Learner-Centered Teaching: How and Why[*]

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Welcome to the college; here's what you'll be teaching next semester. Good luck!

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 teachers, in which case it happens all the time.

The standard preparation for many academic careers is taking undergraduate and graduate courses in a discipline, and for some positions at community and technical colleges, having training and experience in a skilled trade. Upon joining a faculty, a new instructor's orientation may consist of nothing but a short welcome and perhaps a day or less on such necessities as health and retirement benefits and the importance of lab safety. The orientation may include nothing about teaching, though. The unstated assumption is that if you have a degree or training in a subject, you know how to teach it.

Anyone who has ever been a college student knows how wrong that assumption is. Many of us have taken classes from instructors who taught at levels far above our understanding, or put us to sleep with interminable droning lectures all semester. If you teach like those instructors, looking at your students' test scores or their end-of-semester ratings is probably not much fun.

Being an excellent, or even just a competent, college instructor requires knowing about teaching and learning as a discipline, content most college courses outside the Education Department don't include: how to design courses and deliver them effectively, write rigorous and fair assignments and tests, and deal with cheating and countless other challenges teachers routinely encounter. The situation is particularly tough for instructors in community and technical colleges, where the difficulties are intensified by wide variations in entering students' knowledge, skills, motivation to learn, and responsibilities outside of school. Learning how to deal with all those challenges isn't trivial. Many instructors take years to do it, and others never manage to.

It doesn't have to be that way. There are proven teaching methods that increase students' motivation to learn and help them acquire the knowledge, skills, and values they need to succeed in and after college. That is not to say the methods make this work simple: Teaching is and always will be a challenging and time-consuming occupation. The point is that good teaching is far more satisfying and not much harder than poor teaching, and it can be taught.

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So, who are we to be telling you all this? One of us is a retired professor of chemical engineering and the other is an educational consultant, program evaluator, and former professor of education. We have worked together for close to 30 years to learn about, develop, and disseminate effective ways to teach STEM (science, technology, engineering, and mathematics) at the college level. During those years, we wrote several hundred papers and gave over 600 seminars and workshops on campuses and at conferences around the world.

For the past 15 years or so, we have worked on a book that surveys what we have discovered about effective teaching and reviews the research that supports the methods we recommend. Last year, *Teaching and Learning STEM: A Practical Guide* (Felder & Brent, 2016) finally appeared. Unlike most books on teaching, it offers many STEM-related examples, but the principles and methods it discusses work perfectly well in non-STEM fields. In this short paper, we want to share with you some of what we put into the book in the hope that you'll find it useful.

What Makes Learning Happen?

Think about something you're really good at. It might be auto mechanics, basketball, playing 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. The more practice and feedback you got, the better you got, until you reached your current level.

That's how people develop skills—doing things, noticing and reflecting on the results, possibly getting feedback from someone else, and doing them again. For many of us, if we learn by just reading a text and watching and listening to someone lecture, we generally don't learn much, and the chances are we won't retain it very long. Fortunately, there are much more effective teaching strategies that have been validated by both research and the experiences of instructors in all fields.

Learner-Centered Teaching

Let's start by asking what might look like a simple question: What is teaching?

The answer may seem obvious, but it isn't. If you pose the question to educators, you will get variations of two completely different responses:

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

Definition 1 indicates that if you cover something in a course, you taught it, whether or not the students learned it. Definition 2 implies that if the students didn't learn it, you didn't teach it.

Many instructors at both precollege and college levels stand by 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, defining the course content, designing and delivering lectures, and creating and grading assignments and tests themselves, with little or no student input. Students sit through lectures, some occasionally asking or answering questions and most passively observing (and possibly not even doing that). They absorb whatever they can and then

do their best to reproduce it in assignments and exams. The results are often disappointing to teachers and students alike.

The second definition of teaching—causing learning to occur—lies at the heart of *learner-centered teaching* (LCT) (Weimer, 2013). Learner-centered approaches include active, cooperative/team-based, inquiry-based, project-based, and problem-based learning. In all of them, the instructor still has the primary responsibility for defining course content, designing instruction, creating assessments that are both rigorous and fair, and assigning grades consistent with the assessment data. The difference is that with LCT the students are no longer passive recipients and repeaters of information. Instead, they take more responsibility for their own learning and have more control over how they approach it. The instructor functions not as the sole source of wisdom and knowledge but more as a coach or guide whose job is to help students acquire the desired knowledge and skills for themselves.

A substantial body of research has shown that learner-centered teaching outperforms teacher-centered instruction at promoting almost every conceivable learning outcome but rote memorization. *Teaching and Learning STEM* discusses and illustrates LCT strategies—what they are, how to implement them, and how to avoid or minimize problems such as initial student resistance that may crop up when you use them.

What's in the Book?

The elements of learner-centered teaching are organized into the three broad categories shown in Figure 1. In Part 1, we discuss how to design effective courses, motivate students to learn what's in them, and get them off to a good start. Part 2 outlines effective course delivery techniques including lecturing, active learning, technology-assisted and online instruction, and testing and grading. In Part 3, we present strategies for helping students develop high-level skills, including analytical problem-solving, critical and creative thinking, written and oral communication, self-directed learning, and high-performance teamwork.

