continue because they find it helps their concentration, and it helps them to follow your explanations.

More serious questions

These can be questions just a little beyond the are-you-with-me's because they require more understanding of what's going on. ("What would be the next step?" "What would happen if the force were reversed?" "If we increased this value, how would that affect the answer?") Questions like these can often be thought of on the spot.



Other questions will require preparation ahead of time. When you start on new material try to cast it in the form of a problem to be solved and have them think about it for a bit. Ask for suggestions and deal with them seriously; if you dismiss out of hand all the ideas that ultimately won't work, they'll get discouraged. Or you can list possible methods and ask which is likely to be best and why.

Look for paradoxes and puzzles you can spring on your students; you will be rewarded by the sight of them all sitting forward in their seats thinking. Actually, they will do the same thing if you've made a mistake you can't find right away, and some wily teachers have been known to make mistakes on purpose for that reason. You can also give interesting wrong answers from student papers (be sure not to give the student's name) and ask where the mistake is.

If you are lucky enough to get a real discussion going, remember that a discussion has to get somewhere. As the leader, don't let it degenerate into a string of unconnected comments by the students. Use phrases like:

"What do you all think of that last comment?"

"Summarizing what was said so far..."

"We seem to agree at least on this:"

"Does someone have a point that hasn't been covered so far?"

Once again, remember that answering takes time, and you want everyone to have a chance to think about the problem. So, even though it seems like a silent eternity up there at the board, wait for them (try counting to ten). If you jump in and answer for them too soon, they will quickly learn that your questions are rhetorical.

When he asks us if we understand something, we all freeze like small animals caught in the headlights of an 18-wheeler. He assumes that it means yes and moves on to still more complex topics.

A couple of other things:

- When you have a really serious question, warn them it's coming with plenty of chit-chat. Otherwise the wool-gatherers will miss it:

"OK, now I have a question for you to think about. Here it is..."

Did everyone get that? Should I repeat it? Do you understand it?"

- Start asking questions the first day of class; once a class gets used to hearing only your voice, dynamite won't loosen their tongues.

We've spent a lot of time on questions, but the topic is so important for the success of your class that maybe you'll have the patience for two more comments about non-responding classes.

Bad questions

You ask, you wait. It's based on stuff you know they know and can handle, they seem to be trying...: no results or wild answers.

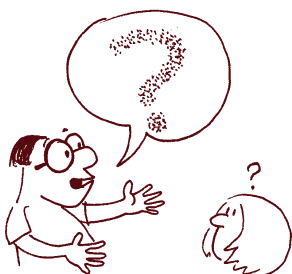
Usually it's because the question is too vague, not pointed enough. Students sit puzzled, unsure of what is being asked or what sort of answer is wanted. Here are some examples of questions which seem natural to the teacher, but are too vague; replacements are suggested.

"How else could we look at this?"

("Could we do this by another method?")

"What was significant here?"

("What was the key step in this argument?")



“What kind of a problem is this?”
 (“In which standard category does it fall?”)

You get the idea. You could always try: “Do you understand what I’m asking?” if you suspect the trouble is in the question. (Alas, teachers never do suspect this.)

Cold-Calling

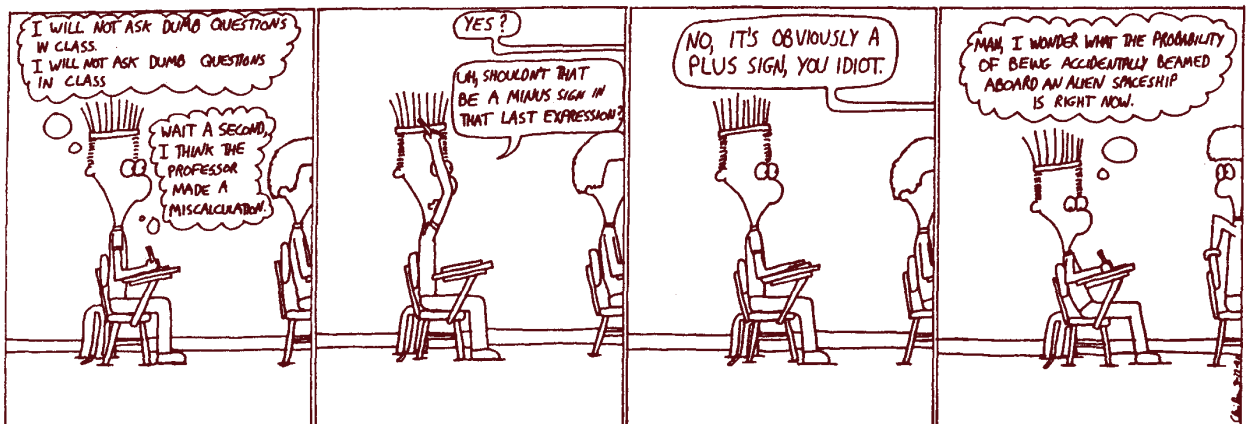
Again, nobody is answering, or worse, always the same two students with everybody else just sitting back and letting them. You have to indicate firmly that you want the rest to join in.

“How about the rest of you—Jean, do you know?”

This is “cold calling”: like the stockbrokers who call people without knowing if they have any money to invest, you call on students without knowing whether they have any idea of the answer.

Some teachers maintain that you shouldn’t do this. But it can be a good tactic if you get the class used to it from the start. If you do it with some tact and good humor, it won’t seriously embarrass anyone. If a student can’t respond, don’t dwell on it, just pass on to another. Try to get everyone involved. To some extent, you can tailor the question to the student—easier ones for weaker students—but be careful, as students are quick to pick up on this.

Preparing questions that will lead to a good discussion takes some thought, but the result when it goes well is so exhilarating that you and your students are sure to get hooked on it.



Before You Walk In...

Lack of interaction may be the number one problem. However, if you run a silent recitation, you can at least console yourself with the thought that it's not all your fault—the students share some of the blame—and anyway, they still probably learn something. These comforting thoughts are not available to the teachers of recitations afflicted with the number two problem: poor preparation. Listen to another unhappy undergraduate.

Monday morning, 10 am. My recitation teacher walks into class with the homework assignment for next week. He is not sure exactly what the lecturer has covered so far, but hopes that he will be able to rely on his knowledge of the basics to get him by. He guardedly asks us if there are any questions. After a while, someone finally speaks up, asking about a point made in lecture. The instructor, not too sure of himself, gives a hand-waving, hot-air answer, and refers people to the textbook. Another student offers an explanation, using examples from lecture. Mumbling his thanks, the teacher begins to work through the next assignment, using sketchy solutions he has scrawled to on the back of an envelope. Other students are talking amongst themselves or napping.

Towards the end of class, he remembers the graded assignments he was supposed to return. He hands them to a student in the front row, who passes them around. One at a time, the students shuffle through the stack to find their paper, while the instructor continues to work on a problem he is having trouble with. Finally, the class is over. Someone returns the unclaimed papers as the students file out.

Wednesday morning, 9:15 am. The alarm clock rings. I roll over and reset it for 10:15.

The number two problem with recitations is that the teachers don't seem to know what they're doing—either they fumble around, or they come to class with apparently nothing special in mind and end up improvising.

What? Me unprepared? I know the subject cold.

Good, but can you explain it? That needs technique and forethought. Even if you are an experienced teacher, different lecturers have different emphases: the course may not be the same as the one you took as an undergraduate, lectured in yourself three years ago, or even taught in recitation last year.

Before the Term Begins

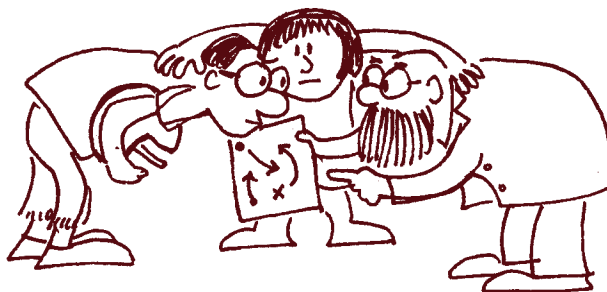
Course Material

You should receive a course outline well before the term starts. Look it over to see what's emphasized and what the course objectives are. Talk to the other recitation instructors, particularly those who have taught the recitations before. Get the textbook and read at least some of it for the flavor, and to judge how much explaining you'll have to do. Can the students read it by themselves?

If you are new to the course, there may be things in it you don't know so well. The earlier you start studying them the better. Later in the term when they come up, you may be at a critical point in your own work and not have as much time to prepare as you would like.

Staff Meetings

Before classes begin there should be a meeting with the lecturer and the other section instructors at which you can discuss the level at which the class is aimed, and what the lecturer will emphasize. In how much detail and how deeply are concepts covered? Will old problem sets and exams be a reliable guide, or will there be changes? Administrative matters should be settled at this meeting, so that you'll have the information for your students at the first class: when exams will be given, when problem sets are due, how the course will be graded, if tutorials will be available. Sometimes the lecturer will suggest what to do the first week to help you get started.



If the course is a new one, it may not be possible to decide everything in advance. In that case, frequent and regular course meetings during the term are essential. You should expect to give the lecturer important input on how things are going, and should expect to influence policy on exams, problem sets, and course material.

Why have sections?

First-time section teachers might want to think a little about what their function is. Observation of classes like the one described before and even worse ones suggest possible answers:

- to supply in advance the solutions to the week's problem set, thereby saving the students a lot of unproductive effort;
- to provide an hour of sleep uninterrupted by cell phone calls;
- to keep the profession small by discouraging potential majors.

Getting serious, a reasonable list of your roles might be:

Prodding — Provoking discussion; getting the students to think about and interact with the material; motivating them to work and succeed;

Helping — Answering questions; explaining difficult points; smoothing out areas of uncertainty; showing them how to get started; what's important;

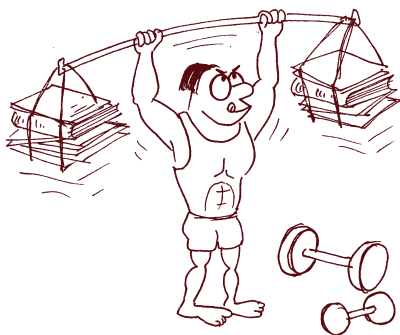
Catching — Acting as a safety net; watching out for students in trouble; giving them extra help when possible; alerting others when necessary.

These are things which can only be done in smaller groups, where the teacher sees the students as individuals. So we need sections.

Preparing for the section meeting

Even experienced hands have to do some preparation before each section meeting if they don't want to run into trouble.

- Look over the problems that students are likely to ask about; for those problems that won't be graded, work out in advance those that you are not absolutely sure you can do off the top of your head; just as important, think about how you will explain them.
- For problems that students are to hand in later for grading, help usually consists of discussing an analogous problem, or one that presents similar difficulties. Don't give things away, however: if you regularly do, your section will get larger, but it's bad for the students and they will not respect you. They have to struggle by themselves first before they can profit from your hints.
- You should know how far the lectures have gotten, and be ready to explain what you think are difficult or important points. For this, talk to other instructors, read suggestion sheets put out by the lecturers, and best of all, go to the lectures yourself (this is often required by larger courses). Failing that, you should at least have the lecture notes (if the lecturer doesn't provide them, perhaps a student's can be regularly copied). If you don't know if something has been covered in lecture, it's better to ask your students than to guess. They won't be happy that you don't know, but at least they see you care enough to ask them.



