

## Teach Less Better

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### *Abstract*

What are we trying to accomplish? Many of us feel the pressures of adding more and more material to the curriculum. Just keeping up with technology can be a challenge in itself. At the same time, business, industry, and society are telling us that our teaching is vastly overrated, irrelevant and ineffective.

Several interesting approaches have been suggested in literature to address this age-old situation. It is not about teaching strategies, it is more a tactical approach to teaching. Although it is true that there are problems with universities, facilities, and preparation of faculty and students; and someone should be looking at the big picture; it is also true we are here, now. What can we do today?

### *Introduction*

It can generally be assumed that new engineering educators are technically well prepared, have a thorough knowledge of the field of study, and have some reasonable depth of experience in the subject matter beyond the current course. It is even likely that they are excited about the field, and find it quite interesting, challenging, and compelling.

It is also assumed that they have a sincere interest in teaching, that they spend considerable time preparing a syllabus, reviewing the text, developing the lectures and classroom experience, putting together meaningful assignments, and spending countless hours assessing and grading student work.

But there's more to teaching than just subject matter and delivery. It is also likely, if they have already spent some time teaching a college course, that they have felt the frustration of not being as effective as a teacher as they had imagined and hoped for. This new teacher may not be perceived as technically competent or caring by the students. The students may not feel they are receiving the education they expected and are paying for.

Students are quite a varied bunch. Consider that they do not all have the same background, they have not all acquired the same amount of knowledge of the prerequisite and subject material, they do not have the same ability to learn, they do not have the same expectations of the course. Students have vastly different understanding of what being an engineer means; they have different

interests and career aspirations.

Students have a variety of needs, and it would be most beneficial to structure our courses to meet the needs of the largest number of students. We can set as our goal, the growth and development of every student, starting from where they are on the first day of class.

### ***Background***

This problem is being faced by college teachers at many campuses and in many fields of study. It is interesting to survey what some others have experienced and how they view the problem.

George Ruskin said, "Teaching is painful, continual, difficult work; to be done by kindness, by watching, and by praise; but above all, by example."

John Dewey, noted thinker and philosopher, suggested that teachers see themselves not only as transmitters of received knowledge, but as professionals, attuned to the learning capacities and motivations of their students.

Horace Mann said, "The teacher who is attempting to teach without inspiring the pupil with a desire to learn, is hammering on cold iron." M.J. Berrill said, "A great teacher is not simply one who imparts knowledge to his students, but one who awakens their interest in it, and makes them eager to pursue it for themselves. He is the spark plug, not the fuel pipe." Alfred North Whitehead said, "From the very beginning of education, the child should experience the joy of discovery."

Joseph Katz and Mildred Henry wrote in their recent book *Turning Professors into Teachers*<sup>1</sup> that even today, we teachers continue to face the age-old problem of trying to communicate with our students, some of whom seem at first to be under-prepared, under-motivated, not attuned, not developmentally ready. Some faculty have looked for a secret formula, to magically transform students into alert and industrious learners. But that expectation seems doomed to failure. If professors want to effectively communicate with students, want to enable students to think critically and investigatively, then professors are going to have to learn something about the differences among students, and the various ways students learn. The authors go on to say that there has been no time in history when more research has been done in the area of teaching and learning at the college and adult level.

Lois E. LeBar once said, "What the pupils want to learn, is as important as what the teachers want to teach." John Holt also said, "They had to teach me before I could teach them." Students are not an empty vessel waiting to be filled; they come to us with preconceived notions.

These are fortunate times for college teachers. There is so much fresh research and new information being released on theory and methods of learning and teaching. People like Kenneth Eble, professor of English at the University of Utah, who dedicated much of his college career to investigating and writing about college teaching. In his book, *The Craft of Teaching*<sup>2</sup>, he says

teaching is a presence of mind and person and body, in relation to another mind and person and body. Great numbers of students are still not being consequentially affected by their college experience. Few colleges and universities have enough students actively involved in their own education. We need to quit leading students around so much on a rope, we need to take off the leash once in a while, and see what they do, occasionally point them in the right direction, but let them feel the freedom. We need to graduate a student who directs their own learning activities.

Learning is a blend of freedom and discipline for each student, merged to arouse pleasure. We learn what we want to, he says. Teachers cannot teach what the student will not learn. A teacher's primary responsibility may well be to introduce a student to his or her own importance, to help learners arrive at their own freedom to learn. As a teacher, being impersonal does more harm than good. Let them know who you are, he says, where you stand, why they should put any faith in your coaching. The single most important failure of today's colleges and universities, according to Eble, is not the libraries, not the classrooms, not the dormitories, not the laboratories. It is the failure to foster the relationship between the single student and the single teacher.

