

context in which the information was originally taught” (Bjork, 1994). By definition, a teaching approach that allows for cramming fails to meet the definition of learning. Cramming results in a hollow victory for students. They often earn a passing grade but they are unable to recall or use most of the information even a week later (Bjork, 1994; Ebbinghaus, 1913).

Each time our students use new information, their brains create stronger and faster connections for the neurons that represent that information (Ratey, 2008, p. 39). This is why it is so important to have students do a lot of the work in our courses. An equally important finding about long-term memory formation comes from the work of Harvard psychologist Daniel Schacter, in his book *The Seven Sins of Memory*. Dr. Schacter reported, “For better or worse, our recollections are largely at the mercy of our elaborations.” If students are to form long-term memories, they need to use new information in a variety of ways (read, recode, write, summarize, annotate, speak, listen, map, reflect, etc.) to make the information available to them for recall through many different neural networks. In other words, they need to do a lot of work with the information to be able to recall it. In chapter 10, I take an in-depth look into the research of memory formation and recall and suggest applications of the research findings to instruction practices in ways that promote long-term recall.

Be Professionals by Following the Research

At a workshop in Oregon in 2010, I was asked what I thought about faculty members being evaluated on their teaching. I believe the question was posed because the person asking had a colleague who believed the administration was out to get rid of bad teachers by using evaluation practices. I answered that, “As professionals, we should be evaluated just like any other professional.” I went on to say that we should welcome it as a way to improve our teaching and our students’ learning. My message was that, as professional educators, we have the responsibility to maintain standards of practice and that this includes changing our teaching when the research offers evidence that new practices are warranted. We have an obligation to follow where the research leads us. As illustrated in this chapter, there is an extensive amount of research supporting the move to a learner-centered practice.

GETTING STUDENTS TO DO THE WORK

Do not confuse motion and progress. A rocking horse keeps moving but does not make any progress.

(Alfred A. Montapert)

Last winter, I had a small run-in with a student, call him KM, in one of my study strategies courses. At the time, I had a faculty guest visiting my classroom, so the brief confrontation had a heightened drama to it. The conflict spurred from my request that KM remove his headphones and listen to instructions. He first removed only one earbud, so I asked him again. He then removed the other earbud but then pulled his hat down over his eyes, apparently in protest. I politely asked him to raise his hat and he replied in a highly disrespectful manner, “Get the f—— away from me!” Soon after the incident, I invited KM to my office to discuss what had transpired. His first words to me were that I had caused it. He said I had no business asking him to remove his earphones or raise his hat. I then explained to him that one of the most important jobs I have as a teacher is to maintain the learning environment of the classroom so that all students can be fully prepared to engage in learning. I continued that his wearing of earphones was an indication of a lack of readiness to learn, and it also sent a message to other students that they could do the same. I explained that being unprepared to learn was unacceptable and went against the whole purpose of being in a college class. What happened next brings us to the point of this story. KM told me that he had never heard that a teacher’s job was to maintain the learning environment or that teachers were supposed to make students at least “appear” ready to learn. I told him that I was certain that was my job and, in fact, I travel the country teaching other teachers that it

is one of the most important aspects of their jobs. He replied, "Well, I never heard of that before."

Why Our Students Might Not Like Doing the Work

My conversation with KM reminded me of why I wrote my first book on learner-centered teaching (LCT): because, to a great extent, I realized students were not ready for the new responsibilities and greater effort that LCT requires. In the first book, I wrote that students have very specific sets of ideas about how school is supposed to be based on their 12 or more years of being in school. When someone says those roles must change, which is exactly what happens when introducing a learner-centered practice, students often react in ways that are not accepting or even hostile. Twelve years is a long time to do something one way, especially when that way, for many of our students, has been rewarded with high grades and accolades.