- Have material ready to prod the students with in case there are no questions: non-assigned problems, materials from other textbooks, or your own experiences that are relevant and interesting. These days in almost every field, there are journals oriented toward teaching and they have material you can use for the classroom. Again, consult with other instructors or the lecturer.
- An important point is hitting the right level: here you have to feel your way. You want something for everyone --- most of the time at a level where everyone can follow without difficulty (some teachers recommend aiming a bit below the average); now and then something that stretches your students a little. The problems they are asked to do are a good guide to the level expected, if not to the one you actually see.

Planning the Hour

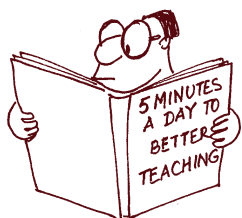
Deciding how to divide up the recitation time isn't easy. Possible activities include: solving homework problems, reviewing the week's lectures with your own commentaries and explanations, working together on new problems, giving brief quizzes, digressing to related material not in the syllabus, telling jokes... Different recitations do different things.

At least do some advance planning—have some modest objectives in mind that you can head for; they will give you an internal compass that your students will sense and appreciate. Have some alternatives in mind if you aren't sure what your class will need that day. Do what you do best and enjoy doing, what your class seems to appreciate, what they need. Keep it varied and keep experimenting.

Remember, though, to start things off with some warm-up exercises. Some teachers like to start with an outline of what went on in lecture — this can serve the same purpose, if done briefly and interactively.



A Word About Pedagogy



There still remains the problem of how to present the material and explain it clearly. Here we are at the limits of what a little booklet can say. Still, even long-time teachers make such elementary errors of pedagogy that it might be worthwhile to talk a little about the subject from a practical viewpoint.

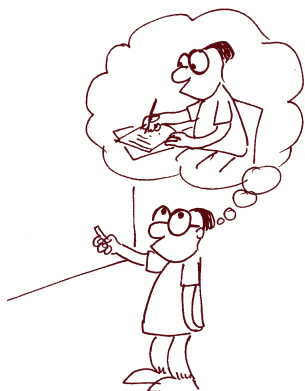
Three different approaches to classical psychology offer valuable insights that can be used in every class.

Define the tasks

Behavioral psychology might urge you to think about what it is you want your students to be able to do. Differentiate all functions of a certain type? Check an answer by qualitative reasoning? Isolate and analyze the forces on a rigid body? Synthesize an organic molecule on paper? Trace the themes of a Bach fugue? These will require different approaches, but they are alike in this way: they are specific tasks that your students can aim at mastering. By contrast, the vaguely formulated tasks implied by enthusiastic lecturers and recitation teachers—understand the role of the mean value theorem in calculus theory, appreciate how Maxwell's equations summarize the laws of electricity and magnetism—leave students uneasy and asking about exams, to their teachers' irritation.

**Are we responsible for the laws of planetary motion?
No, Kepler was.**

—from a physics class



Explain your thought process

The introspective approach to pedagogy would suggest that you look inside yourself for clues to good teaching. Solve a problem and watch yourself do it. What guided your thought? How did you know to try what you tried? Tell your students.

Thinking starts with a problem

Located somewhere between behaviorism and introspection, the school of gestalt psychology teaches that thinking starts with a problem, a difficulty, a contradiction. It sounds like a truism, yet is widely ignored in practice. Teachers say their aim is to get their students to think, yet in classroom after classroom they violate this psychological principle by giving the solution before there is any problem.

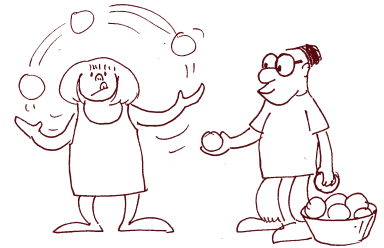
“Now we are going to study a new kind of integral, called the line integral. Here is the way it is defined...”

Sound familiar? Of course, the motivating problem must be an interesting one—that's where it helps to try to find things in the real world to serve as the problem source.

The above ideas barely scratch the surface of what psychology and research into learning has to contribute to our understanding of pedagogy. But we're after just a few basic principles that will be easy to remember and will help your teaching immediately. Here are three more that you'll find use for constantly.

Go by degrees from the easy to the hard

Things can be hard because they are complex, requiring many steps and processes (like multiple integration in calculus), or because they involve subtle ideas (like the Coriolis force in mechanics). If you think the complex problem will be too hard, first give your students practice with simplified problems involving only a few of the steps. For subtle ideas, look for simpler analogies, allow a lot of time, and be patient.

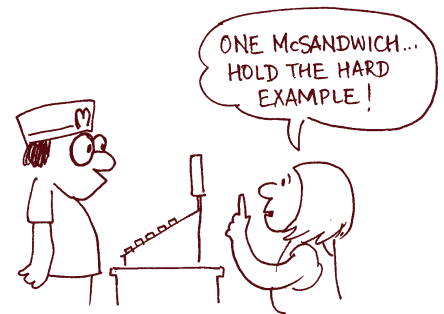


The sandwich method for general principles

To present an abstract idea—a general formula, a general law, a theorem—a good way is to present in order:

- An easy example illustrating the principle
- The general statement and explanation of the principle
- A harder example using the principle

This corresponds to the way people think. It's much easier to understand an abstract idea if you can test it out on a simple example. Then once you've understood the principle, it's fun to see its application to a more complex example that was too difficult to handle before.



The bird's-eye view and review

Often students can't follow an explanation because they can't tell where it is headed, what the ultimate goal is. You know, but they don't. So begin a complicated explanation by giving an overview of what it is you're going to do—the purpose, the general method, how long it will take, whatever. Some teachers like to write this outline on the board. When it's all over, turn back and survey the ground you've covered together, and congratulate them on having made it.

The other way—keeping the students in suspense so that the purpose of everything becomes clear only at the very end—may be a great way to tell a mystery story, but it's a bad, bad way to communicate complicated information. Give them instead right from the beginning the "picture on the box"—the picture on the jigsaw puzzle box that serves as a guide for how the pieces fit together.

First I tell 'em what I'm gonna tell 'em, then I tell 'em, then I tell 'em what I told 'em.

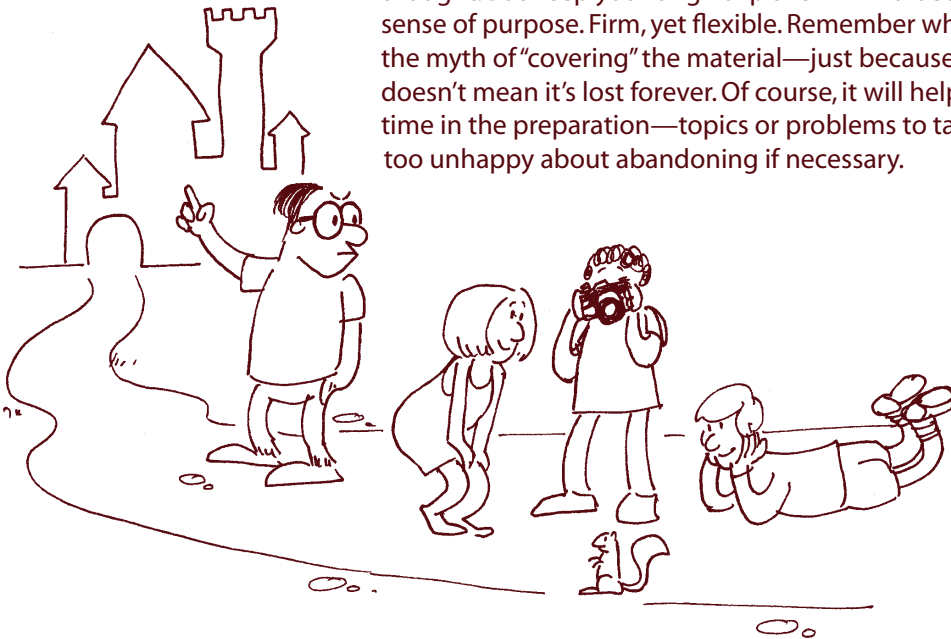
In The Classroom

In you go armed with mind-boggling stuff and determined that, prodded by your skillful questioning, your class will have an intense intellectual experience and reveal a brilliance they didn't know they had in them.

"Could you go over problem 3 on page 112, I didn't get the answer in the back of the book." (General nodding agreement.)

It's a boring, stupid problem, one you hadn't planned to do. Grrr...!

The best laid plans of mice and recitation instructors go oft awry. Relax: you're a tour guide who has been asked to make a side trip. If the group is interested, maybe that side trip will turn out to be more interesting than you thought. But keep your original plans in mind because your section needs a sense of purpose. Firm, yet flexible. Remember what was said before about the myth of "covering" the material—just because you don't do something doesn't mean it's lost forever. Of course, it will help if you've allowed some time in the preparation—topics or problems to take up that you won't be too unhappy about abandoning if necessary.



Your personal schedule for the classroom

Come early. It says you're interested and available, and gives you a good chance to chat informally with a few students, find out what's going on, and get to know some of them.

Start on time. Assume those who come in later were coping with some crisis, but don't review for them.

End on time. Nothing was ever learned after the bell. If you've got two more lines to write that are the keystone of the whole hour's work, beg them abjectly to stay for one more minute and swear you'll make it up to them somehow. But don't think they'll actually be paying any attention—it's just for your own sake you're doing this.

End ahead of time if there aren't enough minutes left to start something new, and the class has run out of steam. In particular, don't start something new, don't preview the next lecture unless the lecturer approves of this, don't start pumping them for questions to fill up the last few minutes. Let them be first on the lunch line instead.

Stay Late, until the stragglers leave—they might want to ask about something they didn't dare ask in front of the others.

Flub-up time

- You made a mistake at the board somewhere, but you can't find it.
- You can't answer someone's question.
- You get stuck working out problem 3 on page 112.

These things happen to everyone, but they are hardest on newer teachers who often feel insecure at the beginning. The main thing is not to become defensive or hostile, and above all, don't fake an answer or b----- around. Even the poorest students in your section won't be fooled, and you will lose everyone's respect. Ask for help instead, hope you get it, and listen to the students who are trying to give it--some of them might be right. Or promise you'll have the answer for the next class. It's all right to make mistakes and you don't have to know it all, but you do have to be honest.

I asked a teacher a question and the answer was something like, "I'm not really sure, but I don't think it will be on the test." I'd prefer and respect an answer on the order of "I'm not really sure, but I'll get back to you on it if you'd like."

Q The students hissed at me yesterday, and I was shocked. Don't you think this is incredibly rude?

A It's not hissing, just letting out steam. It is triggered automatically by either of the following:

- Announcement of a problem set due the day after vacation.
- Referring in class to any course other than the one you are teaching (double hissing for referring to any topic that you expect them to have learned in said course; redouble if you say the topic will be included in the next exam).



