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INTRODUCTION TO COLLEGE TEACHING

1.0 Welcome to the University, There's Your Office, Good Luck

As everyone knows, skilled professionals routinely receive training before being certified to practice independently. Electricians, machinists, and chefs get preliminary instruction and then serve for months or years as apprentices. Accountants, psychologists, physicists, and physicians spend years earning degrees in their fields, and the physicians spend additional years in supervised internships and residencies. It would be unthinkable to allow people to practice a skilled profession without first being trained for it, especially if their mistakes could cause harm to others … unless they are college faculty members.

The standard preparation for a faculty career is taking undergraduate and graduate courses in your discipline and completing a research project on a topic someone else has defined. Once you join a faculty, your orientation may consist of nothing but the heading of this section, and perhaps a half-day or a day on such things as health and retirement benefits and the importance of laboratory safety. The unstated assumption is that if you have a degree in a subject, you must know how to teach it at the college level.

Anyone who has ever been a college student knows how bad that assumption can be. What student has never had a professor who taught at a level ridiculously above anything the students had a chance of understanding, or put entire classes to sleep by droning monotonously for 50- or 75-minute stretches with no apparent awareness that there were students in the room, or flashed PowerPoint slides at a rate no human brain could possibly keep up with?

Instructors like these unfortunately abound on college faculties. If you teach like any of them, no matter how much you know and how accurately you present it, you probably won't enjoy looking at your students' test scores or your end-of-class student ratings. Being an excellent or even just a competent teacher requires knowing many things graduate school doesn't teach, such as how to design courses and deliver them effectively; write assignments and exams that are both rigorous and fair; and deal with classroom management, advising problems, cheating, and an uncountable number of other headaches teachers routinely encounter. Figuring out all those things on your own is not trivial. Although there is something to be said for trial-and-error learning, it's not efficient—and in the case of teaching, the ones making the errors are not the ones suffering the consequences. Many new faculty members take years to learn how to teach well, and others never learn.

It doesn't have to be that way. Proven methods for teaching effectively—that is, motivating students to learn and helping them acquire the knowledge, skills, and values they will need to succeed in college and their professions—are well known. Many of those methods are not particularly hard—you can just learn what they are and then start using them. That doesn't mean they make teaching simple: teaching a course—especially for the first time—is and always will be a challenging and time-consuming task. The point is that teaching well does not have to be harder than teaching poorly. The purpose of this book is to help you learn how to teach well.

1.1 Making Learning Happen

Brainwave: What Goes on in Our Brains When We Learn?

Learning is shorthand for encoding and storing information in long-term memory, from which it can later be retrieved and used. According to a widely-used model of this process, new information comes in through the senses, is held for a fraction of a second in a sensory register, and is then either passed on to working memory or lost. Once in working memory, the information is processed, and after a fraction of a minute (or longer if the information is repeated), it is then either stored in long-term memory or lost.

The chances of a new sensory input getting into long-term memory vary dramatically from one input to another. The inputs most likely to make it relate to (1) *threats* to the learner's survival or well-being. In descending

order, the next most likely inputs to be stored are those with (2) *strong emotional associations* for the learner; (3) *meaning* (relationship to the learner's interests, goals, prior knowledge, and past experiences); and (4) *sense* (comprehensibility).

It follows that if teachers present information irrelevant to anything students know and care about and it makes little sense to them, there should be no surprise if the students later act as if they never heard it. It never made it into their long-term memory, so for all practical purposes they *didn't* hear it. Moreover, even if information makes it into long-term memory, unless it is reinforced by rehearsal (conscious repetition), the clusters of nerve cells that collectively contain it are weakly connected and the information may not be easily retrieved.

In short, *the more new information has meaning and makes sense to students, the more likely it is to be stored. Once stored, the more often the information is retrieved and rehearsed, the more effective the learning is* (Sousa, 2011, Ch. 3).

Think about something you're really good at. It might be soccer, auto mechanics, chess, piano, physics, Java programming, or anything else. Go on—we'll wait.

Now think about *how* you got good. You might think of courses you took but you probably won't. You're much more likely to think about making your first awkward and unsuccessful efforts, getting feedback from someone else or learning from your mistakes, and trying again. If you persisted, you eventually started to succeed. The more practice and feedback you got, the better you got, until you reached your current level.

