

# SEVEN RULES FOR TEACHING

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**A**fter forty years of being a university professor, I would like to think that I have learned something about the art of teaching. From time to time younger colleagues and teaching assistants have asked me for advice on how to teach. My suggestions to them can be summarized in terms of three DON'Ts, three DO's, and one REMEMBER.

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## DON'T . . . **SHOW OFF**

Many teachers, either intentionally or unintentionally, seem to enjoy inflating their egos by trying to impress the class with their own brilliance or with their own recently acquired knowledge. Although a few particularly gifted students may be challenged by this display of erudition, most students will be confused or disgusted—or both. A teacher can be colorful without showing off, and colorful, lively teachers are much appreciated. It is important that the teacher conduct the course at a level commensurate with the students' background. Teachers also have to be very careful not to be condescending.

## . . . **BLUFF**

Beginning teachers often feel embarrassed when they are asked questions that they can't answer. Feeling that their lack of knowledge may make them appear inadequate, they then try to escape by bluffing. Sooner or later their dissembling will be discovered, and the students will lose respect for them. It is far better to admit ignorance and promise to find out the answer to the question by the next class meeting. A challenging question from a student can often be a wonderful learning experience for both the teacher and the class. Keep in mind, too, that there may well be one or more members of the class who are actually brighter and better informed than the teacher; such students will find the teacher's bluffing contemptible.

## . . . **INTIMIDATE**

All of us have at one time or another been victims of a tyrannical teacher who appears to derive pleasure by making students feel uncomfortable or inadequate. Such teachers create a hostile atmosphere and thereby make the learning process difficult. Students will be hesitant to ask questions if they are told that their questions are ridiculous. Students should be encouraged to ask questions, and they should be answered patiently and carefully. The class should be reminded of the Japanese proverb: *Kiku wa ichiji no haji, kikanu wa matsudai no haji: To ask is a moment of shame; not to ask is an eternity of shame.* Teachers should be demanding, but they should not embarrass or ridicule students either in public or in private. They should always treat students with courtesy and respect.

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## DO . . . **KNOW WHAT YOU ARE GOING TO TEACH**

It may seem unnecessary to remind teachers that they should know the subject material thoroughly. It is not enough just to have read the textbook before going to class. We all

know that even the best textbooks contain misprints, factual errors, and unclear passages. The good teacher will have read other textbooks, some primary sources, some review articles, or perhaps some recent research papers in order to have a depth of understanding well beyond that needed for the classroom presentation. He will also spend some time thinking independently about the subject material in order to develop a deeper understanding and even novel viewpoints. This is time consuming, but ultimately very rewarding.

. . . **KNOW WHY YOU ARE GOING TO TEACH IT**

Students have to be motivated in order to learn new material. If they know why they should learn a particular subject and how they can apply the newly learned material, they will be more enthusiastic and receptive. It is therefore essential that the teacher be well aware of the scientific and engineering relevance of each topic; if a topic is not important, then it does not merit inclusion in the syllabus. It is also very important to discuss how the topic being presented is related to subject material in other courses in the curriculum. Many teachers are discouraged when students seem to be unaware of the connections between different courses, and yet they do very little themselves to emphasize these connections. Since students do have problems with carry-over between courses, it is quite appropriate to take a few minutes to review a topic from another course by prefacing the comments with something like "As you will recall from your course in thermodynamics . . ."

. . . **KNOW HOW YOU ARE GOING TO TEACH IT**

It is not enough to master a topic before teaching it. Considerable thought must also be given to the mode of presentation—questions and answers, discussion of homework problems, visual aids, and library assignments are just a few of the many alternatives to straightforward lecturing. The sequencing of the material also requires careful consideration; for example, should one start with a general statement and then give illustrative examples, or is it preferable to give some examples first and then proceed to a general statement? Symbols and notation should be carefully chosen for the optimum mnemonic value. Making a subject easy to learn requires originality and artistry. One of a teacher's most important jobs is to figure out how to take a massive amount of difficult material and present it in an orderly, easy-to-understand way. An excellent motto for a teacher is: "Eschew obfuscation!"

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**REMEMBER . . . THE TEACHER'S JOB IS TO SERVE THE STUDENT**

Students pay money for being taught, and teachers receive money for teaching. The teacher has a contractual obligation to provide the best possible guidance to those who are entrusted to him. This includes high quality lecturing, careful mentoring, career guidance, and in some instances a willingness to help with personal problems. It also includes the maintenance of standards and informing students frankly and honestly when their performance is unsatisfactory; the teacher does not help students by being a crowd-pleaser or by rewarding poor performance. The teacher's responsibility does not stop with the end of the semester, or even with the student's graduation. Years later the teacher may be called upon to provide help in connection with a former student's job application, his aspiration to a position with more responsibility, or his consideration for an award or prize. The student-teacher relation can evolve through the years into a lasting friendship, with all the rewards that such a relationship implies.

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I have arrived at the above simple rules after many years of classroom teaching, student advising, and textbook preparation. At various times I have broken all of the above rules, and I have suffered the consequences. The rules are hard to follow, but it helps to have some guidelines.

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