Ask Peggy



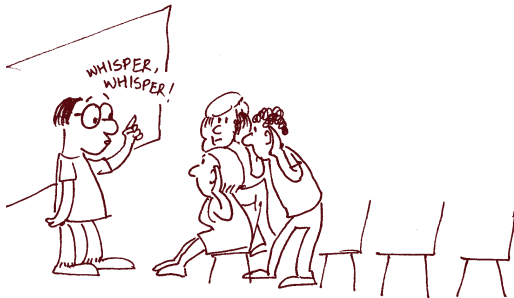
- Q** My students all sit in the back row.
- A** This is a common problem. Some are hoping to be inconspicuous so you won't call on them. Others are using well-known body language to tell you that they are really just uncommitted observers of the proceeding. (I am assuming, of course, that you have not been eating onions.) Possible solutions are to:

Adapt: Use a megaphone and write big.

Fight back: Mumble, write small, and call only on people in the back row.

Ally yourself with The Force: By habit, students sit all term long where they sit the first day. Come early and rope off the back three rows with a sign, "Reserved for Listeners."

Offer positive reinforcement: Ask them as an experiment to sit up front and that day give your most scintillating class.



- Q** Should I be informal or formal in my approach to the class?
- A** There are a lot of ways to teach—energetic or relaxed, in tweeds or jeans, the Olympian authority or the humble just-another-student. If you're not relaxed about your attitude, your students will be uncomfortable too. Just be yourself. However, if you feel you can manage it, being informal in a small section is usually more fun. It encourages interaction, and it's a bit more comfortable when error time comes around—the higher up you set yourself, the further you fall.

The Professor knows everything—even his mistakes are correct.

The TA specialized in proof by intimidation and proof by superior credentials.

Some roles teachers play (and mostly shouldn't)

We cast you a little while ago as the tour leader for your recitation. Other roles that teachers play reflect how they feel about the course and their own place in it, and some have unfortunate consequences.

The union organizer. It's tempting to ingratiate yourself with your section by telling them that it's not their fault they are having difficulties—they are victims of the System. You run down the book, the lecturer, the course in general. Of course any book or lecturer will occasionally be obscure, and it's all right to remark on it. But don't overdo this, because it can demoralize some of your students: why bother struggling if the cards are stacked against you?



The lifeboat captain. Do you give your section the feeling of being tossed helplessly about on the seas of your subject by Angry Implacable Lecturer-Administrator Gods? That's the effect of habitually using "they":

"I heard they are going to make the next problem set really tough."

"They are leaving infinite series out this year."

"I don't know if they will give you a thermo problem on the exam."

If this is the way you really feel, then there is too much of a gap between you and the lecturer for the good of the course and your students. There should be more staff meetings and you should have more input on the problem sets and exams. In the meantime, at least compromise by staying on neutral ground verbally: "This was a difficult problem set" rather than "They made the problem set too difficult."



The wearer of white-kid-gloves.

"The rest of this problem is just the usual algebraic garbage which I certainly don't intend to go through."

"That's just a standard $F = ma$ problem—doesn't anyone have something more interesting they want to ask about?"

Such remarks convey to your students that routine things are beneath you. Many of them will imitate your attitude, with disastrous results later on. The most common complaints from upperclassmen teachers are things like, "They can't even integrate dx/x ," "Doesn't anyone teach them the periodic table anymore?"

So let students know by your attitude that you consider such things important and that everyone must learn them well. Brief quizzes will reinforce this. Poorer students should concentrate particularly on this type of material; finding they know something well may encourage them to go further.

The undergraduate chemistry majors we get from you are really brilliant. Now if they only knew what pH was.

—Graduate Chemistry professor

Here's a role for you that your class will appreciate.

Leader of the expedition. Every course has its winter of discontent—those times when most students are just struggling along, not really seeing where things are headed, and feeling they will never get any mastery. It's up to you to cheer them on, to reassure them that others have made it, and they can too. Point out some of the natural wonders in the distance and the pitfalls you're leading them past. Teach them survival skills. Hold up to them visions of the delights that await them on the summit.

OK, block that metaphor. All the same, a little of your energy and enthusiasm supplied at the right moment can give them the lift that will take them the rest of the way.



Off to a Good Start

The first few classes are important: they set the precedent and pattern for the rest of the term. As they say, “First impressions last.” Some students seem to think the saying is “First impressions are the last”—they bolt out of their first-day recitation to the undergraduate office where they queue up to see what other section is open.

Your challenge is to get over your first-day jitters and off to a good start. Instead of thinking of yourself as up for inspection, imagine yourself as the host of a party full of strangers, or the conductor of an amateur orchestra meeting for the first time. If you can make your students feel a part of something exciting and interesting, you’ll have taken a big step toward ensuring the success of the next twelve weeks.



The first day

Let’s talk about what you can do the first day. We’ll assume that the sections are essentially fixed from the beginning, but if students are allowed to shop around, changing sections freely (find this out before you walk in), then some things should be postponed until the second or third meeting when the class has stabilized.

Introduce yourself

Your name, office, phone, office hours, for sure. If you feel comfortable doing it, why not briefly tell your class something about yourself—your schooling, research, interests, and in general, what you do besides teaching their class?

If you are from abroad, you should definitely tell them about your background. Read now the section near the end of this booklet for teachers from other countries. You should also read it if your English is heavily accented.

By the way, if the room is too large, the first day is the time to ask the students to move closer to the front.

Introduce the class to each other

If the sections are fixed, make up a class list by passing around a piece of paper on which students write their name, address, e-mail address, phone number, major (or possible major), and advisor’s name. Circulate the list at the next couple of meetings as well. When it firms up—check it with the official list to see who has dropped out—give everyone a copy. (Wait for the second meeting to start this process if students can shop around.)



First Day Subject Matter

The main thing is to choose material that allows interaction. If the lecture hasn't met yet, you could quiz the class orally on background material or work some review problems with them. If the lecture has met, you could, in addition, quiz them about the lecture or start in on the homework. Many lecturers make suggestions about what to do the first day—ask at the course meeting. You could have a discussion with them about what they would like to see done in recitation. If the lecturer isn't going to do it, you could outline topics to be covered; you might give them some examples of what they'll be able to do by the end of the course, to whet their appetites. But avoid lecturing; the message for today is that you want them to talk too. That will set the pattern for the rest of the term.

Learning names: There's magic in a name. Knowing your students' names will tell them you are interested in them as individuals and will help interaction. We're putting this in the present chapter to encourage you to start in on it from the beginning. Your efforts will please students and encourage them to return.

Use the names in class: This is the fastest way to learn them. You can ask the students to give their first names (that's all they ever give) whenever they speak for the first week or two. Don't be inhibited by the fear of making mistakes with their names; you'll be forgiven.

Quick 5 or 10 minute quizzes: Ask them to write their full names at the top, then go around the room while the students take the quiz and look at their names. This is a good way to see who needs help getting started—offer it if it is needed. You can even do this the first day.

Return homework individually: Call the students by their full name. Note any unusually pronounced names; how you say their names is important to students. If there isn't any homework, you could instead call the roll occasionally during the first few weeks. (Both of these let the students see who's who.) As a further help, you can note down obvious physical characteristics, and where they sit.



Student picture: Find out from your undergraduate office when these are available, and be sure to get them. Doctor them as needed by inking in new mustaches, beards, glasses, longer hair (removing these poses more of a problem...)



I urge students to come in and visit during office hours in the first few weeks so that I'll get to see them as individuals instead of just as a sea of faces.

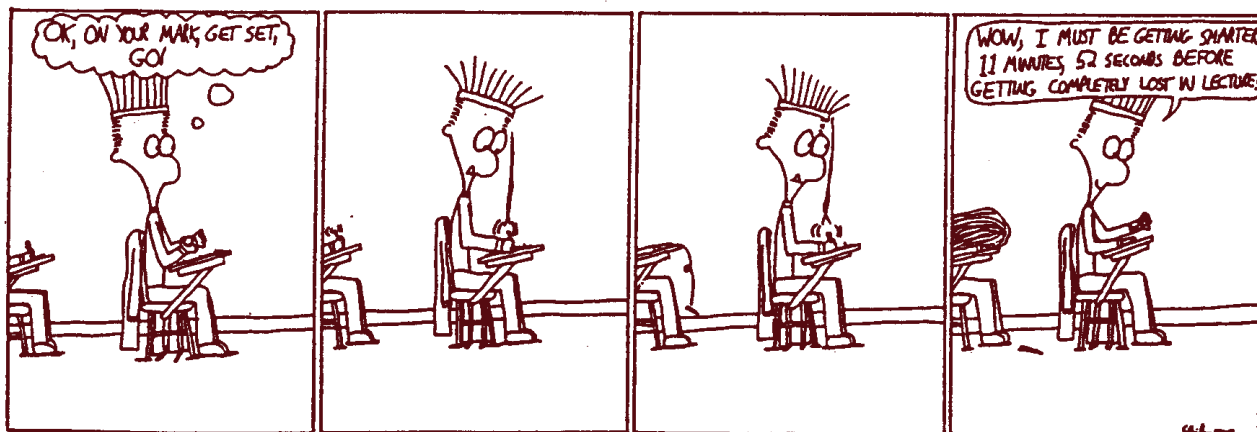
—Math T.A.

In the lecture/recitation format, it's only the recitation teacher who has a chance to know the student. You'll be relied on in a variety of ways (completing evaluation forms, giving grades, talking to advisors, writing letters of recommendation, etc.) to provide information about your students. Students themselves will drop by for help and advice. The more you know about them, the more you'll be able to help. Treat getting to know them as an important business.

Don't be discouraged if the first day doesn't go as well as you had hoped; it's easy to exaggerate its importance. There's always the second day and all the others to come. Expect some quietness in the beginning as you and your students feel each other out. As you get to know each other, most of the first-day awkwardness will disappear and things will go more easily.

Just keep coming to bat—once in a while you'll hit a home run.

—Chem T.A.



Basic Communication Skills

Assuming your course is not in perfumes, cooking, or some refined academic version of these, communication in your class will be by ears and eyes—talking and listening, writing and looking. Let's begin with the last of these.

Eye contact

Do you look at your students? Think how hard it is to talk socially with someone who doesn't look at you. Nothing will give your class the "glass wall" feeling faster than to see you talking to the blackboard, the walls, the window, or a point one foot over their heads.

If this is you, pick two or three students who don't sit next to each other and address your remarks primarily to them, then gradually branch out to the others. Or if you bring notes to class, include in them at several points notes to yourself: "Look at the students while doing this!" Look over students' shoulders as they work at their seats—all these help in breaking through that no-look force shield surrounding your students.

Eye contact will also automatically improve as you get to know your students better as individuals, say through office hours or by coming early to class. Even shy people are usually able to look at their friends when they talk to them.

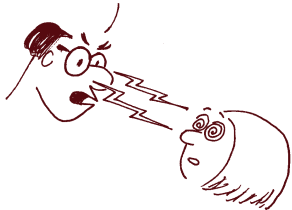
Listening

To communicate, you have to be a good listener. Many people aren't, especially teachers who are a little nervous about their command of the material, or preoccupied with "covering" something, or getting some specific points across. Listening to students presents a particularly troublesome problem, since sometimes they are very poor speakers who don't say what they mean to say.

