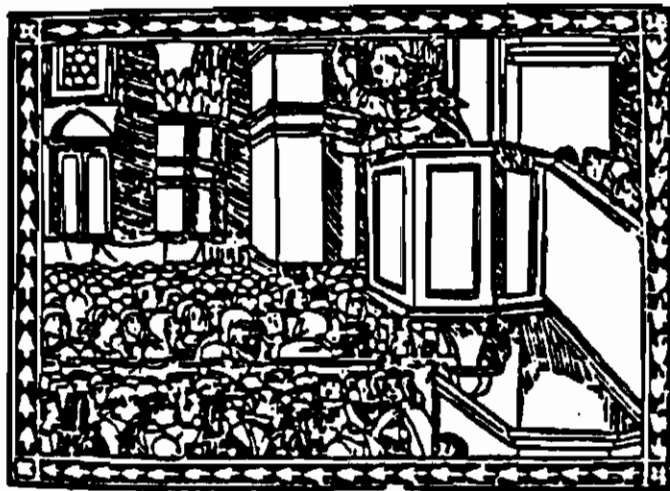




Dr. Crockett,  
Can you  
**TELL ME  
HOW TO  
TEACH?**

Prepared for Use by Tutors  
in the Program in Pre-Medical Studies  
and by  
Graduate Students  
in the Department of Biology  
City College of New York



To the left is seen Professor Crockett lecturing in the Great Hall - C.C.N.Y.

**SUBJECT:** How to Improve Your Teaching

**TO:** Tutors in the Program in Pre Medical Studies and Graduate Students  
in the Department of Biology

**FROM:** Dr. Lawrence J. Crockett  
Assistant Director  
Program in Pre-Medical Studies

Ladies and Gentlemen:

Below are some suggestions that if put to use may help make you a better teacher. I do not pretend to know all the answers, but having had considerable and varied experience, with, no doubt, many failures included, in both high school and college instruction, I offer here some hints. Of course, I too was a student - one who listened, watched and reacted to both good and bad teaching.

### RESPONSIBILITY, EXPERIENCE, AND TEACHING

Never forget your huge responsibility as a teacher, no matter the level at which you may teach. As a teacher, you are among those in society who have tremendous influence over the lives of others, younger others: as have parents, religious, and psychotherapists. The trust that society places in you is staggeringly great, and let us not forget, that Society pays you to do our special work to the best of your honest selves. To fail this trust may be very damaging to many future citizens and even to the world at large, and, in the long run, damaging to you. To fail this trust by shirking it in any way is outright immoral.

While teaching is richly rewarding in the finest sense, it is relatively certain, as well you know, that you will not become rich by being a teacher. If it is ducats you want, go somewhere else - soon!

Teaching is not a profession in which mere experience necessarily guarantees continued improvement. We have all had bad teachers who obviously learned nothing about handling a class interestingly, validly and charmingly. They were outright bores the first day they taught and 30 years (or 100 years) later are the same bores, or have even worsened with time. They continue to use the same notes they wrote - uninspiredly wrote - years ago, and the only difference in those notes is that now they are yellowed with age; perhaps the only thing colorful about such teacher's work.

In some way, one should improve, within certain limits, every time one appears before a class. We all begin our teaching like moist clay, but some set at once, never to change and with nothing worthwhile sculpted. Others, the good and interested ones, never let their clay set, but keep it moist and plastic, the sculpture becoming ever more interesting. You should try to become as the latter and shun being like the former. Remember this: in sculpting with clay, setting clay should next be fired!

### TEACHING SUGGESTIONS

1. On entering the lecture hall or laboratory check: (a) the lighting, (b) the temperature (c) the noise level within and without. Adjust all for the comfort of your students as well as your own.

