

Evidence-based Pedagogical Innovations: a Review of *Make It Stick: The Science of Successful Learning* by Peter C. Brown, Henry L. Roediger III, and Mark A. McDaniel. Cambridge, Massachusetts: Belknap Press, 2014. ISBN 978-0-674-72901-8, 336 pp. \$30. *Small Teaching: Everyday Lessons from the Science of Learning* by James M. Lang. San Francisco: Jossey-Bass, 2016. ISBN 978-1-118-94449-3, xi + 272 pp. \$27.95.

When I consider innovating my classroom pedagogy, two concerns come to mind straight away. First, I am given pause by the overwhelming amount of time and energy required to redesign an existing course or curriculum. Second, I ponder the potential success or failure of the new activity or content. Will all of the time and energy spent result in improved student learning outcomes, or will it all be for naught?

James Lang's *Small Teaching: Everyday Lessons from the Science of Learning* and *Make It Stick: The Science of Successful Learning* by Peter C. Brown, Henry Roediger III, and Mark A. McDaniel confront these paralyzing considerations head on. Written in accessible prose and employing engaging narratives, these two books work in tandem to explain straightforward strategies for increased learning without wasted time and effort on the part of the instructor. Clearly developed with practicality in mind, both books offer concrete examples of activities to complement lesson plans. Moreover, the content is presented with an eye toward efficiency that will appeal to university instructors who have little time to spare. Additionally, both volumes call readily upon cognitive psychology, the study of how the mind works and how people perceive, remember, and think, to demonstrate the proven didactic benefits of the strategies presented. Both books effectively summarize and communicate the methods and results of cognitive science research and establish clear connections between research-based evidence and common pedagogical goals.

The robust organizational structure that shapes each book makes the content accessible and easy to reference. Lang employs a consistent organization in each chapter, which makes the book easy to follow and to consult when seeking to implement one of his strategies. After introducing each key “Small Teaching” concept, the author summarizes significant studies supporting the success of the pedagogical technique. In the second half of each chapter Lang describes specific models for incorporating the teaching concept in the classroom and distills the central principles of each exercise to provide more conceptual guidance for implementing the activity in a variety of instructional contexts. Brown, Roediger, and McDaniel are particularly resourceful, using strategies they promote in the book, namely interleaving and the spaced repetition of ideas, to organize their volume. The recurring repetitions of their key ideas and interleaved exploration of different yet related ideas throughout the book contributes to a cohesive arrangement of the content, which is distilled in a section titled “The Takeaway” at the end of each chapter.

The authors of both books work to dispel prevailing assumptions regarding learning and pedagogy. The authors of *Make It Stick* address mistakes students often make when trying to learn, and they argue against many of the principal notions found in theory, lore, and intuition surrounding studying strategies. They claim that we are often poor judges of both what we know and how we learn well, and argue that the common practices of revisiting book content, reviewing notes, highlighting and underlining while reading, and massed practice (studying a single topic for long, uninterrupted sessions) are simply ineffective. In lieu of the prevailing wisdom, they provide evidence-based suggestions for mastering learning processes.

Each studying technique in *Make It Stick* emphasizes the necessary effort required to actually learn something. Their first two chapters focus on practicing retrieval, asserting the established benefits of low-stakes testing and self-quizzing accompanied by corrective feedback. In the following chapter the authors emphasize the importance of taking frequent breaks from material (spacing) and alternating the practice of various topics or skills (interleaving). In the fourth and fifth chapters they encourage learners to embrace difficulty, demonstrating the benefit of effortful learning and the specious idea that there is such a thing as “errorless learning.” Challenging students to confront illusions of knowing by advocating frequent self-testing and peer instruction forces students to move away from relying on their intuition and encourages them instead to engage what Daniel Kahneman describes as “System 2,” the slower functioning, analytical brain.

In Chapter 6 the authors debunk the common understanding of different learning styles and instead present cognitive tendencies that result in stronger learning outcomes according to empirical research. These include a growth

mindset, the understanding that both one's abilities and one's knowledge are malleable and not fixed, structure building, and rule-based—as opposed to example-based—learning; all are strategies that favor establishing frameworks over memorizing particular examples or case studies. A growth mindset is central to the following chapter, in which the authors present research supporting the benefit of knowing that students can improve their learning and expand their intelligence through deliberate practice. The final chapter provides specific learning tips for students, lifelong learners, and teachers, as well as activities that may be easily integrated to improve student learning outcomes.

In *Small Teaching* James Lang challenges the assumption that pedagogical innovation necessitates a total redesign of a lesson plan or curriculum and argues for careful consideration of how students actively engage with material in the classroom. Lang describes three types of innovations throughout the book: brief (5–10 minute) classroom or online teaching activities, one-time class interventions, and small modifications in course design or communication with students that can enhance your pedagogy.

Lang organizes his interventions according to three crucial areas of instruction: learning, understanding, and motivation, directly referencing *Make It Stick* and its cognitive concepts. For example, in his opening section on helping students attain knowledge (Chapter 1–3), he talks about both practicing retrieval and interleaving the teaching and practice of related ideas or skills. Additionally, he presents research supporting the benefit of prediction. Even if one's estimation is incorrect, the act of speculating inspires easier recall, as long as incorrect suppositions are resolved swiftly.

To help students build understanding, Chapters 4–6 explain activities that will force students to engage actively with material and establish connections across the content. He advises against instituting specific associations for students, instead asking them to build their own conceptual frameworks relating the various ideas presented in class, an idea that resonates with the concept of structure building and rule learning described in *Make It Stick*. Furthermore Lang suggests using valuable class time for students to practice exercising their understanding and the necessary skills to succeed on assessments. Finally, he describes the many benefits of “self explaining” and suggests students elucidate their reasoning by thinking out loud or engaging in the process of peer teaching.

The final section of the book (Chapters 7–9) focuses on student motivation. While Lang acknowledges that some may argue that making students eager to learn is not necessarily the instructor's job, research shows that a teacher's attitude in the classroom can go a long way in encouraging successful learning outcomes. Lang describes the importance of getting to know your students, communicating your investment in their learning process, and exercising empathy and compassion in your interactions with pupils. The growth mindset, a central

framework in *Make It Stick*, is likewise at the forefront of this section. Lang makes suggestions regarding assignment design, assessment strategies, and feedback techniques to promote the growth mindset among students. Empathy also plays a role, as he encourages instructors to open up to students about their own growth as an academic or pedagogue. Lang concludes by encouraging instructors to consistently develop their own pedagogical methods. While it is all too easy to become lackadaisical about teaching, especially in courses that are taught semester after semester, Lang's *Small Teaching* provides simple strategies for regularly implementing pedagogical innovations into individual class sessions.

Both of these books are valuable teaching resources. *Make It Stick* provides essential knowledge and understanding of cognitive processes that can help students determine how best to learn and study for assessments. Taking time to make these cognitive processes explicit might occupy valuable content time, but students will develop skills they can and will use both in their other classes and beyond. Making those ideas more concrete by offering realistic, hands-on applications, *Small Teaching* incorporates many of the strategies described in *Make It Stick* into straightforward pedagogical techniques for direct classroom implementation.

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