Students often resist, at least initially, the roles and responsibilities that come with doing more of the work simply because this has never been asked of them before in a school setting. A teacher-centered practice simply requires less work from the students. Students can often go weeks without any assignment due or even a quiz to study for. Changing to a learner-centered practice, where work is due on a regular basis, where class time is spent trying to solve problems and figure out complex ideas instead of listening to a lecture, is a very different form of school. It's one that students need help adjusting to. As we all know, change can be difficult to accept.

K. Patricia Cross, one of the truly influential researchers on learning in higher education, spoke at a conference in 2001 about American students' views of effort; she said: "One of the oddities of traditional American culture, especially the youth culture, is that it is better to be thought lazy than stupid. Thus, in the competition of the classroom, students prefer to be seen by others as succeeding through ability rather than through effort" (Cross, 2001). In other words, students are inclined to think, "If I have to work at it, I must not be that smart." Learner-centered teaching requires more effort, and students aren't always ready for that new requirement.

Strategies for Letting Our Students Do the Work

Several chapters of this book detail ways to get students to do more of the work. But here are some quick and easy ways to start immediately getting students doing more of the work.

Cumulative Testing

In chapter 1, I discussed how practice is needed to form long-term memories. By forcing students to go back and relearn (and I do mean *relearn* in most cases rather than review previously tested material), we enhance the likelihood of our students meeting Robert Bjork's definition of learning: the ability to use information after periods of disuse. Several studies clearly show that cumulative testing is an excellent mechanism for improving long-term retention (Cull, 2000; McDaniel & Fisher, 1991; Pashler, Cepeda, Wixted, & Rohrer, 2005). These studies show that learning is often enhanced when the learner is required to recall information rather than simply restudy it (Roediger & Karpicke, 2006).

By focusing on the two or three most important points from each section of the course and retesting those points, you provide an effective mechanism for promoting long-term learning. A good way to look at this is to ask yourself, "What would you most want your students to know and use a year after they completed your course?" The answer is the material you should continually retest.

Establish a Wiki Site

One great way to help students do more of their own work is by establishing a wiki site or other appropriate online environment as a test review space for them. This online space lets students post course information, inquiries about course content, and possible test questions so everyone in the class can benefit. Because it is an open site, it can be monitored and material can be added or corrected. Basically it becomes the students' test review material. This online space also saves class time for other activities because an in-class test review is no longer needed.

Rewriting of Papers

Allow students to rewrite papers with the requirement that whatever suggested changes or corrections were made to their first paper must be visible in the rewrite. Rewriting is a powerful learning tool and clearly meets the goal of having the students do the work.

Retesting

Provide an opportunity to retest. Although it requires more time and effort for teachers, retesting prompts students to engage more fully with the course material. It is important to have students understand that there may be limits

to the level of improvement that retesting can offer them. Here is an effective strategy: Allow the first test to determine 70% of the final grade, with the retest helping only with the remaining 30%. For example, if a student's score is 69% on a 100-point test, he or she earns 69% of the 70 points possible, which is 48 points. Even if he or she gets 100% of the 30 points available on the retests, his or her final grade will be 78/100.

Practice Quizzes

Faculty members have shared that one of the best methods to get students to do a lot of practicing is to provide them with test banks for practice quizzes on course material. More than 30 experimental studies have been done to measure the effect of this strategy for improving college students' academic performance. The findings repeatedly demonstrated that taking a test on studied material promotes remembering that material on a final test. Several recent studies have shown that testing not only enhances learning, it also reduces the rate at which information is forgotten (Chan, McDermott, & Roediger, 2007). Online delivery systems, such as Blackboard, are set up to allow this quizzing practice. Depending on the size of the test bank, students can take an endless number of quizzes and receive immediate feedback, which is a powerful way to study the course material.

Mapping

Chapter 8 discusses the power of using a multisensory approach to teaching and learning. An effective tool for this kind of learning is concept mapping. A valuable way to get students to do more of the work is to require them to make maps of their lecture notes and chapter readings. These maps will provide students with visual representations of the course ideas. Vision trumps all other senses when it comes to learning (Medina, 2008). Usually arranged in priority order from most to least important, the maps will represent the relationships between the ideas that are easy to miss in regular class notes or text materials.