2. On the first day of the semester a full schedule - lectures, dates, laboratories, readings, examination dates, etc. should be distributed and held to - within rational limits. It is only fair that your students should know from the beginning everything you will expect of them.
3. Do not tolerate lateness in yourself or in the students. When you make lateness a habit then your students will soon adopt the habit. You advertise your dislike of your class, teaching, your subject, and probably yourself. Lateness is a negative ego trip. Always point out to students that lateness disturbs their fellow students.
4. Begin and end your class on time. If you insist on running over your scheduled time you do a disservice to your fellow teachers at the College. And you are really saying that what you have to teach is so much more important than what your colleagues may be teaching. That is patent nonsense.
5. Do not permit, during lecture, any conversation, however quiet, other than your own lecturing. Warn at the very beginning of the term. To let it go is to approve, and when you finally sicken of it - and you will - it will be much more difficult to terminate. Again, point out that chatter in class disturbs fellow students.
6. Learn to lecture without notes. You may have a set on the desk for psychological support, but just to read them day in and day out is bad teaching. This has a negative effect on the students in the class. Implicit in such teaching behavior is this: if he hasn't learned his notes well enough to talk without them, he must be pretty nasty to expect me to learn them for the next examination. Recall the dullards in your own career as a student who droned on, and on, and on from their dog-eared notes?
7. Do not remain fixed in one place while lecturing. Certainly you do not have to move about in a way leading to the assumption that you have an extreme neurological condition, but remaining fixed in a stunted position makes the lecture less interesting.
8. Do not talk in a monotone. Sound excited about your material. If you don't happen to think the particular material is interesting (not everything you will have to teach may be all that interesting TO YOU) there is no reason why you can't ACT AS IF you really find it fascinating. Believe it or not, when you do this you soon begin to find you are interested. What a boring life in teaching you design for yourself if you can only find interest in your own narrow research area or in a few other topics. How many students you will drive from your subject.
9. Use gesturing while talking. The hands, when one is before a group, sometimes are difficult to use properly, but their proper use aids emphasis in teaching.
10. Learn to draw on the blackboard and to write clearly on it. Practice, if need be, before class.
11. Avoid speech mannerisms, especially shhhhh, repeated ad infinitum or YOU KNOW, YOU KNOW, YOU KNOW or OK? OK? OK? after every sentence or even phrase. They are verbal tics. They occur most frequently among the illiterate, but they are hardly uncommon among professors, politicians, preachers, etc. That makes them no less unhelpful. Verbal tics take the place of legitimate pauses: pauses that give great effect to the presentation of ideas. Actors know full well the value of the pause. Listen to this horror: (Modified from Shakespeare's Macbeth)

Tomorrow - OK? - and tomorrow and tomorrow - OK?  
 Creep in this petty pace - You know -  
 From day to day - OK?  
 To the last syllable of recorded time - You know

And all our yesterdays - OK?  
Have light fools - You know - the way to  
dusty death - OK?

Here is an easy way to break this tedious habit. Tell your class you have become aware of your own bad habit and are going to do something about it by consciously over-using your pet tic during that lecture. Watch: the habit will vanish or shortly abate, and you have shown your students that you are a person who wants to overcome his/her problems.

12. Permit frequent questioning and be sure, when proper, to praise questions. NEVER INSULT A STUDENT'S ANSWER! You thereby devastate your student publicly and close her or his mind. We are here - paid to be here - as mind openers. Always point out when appropriate that a good question is what a former researcher must have asked before he or she solved the problem. To make a habit of insulting students' answers indicates great insecurity in the instructor; that instructor is afraid of his/her students.

13. Always tie the small facts in our lessons to the world at large. Don't merely lecture, say, on the structure of the chloroplast, but suggest by question, "What would happen to you if chloroplasts on earth vanished tomorrow?"

14. Do not feel that you are obligated to say exactly what you have planned to cover in a lecture. Lectures are not sacred, nor are they writ in stone. If you don't finish a topic you are not a failed teacher. If a fascinating student question arises, follow it with the class. Praise the question too. Your students are not so many baggies to be filled, taped and sent off. You are there to help them gain factual understanding but also to make them think.

15. Never cancel even a single class without arranging for a substitute (allowing for only the direst emergencies when you can't). If you must be out a week or so contact the chairman and arrange for coverage. Merely to cancel without substitution announces how unimportant that week's work must have been. Can the rest of the weeks matter? To do anything else is outright shirking duty - paid duty to the college, department, your students, and even to yourself. Then be sure to pay back the coverage to the teacher who stepped in for you.