Remember the discussion in the chapter on Questions: try responding to a question with a question of your own until you feel sure you know and the others know what's being asked. If in doubt, enlist the aid of other students in the interpretation.

- Q** I couldn't get problem 22 on page 263, could you work it?
- A** Did you have trouble getting started, or did you get stuck somewhere in the middle? Or was it that you didn't get the answer in the back of the book?
- Q** Is the gyroscope important?
- A** Important in physics, or the real world, or for the exam next Wednesday?

SO THE CAUCHY
INEQUALITY CAN BE
DERIVED FROM THE
BRUEGEL-RIEMANN LAW...





Your voice

People don't think much about how they sound as speakers, yet the way you say things sends strong messages to your class and to a great extent determines its overall atmosphere. Put a cassette recorder on the desk and let it run for the class hour. Many teachers are shocked by the playback and don't believe what they hear.

Listen to the *inflection* of your voice. Common problems are:

- Dying fall: voice drops into inaudibility at the end of each sentence. Depressing.
- Rising inflection: every sentence becomes a question? Seems like you hear it everywhere these days? Irritating.
- Monotone; voice on one level, without emphasis. Soporific.

Listen to the *pace* of your voice: a rapid-fire delivery that just can't be followed is all too familiar, and a slow pace has problems also.

Does Prof. R _____ realize it's very hard to take notes after he puts us to sleep?

The TA was very, um, knowledgeable, um, but, um, pedantic, and, um, slow.

Some other common speaking problems:

- Sentences interlarded incessantly with "OK?"; "All right?"; with no pause for response and none expected;
- Voices with an emotional overlay: voices that sigh frequently with apparent boredom, or seem to express underlying anger or irritation (usually the teacher is unaware of any of these feelings).

Again, listen to a tape to hear if any of this is what you do. If you've got a well-modulated, well-paced voice, which expresses a cheerful enthusiasm, congratulations: your class has lucked out. If not, you will be able to change most of the things above once you learn to hear them in your voice by listening to an audio tape. Unfortunately, two are very resistant: monotone speech and too rapid speech. But the latter can be helped if you learn to use the blackboard well.

We've left out foreign accents: see the chapter for teachers from other countries.

Sarcasm and other things to avoid

Words like “obvious” or “trivial” and phrases like “I think you should all be able to see that...” will seem like put-downs to your students and inhibit response; they just are very unsettling if one feels insecure with the material. Think how much courage it takes to respond, “Well it may be obvious, but I still don’t see how you got that...” Don’t put unnecessary roadblocks in their way.

Sarcasm can be put in the same category. A teacher who has excellent rapport with the class can get away with such minor and apparently harmless sarcasm as:

“You’re all geniuses so I know I won’t have to explain this to you,”

but it’s too risky for the average class situation—it just isn’t a joke to students who feel insecure.

The visual side of teaching

This means what you write on the blackboard, or show on Power Point, overheads, or class handouts. Some teachers pay little attention to this, but they are making a mistake. People vary in the way they like to take in information; you need to pay as much attention to the eye-minded as the ear-minded. If you both speak well and write well, it gives you two chances to reach everyone.

The visual side is so important and so neglected we’re going to discuss it in a separate chapter.



Seeing is Understanding: Using the Blackboard

Science and Engineering teachers almost always have to write things down—the diagrams, the formulas, the derivations. Yet their blackboards often seem to be more a record of their stream of consciousness than anything else. And oddly enough, many teachers actually seem proud of this. They ought to read this cry from the depths—an unsolicited e-mail from an undergraduate.

Things with which I have had to deal:

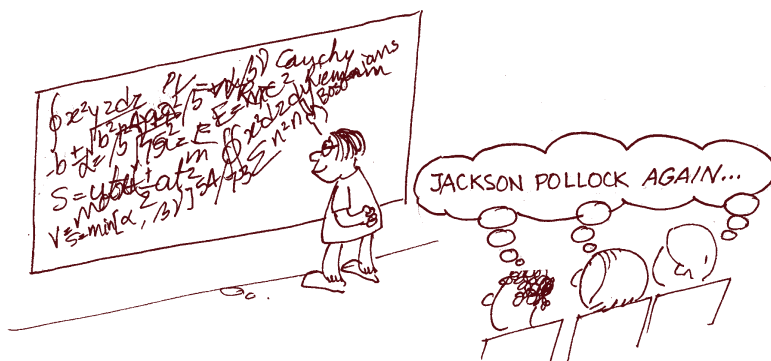
- **I can't read the handwriting. It's either too small or simply illegible;**
- **the board isn't properly erased, and I can't read what is written on top of a white "blurb";**
- **he writes in a weird color, like red, which makes it impossible to read;**
- **he ERASES THE THINGS HE JUST WROTE, and we don't have time to copy it!!**
- **I see so many abbreviations on the board that 30 seconds after he talked about them, I don't know what they mean;**
- **he doesn't write one thing after another, in order; he uses the first board, then the corner of the third one, then the second one, then he erases part of the first one and writes on half of it before moving to the fourth board. It sounds ridiculous, but it happens!!**

The reason you need to fuss over making the board look good is that at any moment:

- half your students aren't listening—they're daydreaming;
- half your students aren't understanding—they're just taking notes. (The two halves might overlap some.)

You want the board to tell what went on well enough so that the daydreamers won't be lost when they tune in again, and so the baffled can use their notes to figure things out later (maybe with their roommate's help).

There's another reason for having a good board: it goes a long way toward making up for any other teaching problems you may have—speaking with a heavy accent, speaking too quickly, not making eye contact. If students can understand and learn from what you write down, they will be willing to overlook a lot.



Neatness counts

The basic rule is: don't skip around the board tucking in formulas wherever there's a little space; use the board sections in an orderly way. One good method is to start at the extreme left panel, go down, continue with the next panel to its right, and start over at the left again when the entire board is full. The writing itself should be clear, the right size (easily read but not wasting a lot of space), and written on a straight line. Check these things occasionally after class by looking at the board from the rear of the classroom.

Write it and leave it

Write down enough (including a brief statement of the problem for the sake of those who didn't bring their books or notes to class) so things can be figured out later; standard abbreviations will help to save space. Don't erase until all the boards are filled, and don't simplify expressions by using the eraser, as this drives note-takers up the wall. Put important things in boxes to emphasize them visually, or use colored chalk.

My chem. T.A. draws all the structural formulas in the air with his fingers. He must think chalk is one of the rare earths.

A few more suggestions on blackboard use:

- Practice drawing pictures or diagrams ahead of time, if you have trouble with them.
- Pull the shades if there is sunlight or glare on the board—even your best students would rather squint than tell you.
- Your chalk squeaks? Watch out for this since it is something that usually annoys the class much more than the teacher. Just break the chalk in half, and hold it at a 45° angle to the board.
- Use fat (railroad) chalk—it gets dust all over you, but no one will ever again complain that you write too lightly, too small, or that you squeak.
- Try to stay inside the squares; that is, if the blackboard has vertical cracks, don't write across them if you can help it. It can be rather confusing visually (also, the bears might get you).
- If you see your students' heads waving back and forth, it means they can't see what's written on the bottom third of the board. Don't use this part. Compensate by writing the top line higher up: stand on tiptoe if you have to. (It might also mean they can't see through you—standing in front of what they write is a method many teachers use to cover the material.)



“Aim not to cover the material, but to uncover part of it.”

—quoted in “You and Your Students”

Learning to use the board

“This sounds great, but how do I learn to do it? In class, I’m so occupied with explanations that I just can’t worry about how the blackboard looks.”

The answer is: prepare ahead of time. Follow these next instructions to the letter, and clip coupons for the rest of your academic life.

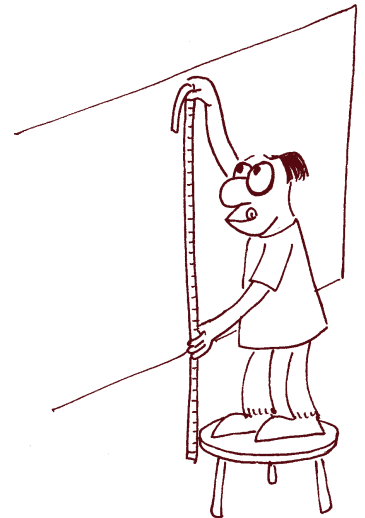
Pick fifteen minutes worth of material you want to present: a substantial problem, a review of some lecture material, or something new but lecture-related. Take a sheet of paper, draw an outline of the blackboard panels on it, think through your presentation, and write on the paper *exactly* what you will write on the board. *No short-cuts: when done, the paper should be a photograph of the board.*

Of course, before you can do this, you’ll have to measure the size of the blackboard panels, and you’ll have to decide how many lines you can put on the board (checking at the back of the room and remembering about not writing too low).

The paper will then be your notes when you go into the room. Your presentation consists of reproducing the paper on the board, talking it through as you go. (But don’t appear to be copying—you ought to be able to memorize a few panels of board.)

It sounds ridiculous, but it works. You’ll find you have to prepare in an entirely different way. Should this expression go here or there? Does this idea stand out enough visually? Can parallel ideas be put in adjacent columns? What’s the best way to draw this figure? What are the fewest words that will make this idea clear? Is this abbreviation self-explanatory, or do I need to write more? Can the argument be reconstructed just by looking at what’s written down?

Every one of the problems the undergraduate complained about will melt away—using the board in an orderly way, sizing the writing correctly, not erasing too soon. The confidence it gives you will actually release your spontaneity—you’ll feel freer to tell jokes and have fun with the class.



Another important problem this solves is *timing*. See how long it takes to go through each panel (3 or 4 minutes is typical). Then once you decide what is to be written down, you get a surprisingly accurate reading of how much time the classroom presentation will need, and you can make choices and set priorities. If you find yourself spending too much time on a panel, you're probably not writing down enough of what you're saying; if too little time, you're hurrying through the presentation and should slow down.

Naturally, much of what happens in a recitation can't be prepared in advance this way. But you'll find that if you go through this exercise conscientiously a few times, inside your head a little blackboard designer and editor will be born that will automatically produce a board your students will be grateful for.

If I write down careful and consistent fingerings for at least three Scarlatti sonatas, and test them out and revise them so that they really work in execution, will I be able to finger the remaining sonatas satisfactorily?

Yes.

If I learn six Scarlatti sonatas with carefully written out fingering, will I be able to dispense with writing out all but unusual passages in the others?

Yes.