Some of the faculty at Amherst College in Massachusetts have recently put together a collection of original essays<sup>3</sup>. They are facing their own struggles with teaching, and they have taken the time to describe what they do in and out of the classrooms. For instance, Benjamin DeMott, English Professor, says his classroom goal is to increase imaginative mobility. He encourages students to accommodate and comprehend the feelings and conditions of being. He says, show them how you think, show them your weaknesses, show them how to relax, how to be comfortable with their own way of thinking, the way of thinking they have repeatedly been told is all wrong. Stir excitement in them to facilitate learning. Set your message in the context of a story. Get the students actively doing, not listening. Don't entertain. Don't "effectively communicate the material". Don't "maintain the students' interest". Let their insights emerge from doing, not from the teachers' lips. The investigator does not go after the truth, the truth goes after the investigator!

Much of the information we present in the classroom will be obsolete before the students' lives are in full swing. The students will not long remember the facts, but what they will remember is the habit of probing and trying and working through an idea.

Another essay is by Austin Sagat, who teaches law. Since most of his students will not be lawyers, they don't really know what most lawyers do most of the time. He gives them a taste of lawyering. He embroils them in a problem. Not just the technical details, but the ambiguity, the emotions, the ethical, the interpersonal, the impossible, the time management. It can be confusing for a student, being placed in a situation like this. Oh, they will feel the emotions, the anxiety, the confusion sure enough. But we must remember to bring it to closure. Let them struggle with it, but then don't let it just die or fade away. Step out of it momentarily, to commentate on what is going on. While they are fumbling, while they are wandering, pay close attention, so that you can occasionally catch them doing something right, and compliment them on it.

Jay Caplan and Marie-Helene Huet teach Romance languages. We as faculty sometimes drop the

ball. We know there is a reason for learning this or that subject, but often we don't effectively conceptualize the reason, we don't verbalize the reason, we don't communicate the reason to the student. It is easier sometimes to just pass it off as "a requirement of the University in order to graduate", and we cheat the student out of an otherwise valuable experience, to learn a new way of thinking, to learn a new point of view, a new vision of the world and the peoples of the world, a new hope for the relationships between people and between peoples.

Lisa Raskin teaches Psychology. She doesn't teach facts, she teaches methods of investigations. She gives them meaningful problems to which they can make valuable contributions. She begins to look at her students as young colleagues. One-on-one meetings with these students become true dialogues. Students quit asking the question, "Is this what you want?" and start saying, "I think it should be this, what do you think?"

Terry & Harb, in an article on teaching, in the proceedings of ASEE (American Society of Engineering Education), observed that each of us has questioned our utility in the classroom, especially after grading exams and rediscovering the all-too-frequent inability of students to apply basic principles which supposedly they have been taught, outside a narrow, well-defined domain. Employers express concern that our graduates fall short in ability and preparation, to define and solve open-ended problems. The authors reflected on recent academic reaction to these feelings, and the relationship to Bloom's Taxonomy of Cognitive Objectives. They see a need to reach different styles of learners, to make each student into an independent learner. They suggest a new approach, based on experiential learning proposed by D. A. Kolb.

Kolb observed patterns of learning new concepts. An immediate experience creates in the learner a need for learning. This is accomplished by reflective observation of the experience. This is assisted by the teacher via the introduction of new concepts (or by the new application of old concepts) that integrate this new experience into what the learner already knows. This becomes an experience which restarts the cycle or pattern. Kolb sees learning as a series of fits and spurts, not as a smooth progression through the material. It's unfortunate that some professors view their job simply as dispensing new concepts, "dumping on" the knowledge. They feel it is the students' responsibility to take care of the rest. Maybe in Utopia, but not in colleges today.

Is it this cycling that is important, or is the cycling simply an observation of the system in operation? What may actually be happening is a closed loop feedback control system, whereby the technically prepared and motivated teacher provides stimulus to the students, observes the course of each student, compares it to the desired outcome, and provides coaching and guidance for staying on course. Just as it would be impossible to pre-program your car to drive from here to the shopping mall, predefining every speed, every turn, every minute adjustment ahead of time, without some driver interaction, continually seeing and responding; so too it is impossible to lay out a course for a student at the beginning of the term and have any prayer of them reaching their goal without constant, individual feedback. Until they learn to guide themselves.