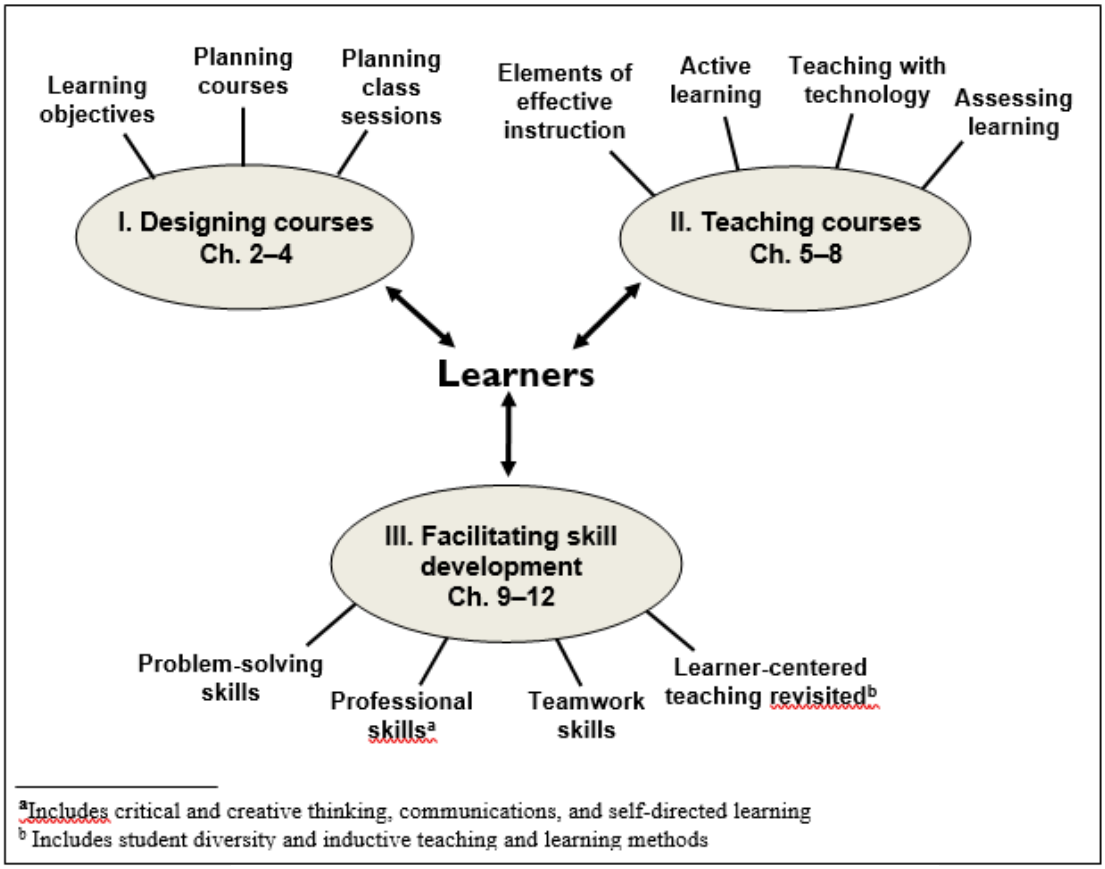

Figure 1. Elements of learner-centered teaching.

If You Had to Choose One Learner-Centered Method, What Should It Be?

Active learning—no question about it. What is active learning? A number of definitions are floating around, but the one we use is that active learning is anything course-related that happens in a class other than students watching and listening to an instructor. It might be students working individually or in small groups to answer a question, start or carry out the next step in a problem solution or derivation, define a term or concept in their own words, brainstorm a list, or do almost anything else an instructor might ask them to do on an assignment or exam. The instructor stops the activity when the allotted time has elapsed, calls on one or more students or groups to report on what they discovered, and either resumes lecturing or starts another activity. For more details and illustrations, check out an interactive tutorial about active learning (Felder & Brent, n.d.) and a narrated video of active learning in an engineering course (Felder & Brent, n.d.).

In *Teaching and Learning STEM*, we describe a variety of active learning exercises, summarize the research attesting to the superiority of active learning over traditional lecturing, and list several common mistakes instructors make that decrease the effectiveness of the technique, such as making activities trivial or too long. We also respond to concerns instructors may have about active learning, such as having time to cover the entire syllabus and managing active learning with large classes of more than 200 students.

The research data supporting active learning are overwhelming. A 2014 National Academy of Science meta-analysis of hundreds of studies found that active learning significantly outperformed traditional lecturing in every learning outcome measured except repeating memorized information (Freeman et al., 2014). After studying the data, Clarissa Dirks, the co-chair of the U.S. National Academies Scientific Teaching Alliance, concluded, "At this point it is unethical to teach any other way" (Waldrop, 2015, p. 273).

Summary and Final Suggestions

College teaching may be the only skilled profession for which the practitioners are not routinely trained. As a result, most college teachers rely on traditional lecturing, in which they present information and students passively receive it. Learner-centered teaching methods, which include active, cooperative, and problem-based learning, have been found more effective than traditional lecturing for promoting almost every learning outcome except memorized knowledge.

We are not telling you that you should drop everything you've been doing in your classes and switch to a full dose of learner-centered teaching starting next Monday. Quite the contrary—if you suddenly make too many dramatic changes in how you teach, you and your students may be so uncomfortable that the class falls apart, the student pushback is overwhelming, and you'll never want to do anything new again. Instead, take it easy. Glance through *Teaching and Learning STEM,* Weimer (2013), or other references on LCT methods and start with a relatively simple LCT technique, such as putting occasional activities into your lectures. Once you and the students become accustomed to the new strategy, gradually increase your use of it and slowly introduce other LCT strategies, never moving too far out of your comfort zone. If you take this moderate approach, your teaching and your students' learning will steadily improve, and that's all you need.

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