—Ralph Kirkpatrick, editor's preface to *Sixty Sonatas* by D. Scarlatti (New York: G. Schirmer, Inc., 1953), vii

Other Visual Aids

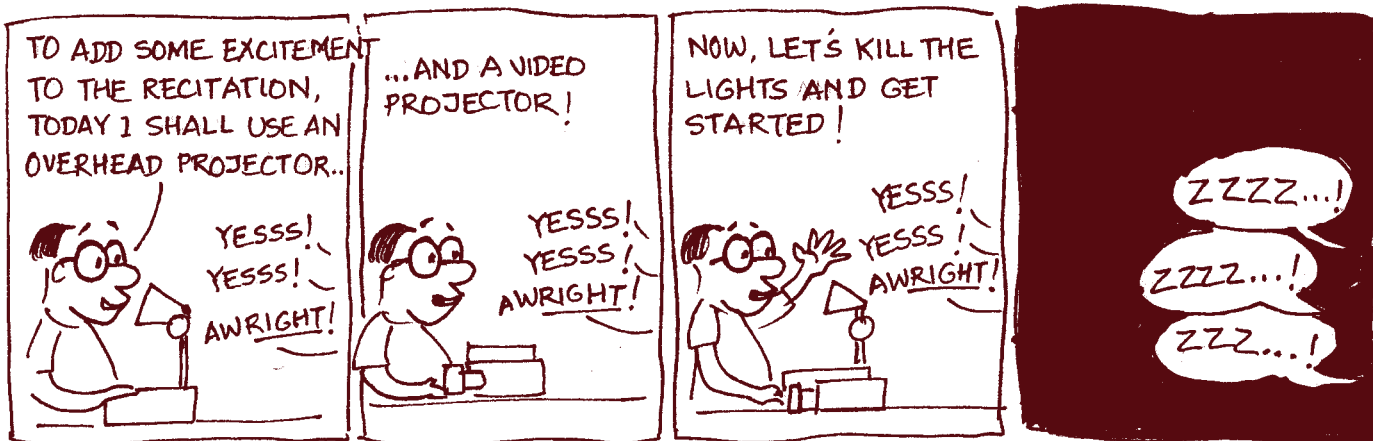
Occasionally using other aids besides the blackboard can lend some variety and excitement to the recitation—just the feeling that you've gone to a little trouble on their behalf can mean a lot to your students and to the general atmosphere.

Transparencies and PowerPoint

The overhead projector can show complicated tables and diagrams, photographs of famous people in the field, and pretty commercial color transparencies with successive overlays that add information. You can show three-dimensional graphs from several perspectives. For these things overhead projectors are real assets, though getting such material together takes time. One more thing: they let you face the students (in a dimmed room, to be sure). These remarks apply to PowerPoint presentations as well, though they may take more time to prepare, and you will need more equipment to show them.

If you do use PowerPoint or transparencies instead of or in addition to the blackboard, consider these points:

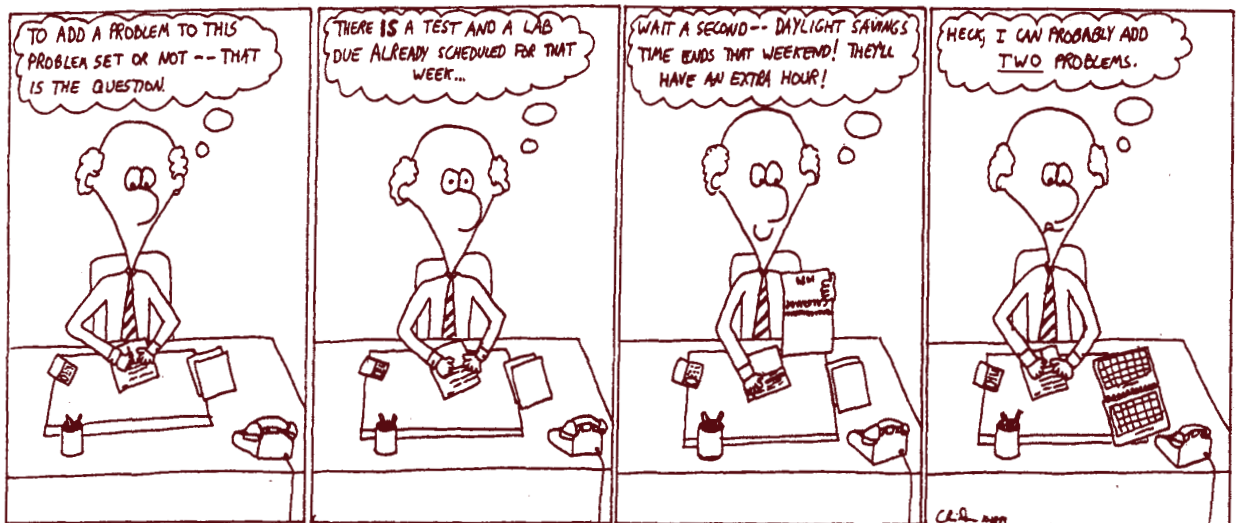
- be careful about the writing size; book and computer print must be heavily magnified to become legible, or you have to use large-size printer fonts; this also goes for on-line computer projections;
- be careful where the overhead projector is placed because it's not transparent;
- taking notes from transparencies or PowerPoint displays is generally too difficult because the material appears (and disappears) more quickly than students can write it down. Think about handing out copies of the displays; students can write on them (but the font size is usually too big);
- the continuous transparency that you write on, rolling back and forth to recall previous points, produces poor notes, no hardcopy, and much frustration;
- dim rooms are great for sleeping.



Evaluating Your Students: Assignments, Exams, Grades

In a system where courses compete with each other for the student's time, those without regular assignments and clear expectations will lose out. Students get so far behind they can no longer even ask questions, let alone follow what is new.

Students tend to gauge their understanding by how well they can do the assignments, so these should be scheduled carefully. This is usually done centrally. Your job as recitation teacher will be to help your students with the homework, smoothing over some of the difficulties without robbing them of all exertion. If there's a weekly problem set, look it over as soon as it comes out and keep it in mind when planning what problems to work in class, but don't sabotage it by working essentially identical problems. (Baby chicks should not be helped out of the shell.)



Students tend to work in groups on homework; the course policy on this should be firmly stated and enforced. You should call in students who seem to be violating it, ask them to explain, and deduct credit as appropriate. Refer serious cases to the course administrator or lecturer.

Because students may work in groups, homework isn't usually counted too heavily in the final grade. It should certainly make a difference in borderline cases (there are often a lot of these), and in letting students who choke on exams still pass the course. Again, the lecturer should set this policy.

The most important thing about correcting the assignments is to do it promptly—which means handing them back at the next recitation. You're going to grade them sooner or later, after all; doing it sooner means that the students get the papers back while the work is still relatively fresh in their minds.

You can then discuss common difficulties in the recitation, and the material still will be current in the course. It's also important for morale—it gives students the feeling that you are interested in their work and take them seriously. They in turn will respond by putting effort into your recitation. For advice on grading, see “Grading Exams and Assignments” below.

Students take exams very seriously, which means that regardless of what you think of tests as teaching devices or as tools for evaluation, you have to take them seriously also.

Review sessions: At the last meeting of your class before an exam, your students will hope for a review. Giving a good review session means a little work in the preparation, but you'll be rewarded by the feeling that they are hanging onto your every word. You might at long last get some questions.

For a quiz review, usually the class hour is divided up: a brief outline of what the quiz will cover (very brief if it was done in lecture), comments and hints about those parts of the material which you feel are most likely to give them trouble, a question period, and finally working sample problems from old exams if there is time.

Exams tend to fall into routine patterns, and you or your students may be lucky and score a direct hit during the quiz review. They'll love you for it, but after the elation has worn off you may feel some qualms. Try for near misses instead. Remember that your overall purpose is to review a section of the course and help them see things in perspective, not just teach them how to pass the exam.

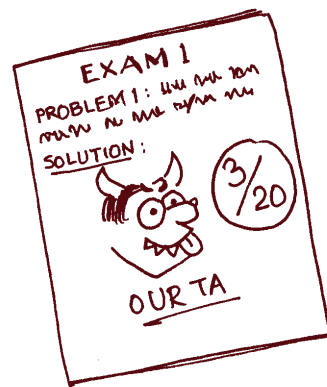
Grading exams and assignments: Exams are often graded by the entire course staff together, or at least the course head supplies detailed instructions. If not, you'll have to use your own judgment. If this is your first time as a section teacher, especially if you come from abroad, talk to some of the experienced section teachers to get a feeling for the standards—show them a few of your graded papers, or ask to see theirs.

Give partial credit, or plan on taking a different route to school each day. It's psychologically better to give positive credit only; indicate the mistakes, but don't put deductions -3, -5, next to each.

Look over some of the papers to see what the common mistakes are, and decide in advance how you will assign the partial credit. It is fairer to grade one problem at a time, shuffling the papers between problems.

Everything said about grading homework on time applies with even greater force to the quizzes.

Examinations



Give
Partial
Credit

One teacher advised never correcting assignments with a red pen: take it as a metaphor way of saying that your comments and corrections should convey an underlying respect for your students' efforts. One TA corrected papers using a set of rubber stamps saying things like "NO!!", "RIDICULOUS," "CONTRADICTING YOURSELF," "UNREADABLE." That was using a red pen.

The T.A. attacks papers wielding her red pen like a flamethrower.

Handing back the papers: Your students will want to know at least the section averages and the overall average, and perhaps some idea of the spread (either through the standard deviation or a rough histogram of the section). They may want a letter grade too, but give them one only if it's course policy to. Some teachers give no information at all, hoping to downplay competition, but of course the students can find out other section averages, and it's silly to make them struggle for the information. Much depends on your manner and on course policy.

There should be solution sheets for students to compare against their own answers, so you don't have to write corrections on the papers as you grade them. Discuss common mistakes, as everyone can learn from others' mistakes, but keep it interactive. You might ask, for example, "What's wrong with this...?" It's also interesting to present unusual or elegant methods that appeared on some papers if you have time. (This goes for problem sets as well.)

After the first problem set we asked for answer sheets. The Professor replied, "Are you kidding? I don't have time to work through all these problems!"

The bad exam: It happens all the time. The exam was too long or too hard—your section average was 42, and your students sit there stunned. They've never gotten such low grades in their life.

Or the average was 65, but there was a trickily worded question that misled half your students, who feel they could have gotten 20 more points if it had been worded as it was in the homework.

The average was 92, and the students who have been walking on air all weekend because they felt they did so well have suddenly fallen to earth: "if everybody's somebody, then no one's anybody."

All you can do is reassure, offer sympathy, tell them it's not an uncommon occurrence. Even if you are as angry as they are, don't play union organizer: "This exam could have been better," not "They really goofed on this one."