Another interesting book, *Do You Teach*<sup>4</sup>, by Hugh Skilling, includes excerpts from seminars conducted by guest professors. One such seminar featured George Polya, Professor of Mathematics, and author of the popular book, *How To Solve It*. He says it is usually best for the

class to see the outcome of a problem just before it is announced by the teacher. That way they are pleased with themselves, and so they like the subject. He also said, select problems that are naturally interesting or work hard to make them interesting. Too often in the classroom, it happens that "All are sleeping, / one is preaching, / such is what / we call teaching."

Find excitement in your subject, be excited about it, even if you've been through it many times before. Polya often adds a musical theme to his teaching, an air with variations, or a rondo, with separate identical repetitions using contrasting material. Watch out, don't contribute to "Lecturing is a process whereby notes are transferred from the book of the lecturer to the book of the student, without passing through the mind of either."

Richard Feynman, acclaimed to be one of the most brilliant minds of our time, agreed with Polya, that in teaching we should always start with an exploratory phase, an intuitive phase, by encouraging guessing. Teach first to their gut, he says, and then to their mind. Relate new problems to what the students already know.

### ***Examine and evolve***

The references are innumerable and contain many great ideas, but what do I do here and now? How do I solve the specific problems of my particular students? How do I change my spirit, my attitude, my methods to accomplish my educational objectives for my students?

***Examine your goals.*** I examined my own goals, and I evolved my own style of teaching, based on love. I realized that my expectations of my students are not what counts; it was the facts of the matter. What could they do? Where were they today? What did they want to do? Where did they want to go? How could I help them get from here to there? It slowly occurred to me that maybe they would listen to me and my guidance and suggestions if I started listening to them, and explaining to them, based on where they were, what I expected of them. I realized I really hadn't in the past clearly expressed to them what I expected. I expected it, sure enough, and just assumed this was a universal expectation, and that they were just being stubborn, denying it.

***Clearly express your goals.*** Now I changed my attitude. I wouldn't expect anything from them unless I gave them fair warning. I expect them to act professionally. I expect them to come to class, to be prepared. I expect them to be honest with me, to do their own work. I expect them to assume responsibility for themselves. And now I tell them this. And I make it clear to them. And I remind them from time to time, because this may not be what they are used to. And when they are not professional, or not prepared, or not honest, or not responsible, I still accept them, but I also remind them again what I expect, and we talk about it, and I listen to them, and they begin listening to me. And I don't hold them accountable for what they have no control over. If they don't remember some basics, I accept that. But I make it my responsibility to find that out early in the semester, early enough to make them aware of the situation, early enough so they have time to refresh their memories.

***Listen to their needs.*** And I listen to what they want, why they came to college, what they expect

from this course, from this lesson. You may think that it is impossible to listen to all your students, maybe because you have such large classes, or so many different students. Well, here is where some magic happens, here is where the spirituality steps in. Start listening to one or two students at first. Really listen. They will probably express quite different thoughts than you expect. Honestly listen to them, without making judgment, trying to understand what their goals are, what motivates them, what limits them. And let these discussions affect your teaching style. Genuinely address their concerns.

Even though you are only listening to one or two at first, if you address their wants you will be addressing the wants of several other students as well. And even for the students whom you haven't listened to directly, your point of view will begin to make sense to them. And even though you don't address all the concerns, your attitude will shift, and you will be perceived differently, as someone that can be approached, as someone reasonable, as someone worth working with, not against. It happens very quickly with some students, it takes longer with others, and with still others, it never happens.

***Don't label them.*** I suppose that if you observe me teaching, you would call it mostly lecturing. But by the mere act of naming it, you strip away its essence. You conjure up in your mind all the other attributes of lecturing that you know, and you attribute them to me. And in so doing, you possibly gloss over the essential nature of what I am doing. We can mistakenly do the same thing to our students. Label them, categorize them, as lazy, dull, aggressive, unprepared, unmotivated, immature. But in so doing, we cheat them of the individualized attention that they are seeking, that they paid for, that they deserve.

***Cultivate a love of engineering in them.*** I love Electrical Engineering, and it's easy for me to read about engineering, to do engineering design, to keep up with the new technological developments. It's fun to discover the new problems to be solved, to build and test electronic circuits and computer programs, to understand the requirements, to perfect the product, to see the fruits of my work in the marketplace. No one needs to force me to read or design or to write reports, when I'm doing what I love. If only students could share this love, many of my problems of teaching would take care of themselves. They would still stumble from time to time, but they would get up and continue in the right direction.

