***Book Review*: Minds Online: Teaching Effectively With Technology** by Michelle D. Miller (2014)

Yvonne Mulhern, Tarleton State University

As online learning becomes a seemingly ever larger part of the higher education experience, concerns about its effectiveness, and of the cognitive and educational impacts of frequent internet use, have arisen among college faculty, administrators, and the wider community. In *Minds Online: Teaching Effectively with Technology*, Michelle D. Miller, a psychology professor and director of the First Year Learning Initiative at Northern Arizona University, explores these topics in detail. Even for instruction librarians who do not teach online, this book should be of considerable interest due to its insights and recommendations that apply regardless of the teaching setting: purely online, face-to-face, or blended classrooms.

The book aims to explain "how principles of human cognition can inform the effective use of technology in college teaching" (p. xii). Miller believes that online technology gives instructors an "unprecedented opportunity" to "teach to the way the mind works" (p. xii). She gives an overview of the principles of memory research and cognitive psychology and offers solid strategies for engaging students' attention and increasing their motivation. She also discusses some of the pedagogical advantages of technology, and examines myths about how humans' psychology is impacted by computers. She admits that it can be difficult to untangle and make sense of developments in cognitive research because researchers use confusing jargon, the media often sensationalizes stories, and research findings crop up at a rapid pace. However, her book's focus on why certain uses of technology and pedagogical approaches have proven effective aims to enable the reader to be more thoughtful about any development, either now or in the future.

The preface and first eight chapters cover topics ranging from the effectiveness of online learning, to research on attention, memory, thinking, and motivation, as well as the effective use of multimedia. The last chapter, the ninth, then ties everything together by offering a plan for action, with examples.

Overview of Chapters

Chapter One (with the largely rhetorical title "Is Online Learning Here to Stay?") dives into reasons for the increase in online courses. These include decreased university budgets (e.g., the hope is standardized online modules can reduce classroom costs); student demand for flexibility; availability of new technologies such as classroom response systems and easily accessible online video clips; and an increased focus on documenting student learning and success. The course redesign movement, which focuses on improving course delivery while reducing costs (p.14) is also addressed.

The second chapter begins with the sobering note that only about a third of professors think online instruction is effective—so in order "for faculty to be maximally effective online, this ambivalence has to be addressed" (p. 20) by weighing the evidence. One fact is that student time spent on "schoolwork" has declined steadily over the past three decades (p. 20), in part due to students having greater out-of-school responsibilities (e.g., jobs), so to have a type of learning which often can be available 24/7 is a meaningful benefit and can help increase the amount of effort students can put towards school. The importance of instruction that provides frequent, rapid feedback that also takes pre-existing knowledge into account is discussed (which is an advantage of online teaching), along with the challenge of creating meaningful, personal social connections in the learning environment and the omnipresent concern of possible academic dishonesty (which can be a disadvantage of online teaching). However, those disadvantages can be addressed. For example, creating a "supportive online course community" by including personal introductions and small groups that encourage mentoring is highly encouraged. Other best practices include an emphasis on goal-directed practice, clear expectations for frequency of professor communication, and early course feedback (week three is suggested). These practices, along with log-in data and assessment scores, can also hopefully alert instructors to issues before any cheating occurs. Students who are internally motivated and who believe in their own ability to succeed are also less likely to resort to academic dishonesty.

Chapter Three deals with the psychology of computing. Miller compares today's internet age with the advent of radio technology in the early twentieth century and the attendant optimism coupled with grave concerns about change that accompany most major technological advances. Miller also clarifies and debunks several associated myths, including Nicholas Carr's proposition the Internet is "most powerful mind-altering technology mankind has ever known" (p.44), the cognitive implications of multi-tasking, and the notion of "digital natives," which has been contradicted by research that suggests that the difference in skill between younger and older students can be small or even non-existent (p.52).