16. Be friendly and understanding without seeming to grovel for your students attention and approval. You can't really be a pal to your students without damaging the delicate balance in a teaching situation. To play up to students is obscene and fundamentally a crude trick to be "liked". Fortunately, students are more clever than that: they see through your attempts quite clearly. Be professionally friendly.

17. There is nothing in the teaching relationship which requires you to be called by your first name.\* At your student's stage of development it may even be bad for them. People trade first names. Real understanding and caring leaves no room for first name nonsense.

\*I have seen interesting exceptions. Certain graduate students in biology who permit use of first name have done so quite successfully. Yet that does not make me recommend it. Students come back years later, when the graduate student has gone to great glory, and ask for a grade, not recalling quite the right year; nor do they know their teacher's name. When they respond that they had "Henry" for the class, that does not necessarily help the situation.

18. Do not make jokes on purpose or too frequently. If some matter at hand leads to a jest or a witticism, fine. Absolutely avoid jokes of sexual orientation. If your "humor" depends on canned jokes or inappropriate sexual references, then you do not have a sense of humor. True wit is as far away from the canned joke as a canvas of Raphael is from the brushstrokes of a chimpanzee.

19. Never introduce a new topic (say, Genetics) by saying or even vaguely suggesting that it is difficult. Bar hard, difficult and complex from your lecture vocabulary. Say rather: And now we begin a topic that should fascinate you!

20. Never degrade a topic or subject you are about to begin. Teach as if the information you are imparting is important. It may not be to you (possibly a private opinion) but is to the field in general. All valid information is of equal value. What the chemist does is of no less value than what the physicist does (or of more value, for that matter), nor of what the zoologist or botanist does. To believe otherwise is anti-intellectual, which is bad, or self-centered, which is worse. And these remarks do not merely apply to teaching in science.

21. Motivate your students each time you begin a new unit. Motivation need not be some tremendous event or demonstration, but can be done by tying the material to something in the student's life directly. Associate the student with the material to be learned (easy in biology). No matter what we learn we are always interested in ourselves. Once our egos attach to something we will be fascinated by it.

22. Never be a Mr/Ms Know it All. Besides, you can't really be, the nature of learning being what it is. Students see through this pose at once and will roundly and properly dislike you for taking it. Students automatically give a teacher credit for knowing "just about everything" anyway. Have you ever noticed the awe in their faces and voices should they meet you unexpectedly away from campus?

In line with this: never hesitate to say "I don't know." True you should not have to say this constantly about the basic material you are teaching. Point out the limits of knowledge as you get to them, and, if a student asks a question about which no one yet knows the answer, be sure to let him/her and the class know that you and the scientific community as yet have no answer - and add that it was a fine question. Perhaps you should remind the student to think about becoming a biologist and answering his own fascinating question for humankind.

23. Point out early on that you do not GIVE grades. You merely add up the points a student earned and make a total. The grade is the grade the student EARNED. It is interesting to note that students invariably say, "I got an A in that course", but "He gave me an F in the other".

24. During the semester you should give a number of tests rather than one or two. Give the student a chance!

25. Mark and return tests as soon as you are able. Students should not be left in agony. Recall your own annoyance with professors who returned papers very late. Students should know as early as possible whether they are doing well or poorly.

26. Do not give the same tests term after term. Give out the test as soon as it is over. Good for study purposes. It will prevent students getting hold of your last term's test -- and some will -- and doing better than those who have not had this chance.

27. Students will come to you occasionally and plead: "Because you failed me in ----- (or if you fail me in -----) I will be dismissed" or whatever. Your answer: "First, I did not fail you, but added up a series of your EARNED grades and they honestly added to an F. Next it is difficult to believe that you are in this trouble MERELY because you failed this course. You must have come to biology in trouble already and having failed other courses, failing biology was the last straw. Please do not dump that on me." Naturally you say this with understanding.

28. It is safer to say no and then later, after having a longer time to think about a request, to reverse yourself. If the request seems complex say, "I must think about that. See me tomorrow." Often questions come in droves right after lectures - administrative problems. Postpone decisions until you are sure of your answers. To say yes, and then to have to rescind it, is much worse.