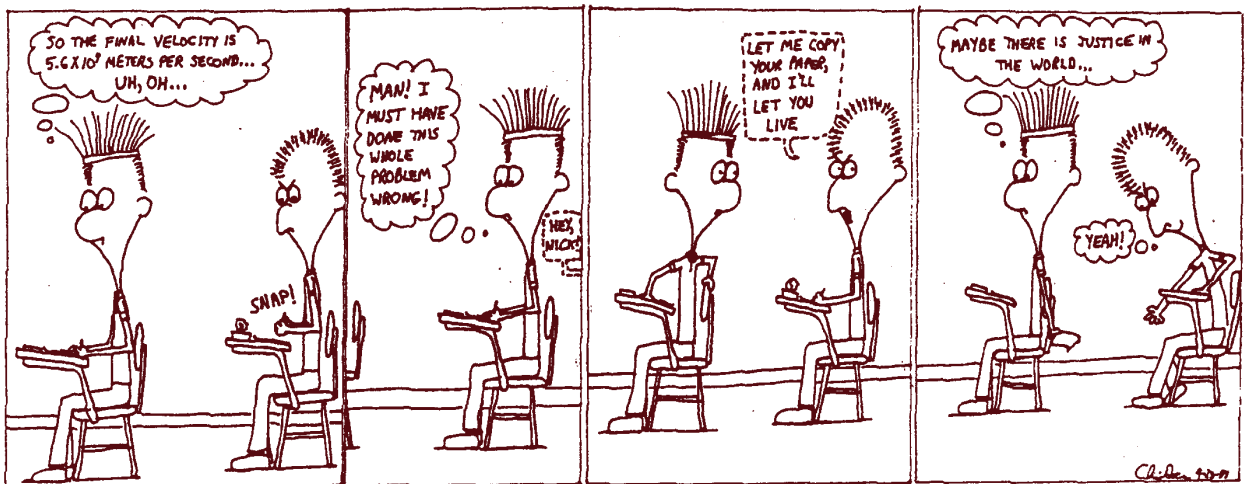
How does a bad exam happen? The lecturer or course head may be inexperienced at making up exams, he or she may not have had enough contact with the problem sets, or may have worked so long over the exam that it ended up seeming too easy.

For sure, it wasn't pre-tested. Ask that future exams be taken in advance by two recitation instructors, to judge the length and difficulty and spot poor questions. Volunteer yourself (you'll have to work out the exam later anyway). You should be able to write down the answer to an hour exam in ten to twenty minutes depending on the field.

Grade-changing requests: If you made a mistake, of course fix it, even if it's only a point or two. If it's just a judgment call, stick by what you did, but tell students that if their final grade turns out to be borderline, they can bring the paper back for reconsideration.

If students plead extenuating circumstances (headache, unusual stress...) make a note of it, and again, tell them you'll take it into consideration at grading time if they are borderline.

If you think the paper has been altered but don't have hard evidence, consult the course administrator or head. Where this is prevalent, some courses routinely copy all graded exams before returning them.



Final Grades. Lecture-recitation courses should have a uniform grading policy: how much each exam and the homework (and class quizzes and labs) will count. Student grades often are assigned in a meeting of all section instructors. You will usually have some leeway, however, and can take subjective considerations into account—giving a higher grade to the student who has steadily improved, for instance, even though the numerical total is the same as another who has steadily declined. Regularity and performance on assignments and section quizzes can be used to raise or lower grades near the boundaries.

Evaluating You: Feedback

You are evaluating your students steadily: the questions you ask in class, their problem sets, their exams. But it goes two ways—they are evaluating you as well. Do you want to know what they think?

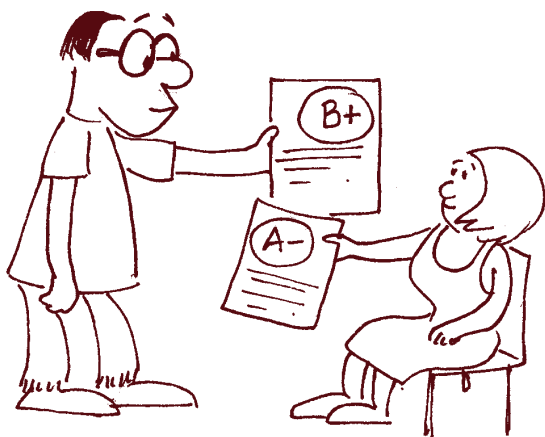
Let's face it, many teachers do not. They may say it's undignified, inappropriate, students lack the understanding and judgment—but the most important reason is probably to avoid getting hurt. Still, feedback can be such a help to improvement that all teachers should try to overcome any natural inclination they may have against it.

Try a Bull Session

Of course, when you look at your students, you'll see their expressions of perplexity, delight, or boredom. That's a form of evaluation. But you can get a lot more information by taking time out now and then to discuss with your class how they feel things are going. Listen quietly and carefully to what they say. For once, just listen; don't argue. But you can tell them how you feel about things, too—after all, some of the fault is theirs if the class is dull. However, don't criticize them too much. Maybe they'll have some ideas on how to improve things. Ask them. You'll have to assure them by your manner that you really want feedback and aren't going to give a C- to those who stick their necks out.

If they are too embarrassed to discuss the recitation, give them a few minutes to write down (anonymously) what they think, then discuss their comments with them during the next recitation hour.

Once or twice during the term you might invite the students to discuss broader aspects of the course—its pace, the text, the assignments, grading, administration, whether they feel motivated to study it, its difficulty, and so on. Sometimes you can pick up this sort of information by coming early to the classroom and chatting with the students there.



Other evaluation processes

- Give out a questionnaire in mid-semester to get feedback on how to improve the recitation. A similar questionnaire at the end can help you improve in the future.
- Now and then, two minutes before the end of a recitation, pass out 3 x 5 index cards and ask students to write what they still don't understand from that hour. (They don't have to sign their names.) Collect these and review what they haven't understood at the next recitation. (Or you can send the class an e-mail if it's a relatively simple point.)
- Bring a cassette tape recorder to class one day, and listen to the playback.
- Have your recitation videotaped, so you can see yourself as others see you. A trained professional, an experienced teacher in your department, or a knowledgeable friend can offer comments. (MIT has a formal program for doing this. Contact the Teaching and Learning Laboratory at tll@mit.edu)
- Your department may keep videotapes of good recitations that you can look at to get ideas from.
- Ask someone in the department whose teaching you respect—perhaps another recitation instructor—to observe your class.
- Set up an e-mail list of everyone in your class and write your students asking for comments.

We should fill out evaluations every day—the T.A. was far more prepared today than she ever has been before.



Small Groups: Tutorials and Office Hours

In some courses, in addition to having lectures and recitations, the students in a recitation section are further subdivided into several tutorial groups of 4-5 each, meeting once a week with a tutor who grades their problem sets and gives further assistance.

Conducting such a tutorial is an excellent way to start out with a course—you'll be close to the students and will perceive first hand the sort of difficulties they have. It's a good way to start out in teaching, too—problems of getting acquainted and interaction are much less troublesome. But don't think that a small group makes them automatically disappear. Some tutors seem to end up lecturing to three students as if they were teaching 300.

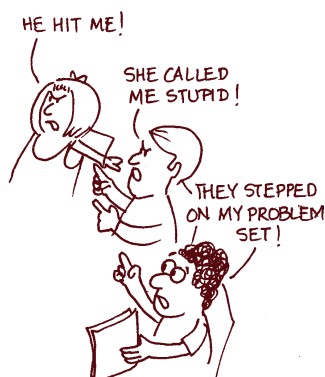
Running the tutorial

Assuming you've gone (as you should) to the lectures and recitations, you'll probably feel it your duty to clear up difficulties students had with poor explanations there. Do so, but don't spend all your time on this. Reinforce your explanations by working problems with them. There are different ways to do this.

One way is for everyone to contribute ideas, while you act as secretary at the board. This way they interact and get to know each other, and it's all the more social.

They can work in pairs, or small groups, solving the problem as a team. In that case, it should be you who picks the one to present the solution at the board; that way they will realize that making sure everyone on the team understands the solution is an important part of their effort. Change the teams so they get to know one another.

YOU SHOULD THINK
OF THIS TUTORIAL GROUP
AS A LITTLE FAMILY!



You can have students work individually, at their seats or the board, while you offer individual help. Maybe at the end one of them explains to the others. Working at their seats has the advantage that they have something to carry away with them; working at the board means they can see each other's work. Do both.

In general, try to keep the hour varied—some of this, some of that, but emphasizing whatever seems to work best with the particular group. Encourage them to keep track of difficult material and bring in their questions. What bothers one student is likely to be a problem for others also.

Working with students of widely varying abilities in a small tutorial is difficult. Your primary responsibility has to be to the ones having troubles. The others can help them, or they can work on more difficult things while you help the students who are struggling.

The tutor and the recitation teacher

The divided responsibility can cause problems. If you're running a small tutorial, you will probably feel closer to the students than to the lecturer or recitation teacher. Be tactful, however, about blaming the lecturer or recitation teacher for the students' troubles: "This point seemed to confuse some of you..." not "R_____ sure did a lousy job of explaining this..."

The recitation teacher for a section that also has tutorials may feel somewhat distant from the students, since someone else is grading their problem sets and clearing up their confusion. Sometimes the tutor is felt to be sitting as a silent critic in the recitation. That's bad. Students should see the recitation teacher and tutor working together in the classroom. The tutor should speak up in recitation if there's a suggestion to be made, and the recitation teacher should encourage this.



It was fun watching the recitation teacher and the T.A. tutor argue with each other.

The teacher and tutor should meet regularly—weekly or at least bi-weekly—to discuss what sort of errors students are making on the problem sets, and what sort of troubles they are having with the course in general. Conveying the complaints of the students is an important responsibility, since the feedback provided can have a significant influence on the course.

Individual tutorials and office hours

Some of the above applies also to one-on-one tutorial sessions with students, either by appointment, at a clinic where you sit in a room and help whoever comes in, or as part of your regular office hours. For this one-on-one tutoring the main points are:

- knowing your stuff;
- being a good listener: try to find out what the difficulty is—ask, or have the student try to do the work in front of you and watch what he or she does, or look at graded quizzes and problem sets;
- being flexible about trying one explanation after another until you find one that works;
- having patience, patience, patience: no matter how frustrated you may get, try not to show it.

Students are often reluctant to come to an office hour, unsure of what to expect. Invite them in class; make appointments with the ones who need help most. You will profit greatly from seeing first hand what difficulties students have, and what helps to overcome them.

It is quite possible to handle several students at once in such individual sessions: one student can be thinking about what you've just said and working, while you are helping a second on a new problem. Introduce them to each other. If you've just explained something to one student and another comes in with the same question, you can ask the first student to explain to the second, while you look on or help a third. It's good for everyone, and many students actually prefer to get help from other students rather than from the staff.



Invisible Students

Women and under-represented minority students (African-Americans, Latinos, Native Americans) report some special problems in those classes where most of the students are white males. (This is still a fairly frequent occurrence, particularly in certain technical subjects.) These problems are clearly interrelated: each one influences and exacerbates the others.



Invisibility. They have their hands up, but are not called on. Or the instructor cold-calls on others for answers, but regularly passes over them.

Low expectations for them. If the teacher does cold-call, the question may be embarrassingly easy, or, these students complain, they are not judged in the same way as others: the instructor's low expectations mean that if they do succeed in doing well on an exam, it is judged to be a fluke; if they ace a problem set, they must have copied it.

Self-doubts. At any school known to make special efforts to attract women or minorities, these students sometimes wonder if they really belong there. Are they having trouble because the material is genuinely difficult, or is it that they simply aren't up to it?

They tell you if you're getting a C or B how 'well' you're doing. They don't think we have the desire or the ability to get an A.