Chapter Four, which covers attention, draws on current brain research to demonstrate the limits and quirks of human attention, and offers suggestions on how to work with students with Attention Deficit Hyperactive Disorder (ADHD),

which also work well for all students: asking for frequent responses, taking advantage of "automaticity" (i.e., the ability of the brain to process something without you having to think about it at a conscious level), and assessing cognitive load. All these are critical in teaching any course, but particularly in designing one online, where there is no teacher to make adjustments on the fly but only the lesson itself.

Chapters five and six deal with memory and thinking—discussion points include rote memorization vs. higher-order thinking skills, the disagreements in memory research (e.g., can we really hold seven items in short-term, i.e., working, memory, or is it actually less than that?), and designing memorable learning experiences for both online and offline students. She advises instructors to not worry about whatever the exact max number of items is for working memory; the useful takeaway is that when designing lessons be careful about how many "distinct and disconnected piece of information" (p. 94) you ask a student to the hold at a one time—the higher that number, the less chance students will be able to complete the lesson, because their working memory will be overtaxed. Recommended strategies for embedding course content into long-term memory include giving frequent tests (or test-like activity) and structuring for "spaced study" (giving students sufficient time to engage with the material on multiple occasions). Additionally, Miller points out that the ability to add new knowledge to a previously existing network of neural connections "is one of the main things that sets experts [in a profession] apart from novices" (p. 117). As most instructors know, "(i)t can be surprisingly difficult to get students to extend what they know to new situations." Miller lists a variety of practical activities that instructors can use, including using realistic scenarios (i.e., problem-based learning), appropriate analogies, and assigning practice for desired thinking skills.

In Chapter Seven, "Using Multimedia Effectively", Miller points out that adding multimedia (including text, audio, video, and animation) to a course doesn't automatically improve teaching effectiveness; in fact, some research has shown that it rarely leads to student improvement and that, if done badly, it can actually detract from learning. Multimedia is appealing as it, seemingly by its nature, helps those who purportedly have certain dominant "learning styles" (aural, visual, etc), but Miller asserts that "time and again, research has demonstrated broad similarities across individuals with respect to the basic machinery of sensory processing" (p.151). In its place, she focuses on the more research-grounded basis for "how to effectively bring together auditory and visual information into teaching" (p. 153) called multimedia theory. Best practices include segmenting material, highlighting key points, teaching new major concepts before introducing them in a multimedia format, and pairing graphics and accompanying text as close together as possible. The importance of creating "fully accessible" course materials, along with specific examples on how to do so, is discussed at some length.

Chapter Eight, "Motivation", applies social cognitive theory to the Herculean task of motivating college students. Miller believes that motivational issues which "look purely emotional in nature—such as procrastination and poor reaction to feedback—can be attributed to a student's mindset. For example, students with a fixed mindset might believe that "tests and other graded assignments reflect on one's inborn, unchangeable intelligence" (p. 175), thereby creating "anxiety-provoking ordeals." Recent research suggests that raising students' academic self-efficacy can do wonders for their motivation. The author points out that instructors can positively affect mindset by providing students with information on how the brain works, and by educating them on the importance of practice and effort, versus native intelligence. Miller also believes that the findings of motivation research can reduce the challenges of online learning. One of these challenges is the "out of sight, out of mind" issue, which refers to the ease with which some students can avoid engaging in online courses. Instructors in online courses can help address this by designing a schedule structure that consistently and frequently requires checking in for new information, "early and often' assessment based on small-stakes assignments, moderated discussions, and giving students the opportunity showcase their work.

Finally, the last chapter, "Pulling It All Together", does precisely what the chapter title says, by offering a course syllabus and examples of activities using the aforementioned principles of cognitive theory research that have been previously illustrated in the text.

Conclusion

Minds Online is solidly grounded in research into various aspects of human cognition and the learning process. Miller stresses the fact that effective online teaching practices generally have the benefit of being effective offline as well. The book's insights into memory, thinking, and attention can benefit librarians who teach one-shot sessions, as well as those who teach semester-long courses. Further, the practical strategies listed for using multimedia, increasing motivation and attention, and working with students' memory and thinking, are of use in a multitude of instructional situations. Librarians who enjoy innovative instruction practices will appreciate being able to undergird their strategies with solid research.