That's how people learn. Mastery of a skill comes mainly from doing things, noticing and reflecting on the results, and possibly getting feedback from someone else. If we learn anything by just reading a text or watching and listening to someone lecturing at us, it generally isn't much, and the chances of retaining it for very long are slim. The truth of that message has been recognized for a long time.

> One must learn by doing the thing; for though you think you know it, you have no certainty until you try. (Sophocles)
> What we have to learn to do, we learn by doing. (Aristotle)
> You cannot teach a man anything: you can only help him to find it within himself. (Galileo)
> No thought, no idea, can possibly be conveyed as an idea from one person to another. (John Dewey)

Modern cognitive science and decades of classroom research studies demonstrate that Sophocles and those other sages were right. People learn by doing and reflecting, not by watching and listening. Unfortunately, starting in about the sixth grade and continuing through college, most classes are taught primarily by lecturing. Traditional education is consequently uninspiring and ineffective for most people, and for some it becomes a serious and sometimes permanent deterrent to lifelong learning.

Fortunately, there are excellent alternatives to pure lecture-based instruction. We will describe many of them in this book, starting in the next section of this chapter. They are not traditional in STEM (science, technology, engineering, and mathematics) education, but they have all been validated by extensive research, and many STEM instructors have discovered them and used them successfully. There's even more good news:

To teach effectively you don't have to use every teaching method known to be effective, and you shouldn't even think of trying to implement too many at once.

If you try to change how you teach too drastically, you and your students may be so uncomfortable that the class turns into a disaster, the student pushback can be overwhelming, and you'll never want to do anything new again. Instead, start with one or two relatively simple alternative methods, such as active learning, and introduce new methods gradually, never moving too far out of your comfort zone. If you take that moderate approach, your teaching and your students' learning will steadily improve, which should be your goal.

Becoming a more effective teacher doesn't require throwing out everything traditional.

We won't be telling you, for example, to abandon lecturing and make every class you teach an extravaganza of student activity. We *will* tell you to avoid making lecturing the only thing that happens in your class sessions. Introduce one or two activities in the first few sessions so you and the students can get used to them, and gradually increase their frequency. As you continue to use the method your confidence will rise, and your use of active learning will probably rise with it. The same thing is true for the other teaching methods we will discuss. Again, the key is to take it easy!

You're not going to win them all, and you don't have to.

Even if you use the most effective teaching methods known to education, many of your students will not get top grades and some will fail. That doesn't mean you failed as a teacher. How well students do in a course

depends on much more than how their instructor teaches: it also depends on their aptitude for the subject, how interested they are in it, how hard they are willing and able to work on it, how important their course grade is to them, and an uncountable number of other factors. We suggest that your goal as a teacher should not be to have 100% of your students achieve your learning objectives, because that's generally neither possible nor even desirable. Not everyone was born to be a scientist, engineer, or mathematician, and if all of your students fully meet your objectives you may be setting the bar too low. Rather, your goal should be to enable as many as possible of your students with the required aptitude, motivation, and work ethic to succeed in your course and transfer what they learn to other courses and eventually to their careers. *That* you can do.

1.2 Learner-Centered Teaching: Definition, Warning, and Reassurance

The great philosopher and educator John Dewey said, "Teaching and learning are correlative or corresponding processes, as much so as selling and buying. One might as well say he has sold when no one has bought, as to say that he has taught when no one has learned" (Dewey, 1910, p. 29).

That statement may seem obvious but it isn't to everyone. If you look up the word *teach* in a dictionary, you will find variations of two completely different concepts:

1. *Teach:* To show or explain something.
2. *Teach:* To cause to know something.

By the first definition, if everything the students are supposed to learn in a course is covered in lectures and readings, then the instructor has successfully taught the course, whether or not anyone learned it. By the second definition, if students don't learn, the instructor didn't teach.

Many STEM instructors subscribe to the first definition. "My job is to cover the syllabus," they argue. "If the students don't learn it, that's their problem, not mine." They use *teacher-centered instruction,* in which the course instructor defines the course content; designs and delivers lectures; creates, administers, and marks assignments and tests; assigns course grades; and is essentially in control of everything that happens in the course except how the students react and achieve. The students mainly sit through the lectures—some occasionally asking or answering questions and most just passively observing. They absorb whatever they

can, and then do their best to reproduce it in the assignments and exams. That model pretty much describes STEM higher education as it has been practiced for centuries throughout the world, despite the fact that it is incompatible with what we now know about how people actually learn.