29. Never speak against a colleague or pass a burden for something to an associate. "Why did I fail biology?" "It was your laboratory teacher who added up your grades: go see him." This, when you know your lecture grades were part of the story?

30. A teacher automatically has power within the limits of the class and over his often, captive audience. Never misuse that power or any other power over people you may have. Well used power is hardly noticeable. The desire for power over others is inversely proportional to the lack of power over one's self. It demonstrates, publicly, your fear and insecurity and a lack of trust of self. The martinet, like the bully, is really a weakling.

31. Try never to show anger in class, or better yet, learn not to anger. (Yes, I know there are some things that happen in life that deserve and probably should elicit anger.) Most anger I have seen used by a teacher was useless and silly and lowered him in my estimation, and accomplished the opposite of what his anger was meant to produce. If you lose your temper with a class APOLOGIZE FOR IT. Show dismay, yes, but no anger. Dismay is usually more effective if the group has come to respect you - and better for your own health.

32. Try never to bring your personal problems with you to class permitting them to ruin your teaching. It is, of course, difficult, but can be done. Even warn your students that you may be out of sorts for personal reasons and you hope it will not show in your lecture. They will respect you for the admission and for being human.

33. Be sure your students understand, early on, that learning is 90% STUDENT WORK. No student can get all the material by merely hearing it once (there are occasional glorious exceptions, of course!). Some students think a teacher is not a good one because they can't get the material by listening once! Say something like: "If an actor were given a long role and because he could not learn it by one reading or hearing, rejected it, he would be thought mad and probably never hired again." Learning requires repetition by the student (see my notes on How to Learn).

34. Try to make yourself available outside the classroom to help students with specific difficulties. Establish definite office hours and be there. Of course, no one will come for ages and everyone will the day before the test! That is human procrastination. Let him who is without the sin of procrastination cast the first stone! Remind them constantly of the opportunity to see you in your office for help.

35. Make your students write. Multiple choice questions, I suppose, have their place. (Actually I personally despise them). Fill ins are better, but nothing helps a student crystalize his/her thoughts more than writing about some subject area, small or great. Has a student really learned anything if he/she can't communicate in an understandable way?

36. Be sure your blackboards are clean before beginning. Anything on the boards will take your student's attention from you. Furthermore, be sure, if the last teacher in the room has left the board covered with notes, that this is erased AND that he/she is asked to remove writing before you come in. Don't hesitate to remind the teacher if still present when you arrive. Then be sure you do not leave your material on the board when you leave. Neither permit dumping on you nor dump on anyone else.

37. If you must make references to historical persons (scientific or non-scientific) to add some spice to your lectures, and, now and then, I think this praiseworthy, if not overdone, be sure to have your facts correct. Much "street history" is utter non-sense. Indeed, success as an historical personage seems to engender false rumors that come to be believed as the most absolute truth by those untutored in history. I include below some of the "street history" nonsense "facts".

(1) Marie-Antoinette (1755-1793), Queen of France (1774-1793), did not say "Let them eat cake!" Not even croissants. It was actually unlike her to say such an unthinking thing about starving people. Apparently one of her husband's maiden aunts, living at Versailles, said something like it but without the evil intent later given to it. Recently I heard a very noted woman make this mistake during a broadcast. Shocking!

(2) Lucrezia Borgia (1480-1519) never poisoned anyone.

(3) Galileo (1564-1642) has come in for his share of these nonsense "facts". It is without any historical foundation that he dropped anything from the Leaning Tower of Pisa. Signore Galilei did not invent the telescope. It was invented in Holland, and when the news got to Galileo, knowing much about lenses, he rushed to his laboratory and promptly made one - better than the original actually. This was in the summer of 1609 and by December of that year he had put together a telescope that gave a magnification of about 30 power. He called it his "occhiale." This he turned on the heavens and soon rocked the philosophy and cosmology of his day. (It may be of further interest to you to know that he was at that time a small-salaried professor of mathematics at the University of Padua, then under Venetian control. Venice was at the time a major maritime commercial capital of Europe, and for his invention, which could be used commercially, on the coast or at sea, he was given a raise in salary and tenure. Better than that it got him an offer from his home city of Florence. Sound familiar? Academia has not changed!) But invent the telescope he did not.