A Scaffolding Approach to Getting Students to Do the Work

One of the crucial issues that teachers face in implementing a teaching model that gets students to do more work is ensuring that students have the skills and background knowledge they need to do the work while simultaneously not diminishing their learning by providing too much help. One solution comes from the research of Jean Piaget, Lev Vygotsky, and Jerome Bruner,

three giants of psychology, in the form of the educational practice called scaffolding. Scaffolding in an educational context is a process by which a teacher provides students with a temporary framework for learning. Done correctly, such structuring encourages students to develop their own initiative, motivation, and resourcefulness. Once students build knowledge and develop skills on their own, elements of the framework are dismantled. Eventually, the initial scaffolding is removed altogether because students no longer need it (Smagorinsky, 2007). The defining features of successful scaffolding include providing students with clear direction, purpose, and expectation. Expected results include on-task activity; better student direction; reduced uncertainty, surprise, and disappointment; increased efficiency; and palpable momentum (McKenzie, 1999).

"Scaffolding requires continuous sorting and sifting as part of a 'puzzling' process—the combining of new information with previous understandings to construct new ones. Students are adding on, extending, refining and elaborating" (McKenzie, 1999). Students need enough help to get going and they need monitoring to see that their struggles are not overwhelming, but too much help and they won't struggle at all. For example, it does our muscles little good to lift the same weight the same amount of repetitions every day. Only when we struggle by adding weight do we begin to increase our strength.

Another important aspect of effective scaffolding is that our assistance results in the students seeing progress. James Zull, in his book *The Art of Changing the Brain* (2002), spoke about the important need for students to see that they are making some progress to sustain their efforts, especially in tasks that are difficult or that they don't like to do (Zull, 2002).

There are different models of scaffolding. One is an apprenticeship model whereby an expert models an activity, provides the student with advice and examples that guide the student in practice, and then tapers off support until the student can do the task alone (Lawson, 2002). A second model encourages ongoing use of tools and consultation with other people, arguing that in real life, few people ever work exclusively on their own (Branford, Brown, & Cocking, 2000). Most agree that scaffolding is particularly effective in areas in which students need to be more self-reliant, such as technology-based learning (Banaszynski, 2000).

Zone of Proximal Development

A key element of successfully using a scaffolding approach is to determine the zone of proximal development (ZPD) in our students. First discussed by

Russian psychologist Lev Vygotsky, ZPD is the difference between what a learner can do without help and what he or she can do with help. Suppose a first-year student in a psychology course can read and understand the textbook material and some of the assigned outside readings from known experts that are explaining psychological research, but she cannot successfully read the research journal articles from psychology. We would say that the assigned outside readings are within her ZPD, and that this is the level at which assistance will be most profitable. “The instructional challenge is to provide problems that both fit the manner of the learner’s thinking and tempt him/her into more powerful modes of thinking” (Perry, 2002).

Scaffolding and Math

A math instructional model that is quite popular uses a learner-centered scaffolding approach. Students are first placed through testing into the appropriate level of math course. The instruction process begins with allowing students to try and solve the assigned math problems on their own with no new instruction. The only instruction is what they had previously learned in other courses or, once a few days of class have transpired, what they learned in earlier parts of their current course. After trying on their own, students then work in pairs to help each other complete the problems. Finally, they work in groups of four and share their ideas and solutions. Once they have exhausted their own ideas, or in some cases discovered the answering process on their own, they ask questions of the teacher about the parts of the process they did not understand. The teacher answers all the questions and, if needed, engages in an instructional demonstration. In this model, support is given only when it is really needed. The specific need is usually clear because the students have made real efforts to learn the material on their own. Only when they could not understand the material was instruction provided (Yambric, 2008).