John Dewey, whose quote began this section, clearly believed in the second definition of teaching—to cause learning to occur. That definition lies at the heart of what is now called *learner-centered teaching (LCT)*. The teacher of a course still sets the broad parameters of instruction, making sure that the learning objectives and lessons cover all the knowledge and skills the course is supposed to address, the assessments match the objectives and are fair, and the course grades are consistent with the assessment data. The difference is that the students are no longer passive recipients and repeaters of information but take much more responsibility for their own learning. The instructor functions not as the sole source of wisdom and knowledge to them but more as a coach or guide, whose task is to help them acquire the desired knowledge and skills for themselves.

Weimer (2013, Ch. 2) surveyed the voluminous research literature on the various forms of learner-centered teaching and observed that properly implemented LCT has been found superior to teacher-centered instruction at achieving almost every conceivable learning outcome. We will use LCT as a framework for the rest of this book. In later chapters we'll discuss specific LCT techniques—what they are, what research says about them, how to implement them, what can go wrong when you use them, and how to make sure it doesn't. Before we preview the book in the next section, though, we'll warn you about something you might find troublesome when you launch into LCT for the first time. When you make students more responsible for their own learning than they have ever been, they will not all leap to their feet and embrace you with gratitude! Weimer (2013, p. 199) offers the following cautionary words:

> Some faculty [members] find the arguments for learner-centered teaching very convincing. With considerable enthusiasm, they start creating new assignments, developing classroom activities, and realigning course policies. By the time they've completed the planning process, they are just plain excited about launching what feels like a whole new course. They introduce these new course features on the first day, sharing with students their conviction that these changes will make the class so much better. And what happens? Students do not respond with corresponding enthusiasm. In fact, they make it very clear that they prefer having things done as they are in most classes. Teachers leave class disheartened. The student response feels like a personal affront.

If you have not used learner-centered teaching yet, the resistance you may encounter from some students the first time you try it may be a shock to your system. You may envision your student ratings plummeting and your chances for advancement on the faculty shrinking, and it can be easy for you to say "Who needs this?" and go back to traditional lecturing.

If you find yourself in that situation, fight the temptation to retreat. Several references on learner-centered teaching methods have discussed the phenomenon of student resistance: why it's there, what forms it might take, and how instructors can deal with it (Felder, 2007, 2011a; Felder & Brent, 1996; Seidel & Tanner, 2013; Weimer, 2013, Ch. 8). We won't go into detail about it now but will explore the issue later when we get into active learning, cooperative learning, and other learner-centered methods. For now, just be aware of the possibility of student resistance to LCT, and be assured that you can minimize or eliminate it if you take the measures we'll tell you about. If your need for immediate reassurance is urgent, check out any of the five references just cited, and then relax.

You may also hear from some of your faculty colleagues that LCT doesn't work. If you do, cheerfully offer to share with them the research that proves it does (we'll provide you with plenty of it). That offer usually ends *that* discussion.

1.3 What's in This Book?

A graphic organizer of the book is shown in Figure 1.3–1.

Here are the main topics covered in the chapters.

Chapter 2.

Writing course learning objectives (statements of how the students will demonstrate their mastery of the knowledge, methods, skills, and attitudes or values the instructor plans to teach) and using them to achieve *constructive alignment,* in which the course lessons, activities, assignments, and assessments of learning all point toward the same goals.

Chapter 3.

Preparing to teach a new or redesigned course for the first time. Writing a syllabus and formulating a course grading policy. Getting the course off to a good start.

