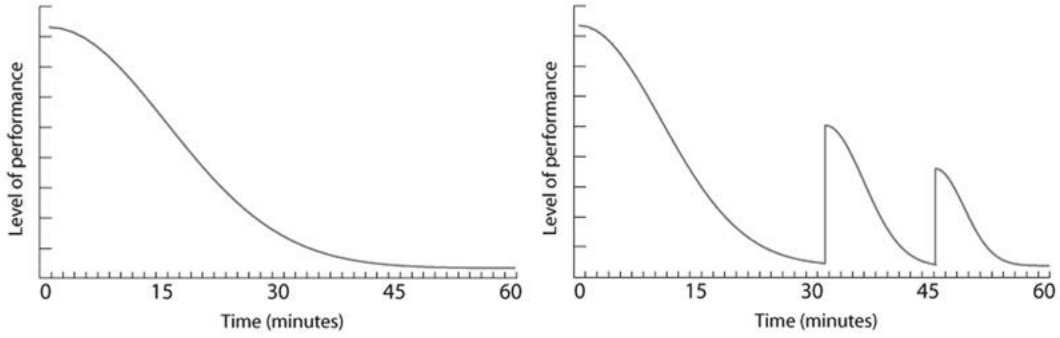
Learner-Centered Teaching

Professor-centric lectures, no matter how well-crafted and how entertaining, can go only so far in helping students learn (Bridges & Desmond, 2000). A body of research published thirty years ago shows that even motivated adult learners have an attention span of no better than fifteen to twenty minutes (Johnson & Percival, 1976). Today's multitasking, hyperkinetic cyber youth are even less inclined to sit and listen to a lecture. Indeed, the lecture is social technology dating back to the Middle Ages, a time when electronic distractions did not exist (see Figure 8). On the other hand, people routinely watch a movie that lasts two hours or more while following the plot and with minimal lapses of attention, suggesting that a strong narrative, emotional engagement, and variation of sensory input are the keys to sustained attention.

Figure 8: Schematic Summary of Student Attention Level in Lectures



These two graphs measure students' relative level of performance as the fraction of students paying attention at any time as determined by twelve lecturers over an average of ninety lectures. The level of attention and performance during any lecture shows an almost immediate decline, and at the end of a class period of normal length (sixty minutes) attention is down to a very low level (left-hand graph). Interrupting the lecture for activities, quizzes, or asides helps (right-hand graph), but engagement never returns to what it was at the start of the class. Source: A schematic representation of the conclusions drawn by Johnson, A. H., and F. Percival. 1976. Attention breaks in lectures. *Education in Chemistry* 13:49–50.

If that is not convincing, then consider this striking example from physicist Carl Weiman of the University of British Columbia; he pioneered education reform while at the University of Colorado. In an introductory physics class for non-science majors, he gave a cogent mini-lecture on the physics of sound and then brandished a violin. He explained that the strings do not move enough air to create the sound from the violin. Rather, the strings cause the back of the violin to move via the sound post, and thus it is the back of the violin that actually produces the sound. Fifteen minutes later he asked a multiple-choice question about where the sounds from a violin came from, and only 10 percent said the back; almost everyone else said the strings. This low level of retention of a counterintuitive fact after only fifteen minutes also applies to faculty and graduate students. Does this mean that all lecturing is bad? No, but it means that

lectures have to be carefully designed with principles of cognition in mind (Schwartz & Bransford, 1998).

The most effective courses are learner-centered courses in which learning goals are clearly stated and are commensurate with methods of evaluation (Dancy & Beichner, 2002); interactive techniques are used to continually engage students; and assessment is used to tune the strategies to the particular context of each course, each professor, and each set of students (Angelo & Cross, 1993; Hake, 1998). “One size fits all” has no place in learner-centered education.

Most professors are familiar with the unspoken pact that can develop in the classroom. The professor agrees to deliver a highly structured presentation, not to ask students to think outside the box, and to evaluate them according to the material in the textbook with objective tests, usually multiple choice. In return, the students agree not to be disruptive, to act as tidy receptacles for information, and to regurgitate that information when it is time for a test. All of this is implicit. As long as nobody questions the premise, and the grades connect to the content that is being taught, everyone is fairly happy. This description is a caricature, but not by much. Weiman and Perkins (2005) describe the failure of traditional methods of physics instruction, noting that:

> Students receiving traditional instruction master on average less than 30% of the concepts that they did not already know at the start of the class. The result is largely independent of lecturer quality, class size, or institution. . . . After instruction, students, on average, are found to be less expert-like in their thinking than before. They see physics as less connected to the real world, less interesting, and more as something to be memorized without understanding.

Source: https://www.amacad.org/content/publications/pubContent.aspx?d=1111