After his trial by the Roman Inquisition and while still before them he did not say under his breath "Eppure si muove!" (The earth does so move!). Frankly, he was probably so shaken that he had little breath left; however, it is possible that he said this some time afterwards, far from Rome.

(4) Antony van Leeuwenhoek (1632-1723) did not invent the microscope. The microscope as we know it is a compound, light microscope. Leeuwenhoek's contained a single lense and was a variety of magnifying glass though a marvelous one. It was Zacharias Janssens, another Dutchman like Leeuwenhoek, who apparently invented it in about 1590, though an 17th century Italian, Eustachio Divini is also some-



times given the credit. The compound microscope then had too many problems to be much good and the Leeuwenhoek single lense "glass" (as he called it himself) was better until the early 18th Century. With that "glass" Leeuwenhoek became the Father of Protozoology, Bacteriology, Spermatology, Hematology, and many other fields. But invent the microscope he did not!

If you must inject interesting non-biological or biological, historical facts into your lectures be as sure of their accuracy as you would of your biological, supportable hypotheses. Do not make more difficult the teaching by your colleagues in the Department of History!

38. That this item occurs last is not, not even vaguely, because I feel it to be unimportant. As in any academic (or royal) procession the best is left to the last.

Society, it would seem, has of late, and my guess is, for the nonce, lost its confidence in science. They, as it were, suddenly learned that science can't do everything. Of course, it was foolish of them to imagine science could do all, but did we not, sometimes, sound as if we could. That science does not prevent evil in the world can not be laid at the door of science. All human inventions can be used two ways; that is a matter of moral choice, not science. The pen is also a dangerous instrument if you stab someone with it.

I believe the problem a greater one actually than that. There must be many millions of college educated in society after the decades of college going that became popular after WWII. Most of them, I assume, had to take a "science requirement". But where, where are the millions out there among the educated who should know what science is, real science, and what science is about. I suspect they had their "science requirement" (as I did along with them and many years ago) but no one taught them what science is, and what science is about. I place the blame for this squarely on the shoulders of science teachers. We have taught the facts of science well, but we have failed general education badly.

Of course, not you, as you are too young; yet you too may continue the problem, because you have been produced by the same system that spawned the difficulties. My fear is that you will continue the system.

Perhaps we have been overly intent on teaching our own special facts and not very interested in what facts mean in science and how we win those facts from a sometimes reluctant nature. Have we not, perhaps, been more carried away with the teaching of the life cycle of a moss, or of a starfish, than what truth is in science? What science can and can not do? Have we failed, over the years, to make clear that we deal, as scientists, in supportable hypotheses and consider them the closest approach to truth we have; that our truths are but temporary truths and that there are no absolutes in science and that the supportable hypotheses we have generated in a mere 300 years have given us more understanding of the Universe and life than anything known before, that is, in the 1,500,000 (or so) years we have been a human primate. Yet, all this was done without absolutes!

Have we, indeed, shown those millions what real science has to be so that when a false one proclaims itself, the truly educated laugh them to the scorn they deserve? I suspect not, for those millions of our students are oddly quiet. It is indeed a silent spring.

Have we clearly pointed out and repeatedly that we are not mere gatherers of facts, that mere fact gathering is useless, but that we gather facts in order to see the unity of things and unity in nature? Have we grounded ourselves in the philosophy of science? Have we forgotten we are doctors of philosophy? Have we constantly woven the foundations of our science into our teaching? I suspect not.



It is ever so much more important to society that a non-major clearly know that scientific truth means, and how it is to be obtained, than to know the life cycle of a fern or the structure of the gill arch. It would not hurt if the majors understood such things either! I am not sure they do.

Therefore teach in a way that your students will, as citizens and parents, understand what science is about.

No doubt many other items could be added to this list. If you can think of any I'd love to hear from you. If you take exception to anything here I'd like to know that too. I may be dismayed, but I won't anger.....

Good luck and success in the classroom!

*Lawrence J. Crockett*

LAWRENCE J. CROCKETT  
Professor of Biology  
Assistant Director  
Program in Pre-Medical Studies