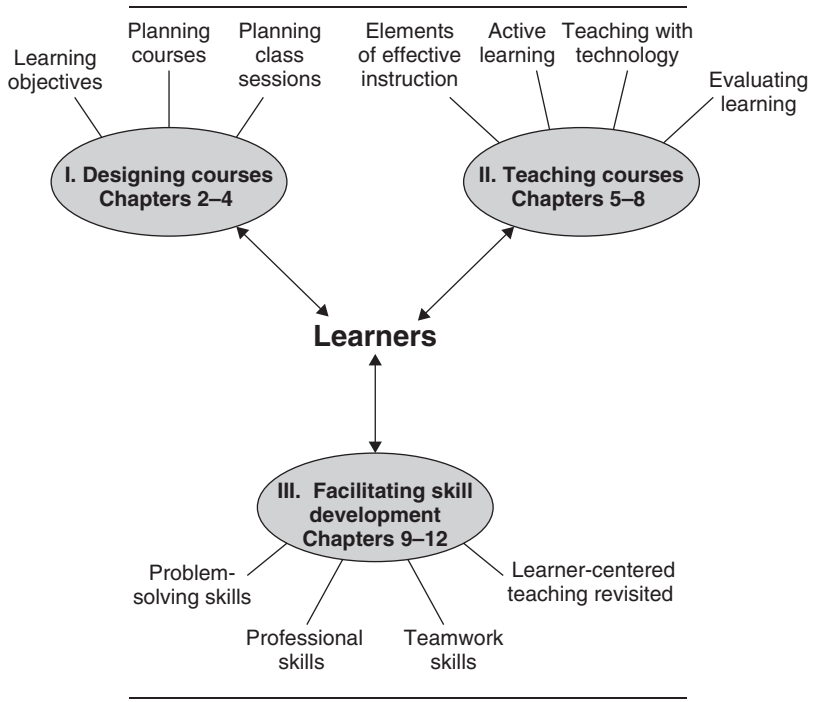

Figure 1.3–1: Elements of Learner-Centered Teaching

Chapter 4.

Planning individual class sessions.

Chapter 5.

Teaching effectively and continuing to improve.

Chapter 6.

Getting students actively engaged in class, no matter how large the class is.

Chapter 7.

Teaching effectively with technology. Blended learning (combining face-to-face and online instruction), flipped (inverted) classrooms, and online courses.

Chapter 8.

Evaluating how well students are acquiring the knowledge, skills, and conceptual understanding specified in the course learning objectives.

Chapter 9.
Helping students develop expert problem-solving skills. Problem-based learning.

Chapter 10.
Helping students develop skills in communication, creative thinking, critical thinking, and self-directed learning. Project-based learning.

Chapter 11.
Helping students develop skills required for high-performance teamwork (time and project management, leadership, conflict management, and various interpersonal skills).

Chapter 12.
Revisiting learner-centered teaching and wrapping up.

1.4 How to Use the Book

Our goal is to describe some proven teaching methods—mostly relatively easy ones that don't require major preparation time and a few that present greater challenges—and to prepare you to implement those methods. There's one small problem, though. Let's look at a point we made earlier in this chapter:

> Mastery of a skill comes mainly from doing things, noticing and reflecting on the results, and possibly getting feedback from someone else. If we learn anything by just reading a text or watching and listening to someone lecturing at us, it generally isn't much, and the chances of retaining it for very long are slim.

That's true for our students, and it's also true for you as you work to become a better teacher. If you start out intending to plow through this book from cover to cover, you'll be inundated by a flood of information coming at you faster than the human mind can absorb. You may pick up a few useful ideas but they may not lead to significant changes in your teaching, and you could easily decide to stop reading before you even get close to finishing.

Instead of reading the book like a novel, treat it more like a reference work. We have made the chapters and many individual sections in them

reasonably independent, so you can jump in almost anywhere and just start reading. Here are some ideas for when and how to do it:

Take the book out at the beginning of each course you teach, look through a section you haven't read recently or at all, find a couple of new ideas to try, and try them.

Give them a fair chance to succeed—don't just do something once and decide that it didn't work, because it usually takes some repetition before teachers and students become comfortable with unfamiliar teaching strategies.

During the course, when a question, problem, or need arises, find out which part or parts of the book deal with it and check them out.

For example, if you just gave an exam and the results were terrible, go to Chapter 8 to get some ideas about what you may have done wrong, even if you haven't read what comes before it. (You may not have done anything wrong—sometimes students just don't study.)

When the course is finished, search for information about things that might not have gone as well as you would have liked.

Figure out what you want to change when you teach the course again, and put the changes in your class session plans to remind yourself to make them.

In short, read the book *actively* to get the most out of it.

Okay, we're ready when you are. Enjoy!