***Let them see you doing engineering.*** I've been doing engineering for a long time now. I'm better at it now than I was twenty years ago. It's more fun now, too. I know more ways to succeed. And I can take bigger risks because I have enough confidence in myself as a person to fail now and then and not lose complete faith in myself. But most students don't share this spirit naturally; it has to be cultivated in them. I have found that as I teach, I have been challenged to review and redefine the way I do engineering, the way I design. I have come to realize patterns of thought that I had been experiencing without really being aware of them. When students see that I am human, that I make mistakes, that I have fun doing engineering, then they are motivated to share in this work with me. They quit being passive about their education and start taking an active role in their own learning. It is great to reach the point in dealing with a student peer-to-peer, where they realize they are valuable and equal and able, where they don't scoff at my mistakes, where they are not ashamed to contribute, where they take responsibility for themselves.

***Encourage them to be independent learners.*** I no longer lament the fact that I have to teach the same thing over and over again, for if they are not ready to learn it the first time, maybe they will learn it the next. Rather than spending my time teaching the material of the course, I spend the bulk of my time preparing them to learn it on their own; showing them where it will fit into what they already know; illustrating what problem it will solve for them; creating a need in them for the knowledge; showing them how the information can be used; giving them ample opportunity to share with me their success in gaining knowledge and applying it; being there to get them over the hurdles they inevitably get stuck at. They now do the bulk of the learning by themselves, I'm directly involved in only a minor portion.

***Start with each student where they are at.*** The independent students are at one point in their learning, so my comments to them are quite different than for others who may require more specific help and closer guidance. Despite what some may think, there is no absolute standard against which every student is measured. ABET (the Accreditation Board for Engineering Technology schools) sets only a minimum standard for what must be accomplished, the criteria for differentiating between who passes and who fails. But beyond that, the professor can place emphasis not so much on where a student is during the semester, but if they are moving forward in the right direction at an acceptable rate. Yes, I am still the gatekeeper, the one who at the end of the semester must differentiate between those who pass and those who fail, but that's really only a final decision once a term. In between time, I'm a guide, a coach, a servant, an encourager, an observer, a mirror, a feedback mechanism.

***Relate new ideas to what they already know.*** It has become common in teaching engineering and engineering technology, to rely on some sort of capstone course, a senior level design course, to integrate the various academic material, to show the relevance to the real world. However, students are often frustrated because they don't see the application, they don't see the connection. The approach of some professors is to tell the student to "grin and bear it", or "discipline yourself", or "just learn it for now, you'll see how to use it later". But that approach rarely works. It is possible for the integration process to take place in every course, in every chapter, in every topic, indeed in every lecture, in every thought. Students need hooks to hang the new information on. Otherwise, it is just so much banter. In upper division courses, don't bemoan the fact that many undergraduates have difficulty applying basic principles to comprehensive problems. Don't blame them for not learning well enough in the past. Don't blame someone else for not teaching it well enough. Now may be the best time for them to really learn the basics, in the context of applying it.

***Catch them doing something right, catch them having fun. Encourage them, share their joy.***

### ***Summary***

Teaching to me is a labor of love. I haven't solved the problem and found the solution. But to help deal with the day to day adaptation required for teaching, I occasionally reflect on the rule of Benedict <sup>5</sup>:

There is a need for a rule, a guiding principle to fall back on, because we cannot always think through every response to every situation at every moment in our lives; There is a need to listen to others. It is easy to think we know what is good for someone else; it is more difficult to listen, and let them define themselves to us. There is a need for humble reflection, to occasionally focus on our purpose, to recover from our periods of action. There is a need for community, for appreciating diversity, not to control and not to be controlled, for finding my call in life. There is a need for humility, to fall and get up again, to stop waiting for perfection to be happy, not to manipulate the world to my ends.

There is a need for mindfulness, not being consumed, not trying to build everything like a gold watch, but giving each task the time it deserves. There is a need for work, for doing, not necessarily only for achieving. There is a need for leisure, to engage the heart, to realize and recognize with our whole selves. There is a need for giftedness, to recognize and encourage and help students develop their own uniqueness. There is a need for hospitality, a need for the unbounded heart, doing something for even the failing student, the lazy student, the obnoxious student, the weary student, for every student; what we give need not be perfect nor complete, simply sharing what we have that is appropriate.

There is a need for obedience, everything will not always be to our liking, we can't let our need for social approval deter us from doing what we know should be done. There is a need for stability, to avoid battle but have the strength to fight, to outlast dark until the light comes again, to work but also to wait; to grow and not necessarily triumph; to live where we are. There is a need for station, being present, stopping one thing before beginning another. There is a need for peace, to face the world as it is. There is a need for vision, an unselfish vision, a world vision, to see our place in the world, but more important to see the world.

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