—minority undergraduate

For you, as the teacher, the main thing is to be aware of these common perceptions, and to be sensitive to them. Learn everyone's name and treat your students equally, but these students can be treated a little more equally. Express an interest in their work, invite them to your office hours, offer reinforcement to their questions and the answers they give in class. You can do these things without being patronizing or communicating low expectations.

Be careful about unintended slights and misplaced sympathy. Well-meaning instructors have been known to tell a woman student:

"Don't worry if you're having trouble interpreting these 3-D graphs; research shows women have poorer spatial intuition than men."

Whether the "research" is true or not is irrelevant: norms for populations as a whole never predict the behavior of any individual, and that's who you are teaching. Everyone deserves your best effort. Hopeless students have blossomed with B's and A's when their TA called them in, told them there was no reason why they shouldn't do well, and that he or she expected them to.

Language. A final word on language. Jokes related to race or gender have disappeared from the classroom, but stereotyping and language which derives from it have not.

“Here’s an oxidation-reduction reaction you women use in the kitchen.”

“I’ll give you a lazy South-of-the-Border-type short-cut you can use to solve this kind of problem.”

“Only a black-hearted villain would give you two triple integrals to evaluate on an hour exam.”

Forget the theoretical arguments about statements like these; it’s just Golden Rule stuff. Imagine you’re an American named O’Reilly; how would you feel if “Irish” were substituted into the second sentence above? Or if you’re male, think about your reaction to hearing

“Here’s a problem on predicting the destructive power of a conventional bomb that ought to interest you men.”

One of the T.A.s called an algorithm “seductive.” That kind of scared me. —female undergraduate

Teachers From Other Countries

If this is you, your main problem is likely to be that you don't know there is any problem. You do everything just as you think it should be done, but the students don't stay in your class; well, that's their problem, not yours.

Wrong. In this brief chapter, we want to signal what seem to be the three main difficulties.

Non-native-English-speakers

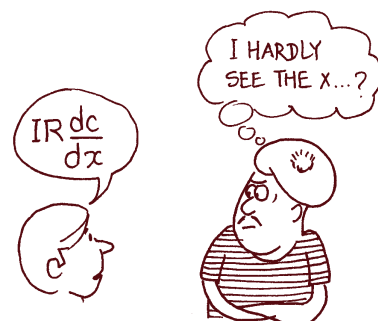
Despite what you may think, or students may say, it's not your accent, or your grammar, or your vocabulary, even though these may be poor. It's that you don't understand what your students say—you don't understand their questions, you don't understand the answers they give to your questions; you don't understand the comments they make. Your students feel they cannot communicate with you, grow frustrated, and leave.

In learning a language, auditory comprehension comes last. English is especially troublesome because of its huge vocabulary, and the fact that students are likely to use all sorts of colloquial expressions, run together in rapid and unintelligible speech. English-speaking students raised in this country (let's call them Americans, for simplicity) are often not used to talking to people whose first language is not English; they do not know how to speak clearly to them, nor do they know how to simplify their speech to standard non-colloquial English.

When you feel you can not make a good guess at what a student is asking, it is the hardest thing in the world to keep saying "I'm sorry, but I still do not understand you." *But you must.*

Read the chapter on Questions: follow its advice, constantly repeating the question until you are sure you have got it right. Find a classroom interpreter if you have to.

A Japanese instructor with the most rudimentary spoken English and virtually no auditory comprehension was given a recitation in linear algebra. We expected the students to leave almost immediately. But they didn't. A classroom visit revealed his secrets. He knew his stuff perfectly, he wrote everything necessary on the board, and all questions were either rephrased by a student who spoke each basic English word with digital perfection, or they were passed up front to him on little slips of paper. His students were so appreciative that they took turns helping him out with the words he was looking for and supplying all the missing articles (definite and indefinite).



This vignette shows you also how to solve your accent problem---if your board work is good, everyone will be able to figure out what you mean and take notes regardless of how impenetrable your accent is. (Take note: Americans are polite; only the most obnoxious will complain about your accent or try to correct your grammar. But in two words, the best quick fix for a bad accent is to speak slowly and loudly---if you do this, you will be understood no matter how strong your accent is nor how poor your grammar. If you want to improve your English skills, speak to an administrator in your department to see what sort of help---classes, language labs, audiotapes, videotapes, etc.,---is available. At MIT, check out the resources available through MIT's English Language Studies program at <http://web.mit.edu/fli/www/languages/ELS.shtml>

Level

A second main problem affects many teachers from abroad, even the ones from Oxford. You tend to misjudge the level of American students, whose prior education and background is not the same as yours. The subjects they have studied may be the same, but they are taught differently. In particular, though American students have many strengths:

- most don't have the verbal facility or literary background of a typical English student;
- most don't have the same familiarity with abstract concepts and abstract thinking of the typical European student;
- most don't have the self-discipline for sustained effort on an assigned task of the typical Japanese or Chinese student.

Over and over one sees teachers from abroad present material at too advanced or too abstract a level, fail to supply examples and applications, or assume work has been done just because it has been assigned.

Cultural differences

A third problem is that cultural differences can cause trouble if they are not allowed for. For example, American students will expect you to look at them, even though eye contact may be rude in your culture. Sleeping or eating in class does not usually show a lack of respect for you; most of your students would be surprised to find out you thought it did. Nor does calling you by your first name. If any of these things really bother you (they bother some American teachers also), you can ask the students not to do them. But it's better not to: rules should have a purpose, not just be rules. (You could prohibit excessively smelly food, since it makes everyone hungry, and likewise forbid snoring and the eating of celery.)

In general, the best way to approach these differences---of level and culture---is to seek advice from one of your American colleagues when anything bothers you or seems strange. Do this before you let yourself get angry with your class. Try to avoid being arrogant in their eyes, and remember that students are often badly overworked.



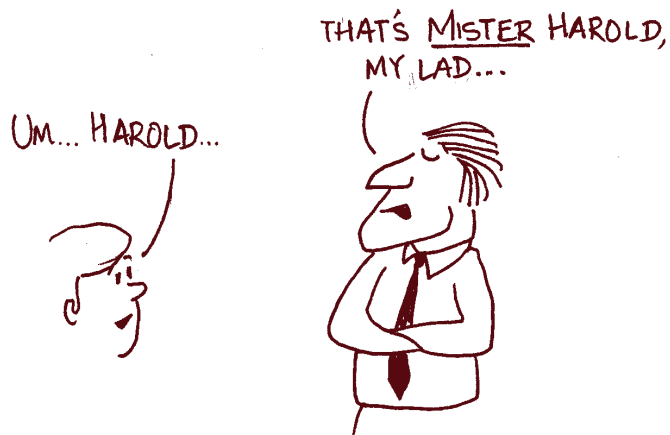
The first day

Pay particular attention to what you do, since a good start can forestall many difficulties. Write your name on the board. Tell them how to pronounce it (and whether they can call you by your first name or a nickname).

Acknowledge your accent if you have one; ask them to let you know when you are speaking too fast, or when they can't understand you. Tell them how you will handle their questions and ask for their patience. Try to gauge their level. Show that you care about whether they understand you. A little good will on both sides will take your class a long way. If you show that you want to try hard to be a good teacher for them, they will be generous and patient.

The TA was confusing and unprepared, but masked this with his inability to speak English.

The TA does not speak English. The TA does not understand English. "How many problem sets have we had so far?" elicits the response, "Test Wednesday."



Problem Students and Students with Problems

Let's talk about a few special kinds of students who pose a problem one way or another. You may not have any in your class, but if you do, they can be a concern.

The loud-mouth

This is the student who sits up front, has an answer (right or wrong) for every question almost before it is out of your mouth, calls out without being recognized, asks complicated questions off the subject, and offers comments at great length, relevant or not. Any one of these things, done often enough, can seriously disrupt the class. Your first recourse is to phrases like:

"Please don't call out; let's give everyone a minute to think."

"Why don't we wait with that question until we reach that topic?"

"I'm sorry to interrupt; could you summarize your point in one more minute, so we can hear from some of the others?"

Many students will take these hints, and become a valued member of the class. If not, the best thing to do is to talk to the student privately. Express as much appreciation for the class contributions as you feel is warranted, but say that one of the goals of the recitation is to get everyone to participate. Explain it's difficult to achieve this if one student dominates, so you're asking for help and cooperation on this. Back in class, a reminding look ought to be enough if the student forgets and starts in again.

The silent student

At the other extreme, the student who never volunteers anything in class isn't any active problem for you or the class, but deserves attention anyway. (In a humanities section, of course, everyone should be speaking, and it devolves upon you to see that they do.) Many such silent students have plenty to say, but need some encouragement. Try to find some reason to establish personal contact with them (a good problem solution or interesting remark in a paper, for example), then in class call on them when you're calling on others.

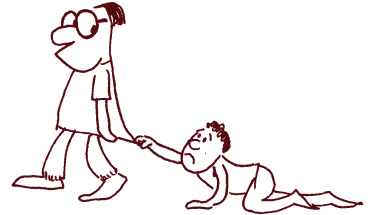


Or try, in a casual tone of voice, “How about an answer from some of you that we don’t hear so much from? (*looking around the room*) Mark? Sally? Jim?” Don’t browbeat anyone; keep it light. Once you can get silent students to speak, you can often afterwards read from their faces when they have something to say, and then call on them without fear of embarrassing them.

The dependent student

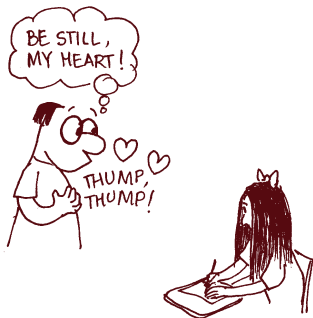
It may be flattering to have a student continually asking questions after class, filling your office hours, perhaps seeking extensive personal advice. It can also be a pain in the neck. If so, you have to decide where the problem is and act.

- If the student has too weak a background because of missing prerequisites, it’s not your job to supply these by personal tutoring. Recommend extra tutoring, delaying the subject a semester, or transferring to an easier version of the course if one is available.
- If the prerequisites are all there, but the student is just very weak in the subject, you do have some responsibility to help. However, it should be shared with the other tutoring services available. Set firm bounds on the amount of time you can spend and let the student know.
- Some students are “dependent types”—they like to be taken care of or are used to leaning on some one. But this doesn’t have to be you. Anyway, it’s not good for them. Encourage them to stand on their own feet. “I could help you with this,” you could say, “but I think you’ll learn more doing it by yourself.”
- The student may be personally attracted to you—may want to be friends, or just enjoy spending time with you, possibly without realizing this explicitly. There’s nothing wrong with this, but if you’re unhappy about it, or cannot afford the time, there are many subtle ways to show that personal attention is unwelcome. Be businesslike, but tactful.



The possible date

Many stories could illustrate TA - student attraction, but to choose one of the most common, let’s suppose you’re a male instructor who can’t help noticing that cute woman who sits in the second row, asks good questions, and sometimes stays after class to make a comment. You think she may be trying to tell you something, and wonder if you should continue the discussion over coffee, and maybe ask her out.