Let Students Try It on Their Own, With a Little Bit of Help

What is the best use of teachers’ time in the classroom? This is a key question in a learner-centered practice. Is it best to explain concepts and ideas to everyone, even though some of our students can clearly figure them out on their own? If not, what do we do about those students who don’t seem able to handle the learning tasks on their own? Will they fall far behind? Or should we first let all of our students try to do the work on their own with a little bit of help from us? Should we then follow this with having them work

with each other to see if collaboration can resolve remaining difficulties, and then intercede only when they are having difficulties they can’t resolve on their own or with peer assistance? While the correct action to take may depend on the learning situation, some instructional models clearly show the benefits of letting our students do the work on their own with just a little bit of help.

The Emporium Model

One very successful model is The Emporium Model of math instruction developed at Virginia Tech University. This model has been replicated at seven universities with significant success through the National Center for Academic Transformation (NCAT), Program in Course Redesign, which was funded by the Pew Charitable Trusts, 1999–2003. This model has demonstrated that it is possible to improve student learning by letting students first try to do the work on their own, with some software assistance to get them started, before any intervention from the teacher.

The Math Emporium Model:

- Uses computer technology to individualize a student’s experience in a course, thus improving instruction. It allows students to progress at their own pace, review material, and take practice quizzes as much as they like. They can obtain personal help only when desired.
- Uses an active learning process as opposed to the traditional lecture model. The Emporium Model has improved learning when measured against traditional face-to-face learning.
- Uses faculty members and other coaches to provide just-in-time assistance 15 hours a day by using techniques designed to allow the students to discover answers themselves.
- Uses math courses that clearly delineate expectations and provides comfortable and effective mechanisms to support learning. However, students gain other valuable real-world skills beyond course content, including self-discipline and organization, when they are entrusted with the responsibility and authority to manage their own learning. These are the key elements of a learner-centered practice (Williams, 2005).

Here are some findings from the use of The Emporium Model:

- Enrolling 13,000 students annually, nine college-level math courses increased student success (final grade of C or better) by 25% on average, with a range of 7% to 63%.

- These same nine courses reduced the cost of instruction by 37% on average, with a range of 15% to 77%.
- Comparing grades of C or better most likely understates the achievements of The Emporium Model because grading standards under this model are higher and more consistent than under the traditional format, for example, no curves, no partial credit, consistent performance standards, and so on.

Clearly, the findings show that students can do a great deal of learning on their own, with proper assistance. It is interesting to note that, on one Virginia Tech student blog site, I found a student who hated The Emporium Model. His hatred was based on the fact that it required more work, more responsibility, and more initiative. He wrote, "For the students who are not independent learners, it is a terrible way to take a class." This is probably true. However, Americans now consume information for about 1.3 trillion hours each year, an average of almost 12 hours per day. Total information consumption totaled 3.6 zettabytes and 10,845 trillion words, with each person using, in some form, 34 gigabytes of information on an average day (Bohn & Short, 2009). In contrast, people living in the mid-1800s would have consumed in their lifetimes less information than is published in one week of the *New York Times*. The point is that students will need to become lifelong independent learners, whether they like it or not, if they hope to stay employed. Cognitive neuroscientist Janet Zadina put it this way: "Making learning too easy is a mistake."

We all can't develop interactive software that can help our students learn, but many companies are beginning to do just that. However, we all can understand the core of The Emporium Model, which is that students learned math by doing math. We all can put that kind of action into practice in our courses.

Sitting on My Stool

If you ever visit my classroom, you will likely find me sitting on my stool, watching my students engage in the day's learning activity. The reason I am just sitting and apparently not teaching is that I have already completed my work when I planned the activities that are now prompting my students to do their work. You might catch me doing a brief presentation, answering some questions, or debriefing the students following an activity, but in my classroom, students do the work. This is the goal of LCT. I am a facilitator

of learning. This means my two main jobs are planning learning activities and giving students feedback. I discuss teacher as facilitator in more detail in chapter 4. My role is clearly different than what it was when I was a teacher-centered instructor. This new role takes some getting used to; however, each day I remind myself that I am following the research and I am optimizing my students' opportunities to learn. This is a responsibility all educators must accept.