The answer is: as long as she's in your class, don't. You may be misinterpreting things: she might not be attracted at all or she might be looking for a mentor, but not a date. If you ask her out, she may feel uncomfortable or pressured. Even if you've read things correctly, other students in your class can be upset by any relationship (it won't take long for them to hear about it). You cannot go out with someone whom you are giving a grade to, and who might want a letter of recommendation some day. The possibility of ulterior motives always lurks in the background to spoil things.

So wait until the semester is over and the grades come out. (If it's love at first sight, and you're desperate, tell her you'd like to ask her out, but cannot as long as she's in your section. Then she can offer to change sections, or gracefully decline by telling you that you're such a great teacher she wouldn't consider changing.)

If it's the student who makes the first move, perhaps by asking if you would meet her for lunch, or have dinner in her dormitory, you should decline gracefully, unless it's a public event with other students and teachers present. Don't get into situations which could prove awkward later. (But if inclined, you can suggest waiting until the semester is over.)

The troubled student

Students may come to you with personal or academic problems because they like and trust you. Listen as you would listen to a friend who wanted to talk, and respond as you would to a friend, offering what advice you can.

If you feel more experienced guidance is called for—this will certainly be so if the problems are serious—then beware of offering too much advice of your own. It's better to refer the student to one of the Deans who does counseling (you can find out the resources at MIT by going to <http://web.mit.edu/counsel/www>); they see troubled students all day long and have a lot of experience. Normally students are referred to them by their advisors, and you should find out if the student has talked to his or her advisor or would like to. You need to be tactful. In general, for serious cases, try to have the student make the appropriate appointment by phone while still in your office.

A more formal resource is the Medical Department. Psychiatric referral is usually done through a counseling Dean, but you can call the Medical Department yourself if the case seems very serious or an emergency.

These resources are available to you for consultation. If you're not sure of what the best thing to do is, call them up and ask their advice. They want you to, and you may be able to head off serious trouble.

Academic problems

You should get in touch with students who do poorly on the first exam, or who miss a couple of homework assignments, to find out what the problem is. It is usually you who will have to do the seeking out, since students are embarrassed by poor grades or performance and feel awkward about seeing you. Many will try to pretend to themselves there is no problem, or optimistically hope that things will go better “when they get things together.” Freshmen often behave this way. After twelve years of success in school, they find themselves in academic trouble for the first time and have to cope with the resulting internal and external pressures.

Your job is to confront these students gently, but with a dose of reality. Was their poor exam really just a “bad day,” or aren’t they preparing as well as they think they are? Get them to make sensible plans for their academic work. They may need suggestions on how to study and manage their time, as well as help with the course material. Encourage them to take advantage of the tutoring services available—those offered by the large freshman courses, the Dean’s office, the dorm and fraternity tutors. Perhaps there is someone else in the section who lives nearby with whom they could study, or some upperclassman who can help.

Remember, you are one step closer to the students than anyone else in the course, and therefore the first line of defense against their academic troubles. If the problems seem serious, particularly if they extend to the other courses (be tactful about inquiring), you should contact the student’s advisor or the resident tutor in their living group. If these don’t seem like an appropriate first resource, it may be better to alert one of the Deans. They do academic counseling and have programs designed to assist students with study skills and time management.

If you cannot get in touch with the student, at least alert the advisor, whose name you can get from the Dean’s office (or from the class list you circulated).



Epilogue: A Word about You

Although we hope you've been able to pick up something useful from this booklet, it is from the actual teaching that you will learn the most, both about the subject and about yourself. It can be rewarding and a lot of fun.

Once you've started teaching, it may be useful to pick up the booklet again to refer to specific problems you encounter. An outline and index on the next pages will help you with this.

No two teachers are alike. The suggestions in this little booklet are meant to apply to a wide variety of teaching styles, but in the end they are just suggestions. You have to choose and adapt them to your own personality and style. You must feel comfortable with what you are doing if your students are also to feel comfortable. Be yourself.

Remember that recitations also differ. If your particular section isn't going well, do all you can to improve things, but don't take it all personally and blame yourself. Even the most gifted teachers rarely have a recitation like the one we dreamt about in the Prologue.

Some teachers have a problem with over-commitment—they put so much energy into writing supplementary notes, seeing students in their office, writing elaborate comments on assignments, or preparing for class, that their own professional work suffers. You must pace yourself—you are going to be teaching for a while, a lifetime perhaps, and you can't sprint the whole distance. Instructors who give their utmost for one semester sometimes feel burned out the next semester; they just can't seem to get interested in doing it again. Save part of yourself for the future and look for a balance between your teaching and your other activities.

We said it a few times already, but it's worth repeating here at the end. One of your most important resources is the other teachers in the course. Talk to them about the course material and about problems you are having with the students or with pedagogy. Exchange classroom visits with them. Some courses sponsor a meeting of the recitation teachers (without the lecturer) after two or three weeks have gone by, so they can trade experiences or comments. But talk to the lecturer too—he or she needs the input from you about the course and may, in turn, have valuable suggestions to offer.

Good luck!



Summary

Preparing for Class 18–19

- Study lecture notes; earmark possible difficulties, prepare explanations. If students had to do problems, look at them, be sure you can do them. For work to be handed in later, think about what help you could legally offer: analogous problems, partial explanations.
- What will interest your students? Look in other books for material, ask teachers. Look for connections to the real world and their lives.
- Prepare some good thought- or discussion-provoking questions to ask; choose one or two easy things to get the class started off.
- Divide up the class time; plan varied activities.
- Set priorities: what to be sure to do, what to do if there is time.

In Class 22–27

- Arrive early, stay late, but hold class only within the allotted times.
- If there is work to hand back, start this early, reading names aloud. Outline goals for the period: orally, or write them on the board.
- Get them thinking from the beginning, with questions, problems, or seatwork; if seatwork, walk around observing and helping.
- If you wish, experiment with group work; you choose the presenter.
- Try asking them at the end to write down (anonymously) what they learned that period and what is still unclear.
- Tell them what you will do next time; encourage them to prepare.

Pedagogical points 20–21

- Start with the problem, not the solution.
- Outline the overall strategy; keep reminding students of where each part of the solution fits in; review the whole at the end.
- Introspect to see where the ideas came from; how did you choose where to start, how should they know? How should they choose among the methods?
- Tell students what sort of things you expect them to be able to do.
- Go from easy to harder; start with simplified models and methods.
- Use the sandwich method to explain general principles; be generous with examples.

Your questions 12–15

- Small questions can be spontaneous; bigger ones should be prepared.
- Repeat and discuss questions to make sure they are understood; allow time for thinking and discussion.
- Make sure the questions are pointed and clear; if in doubt, ask the students.
- Be supportive of student answers, even (or especially) if wrong.
- Cold-call on them as needed, or to get the silent ones to talk, but be kind. Use judgment and tact in tailoring the question to the student.

**Their questions
10–12**

- Repeat them yourself and make sure everyone has heard and understood; refuse to have private conversations during class.
- Listen carefully; make sure you yourself understand what is being asked. Enlist the help of other students in deciphering a vague question. Don't bluff; if stuck, ask for help from others; promise the answer for next time.
- Be supportive of the question, even if you think it is poor or silly.

**Communication
skills
30–37**

- Maintain eye contact while talking and listening.
- Voice: use audiotape or videotape, check inflection, pace, volume, mannerisms, emotionality, accent.
- Speaking: avoid sarcasm, use of "obvious" or "trivial" language that reflects stereotypes.
- Blackboard: first of all, use it; write just enough so it is intelligible by itself. Use the panels in order, don't erase too soon; see other advice. Learn to use it: see suggestions on how to do this (p. 35)
- Overheads and slides: use occasionally as an adjunct; watch for pitfalls.

**Promoting
interaction
5–9**

- Start with exercises (seatwork, simple questions) to get thinking started.
- Prepare questions in advance; cold-call if needed to get participation.
- Acknowledge if they are behind and deal with it somehow (find out first where they have gotten to). Get them to prepare by announcing what you will do next time.
- Check your communication skills, via audiotape or videotape.
- Avoid steamrolling your students: less is more.
- Ask for feedback, oral or anonymously written, if things aren't going well, or even if they are.
- Know who your students are: learn and use names.

**Early in the
term
27–29**

- If comfortable, talk about yourself; if ill-at-ease, go quickly to the material of the course after giving them the essentials.
- Find out their background, via diagnostic questions, short quizzes, class discussion.
- Learn names (see the various techniques for doing this); give seating expectations, if any.
- Circulate list of names and addresses; set up office hour appointments.

**Assignments,
Exams
38–41**

- Grade them promptly, giving partial credit.
- If relevant, give out answer sheets to avoid spending a lot of grading time writing extensive comments and a lot of class time going over the work.
- Make expectations about working together clear and enforce them.

**Special
students
47–48, 52–55**

- For a variety of reasons, under certain circumstances, some students deserve special attention, while others demand or require it. See the chapters on "invisible" students and "problem" students.

Classroom Observation Checklist

teacher	subject	day/hr	room	recit., lect., tut.?
observer	date	time: from ___ to ___	number of students	

Check or circle items deserving attention; comment in space provided.

general topics covered
types of work, percent of time spent on each
(problem solving, review, new material, etc.)

Summary _____

knows subject, confident, competent
knows what goes on in lecture, knows book
well-organized in class
right amount of material

Preparation and Pedagogy

Overall impressions _____

clear or fuzzy? orients, summarizes
at right level repeats just enough
goes easy → hard stresses hard points
starts from problem defines the tasks

Explanations _____

is prepared with good problems and solutions
uses a variety of methods
explains the thought processes
hits the right level

Problem-solving _____

interesting, relevant offers motivation
well-prepared, clear right level
gives examples overview, summary
starts from problem defines the tasks
relates material to lectures, other courses

Lecture (new material or commentary) _____

recognized? what were they?
how handled? class help asked for?
admitted or covered up?

Inadequacies or errors _____

right size, legible level
no squeak no glare
clear diagrams diagrams labeled

Classroom technique

Board writing _____

gives complete story used in orderly way
minimal erasing board clean at start of class
gives problem number and summary

Board use _____

clear, understandable faces class
right volume right speed
varied, not monotone er---OK?---alright?
energetic, not bored or sighing or droopy

starts on time ends on time
well-apportioned not rushed

hair-combing beard-stroking
excessive pacing speech mannerisms

listens carefully repeats question if needed
encourages questions patient
answers well

formulates problems poses questions
"what's wrong with..?" poses paradoxes
solicits class help
gives adequate time for response

proper seating---not bunched in back
good eye contact uses names

enthusiastic, finds it exciting
neutral seems bored by it

friendly supportive
concerned available
distant, withdrawn indifferent
hostile sarcastic

attentive, interested, responsive
daydreaming, doing other work, bored
silent, hostile any problem students?

rushed/slow exciting/dull
stiff/informal
too singleminded too meandering

Other comments _____

Suggestions for improvement _____

Speech _____

Time _____

Mannerisms _____

Interaction

Questions _____

Class participation _____

Other aids _____

Attitudes and atmosphere

To material _____

To students _____

Student attitude _____

Overall atmosphere _____

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