

ARTICLE

Increasing Accessibility Through Popular Press Books into Neuroscience Coursework

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Utilizing popular press books can increase accessibility and aid in retention of marginalized groups; by increasing student engagement, improving material accessibility through real-world examples, and helping ease the financial burden of textbooks. The current article outlines how several popular press books have been successfully implemented in different levels of neuroscience coursework, including an introductory neuroscience course, a mid-level drugs and

behavior course, and a senior seminar. Implementation strategies and pitfalls are discussed, including best practices for assessment and incorporation of popular press books into course material.

Key words: neuroscience, popular press books, introductory neuroscience, accessibility, retention

Student retention is the key to program success, and in particular, the neuroscience discipline needs to make strides to retain marginalized groups in STEM (Neuwirth et al., 2021). Utilizing popular press books is one way to increase retention, as they promote student engagement (Caruth, 2018), make material more accessible (Gasman and Nguyen, 2014), and help ease the financial burden of college (Hurtado et al., 2010).

Popular press books promote student engagement due to the narrative/story-like format in which information is presented. When information is presented in a narrative format, it helps students interact with the material and they find material to be more enjoyable (Fernald, 1987, 1989). Students also report that the narrative format transports them into the topic (Gunther, 2011; Janit et al., 2011). This reported topic immersion is believed to be responsible for increased academic success, as students perform better on exams several weeks later when reading narrative versus standard textbook readings (Janit et al., 2011). As such, the improved student engagement and academic success from using popular press books, should improve retention of marginalized groups (Caruth, 2018).

Popular press books also increase the accessibility of course material, and provide real-world examples, both of which improve academic course success, and college retention of marginalized individuals (Hurtado et al., 2010; Gasman and Nguyen, 2014). As scientific literature has become more inaccessible (Hayes, 1992), students are often intimidated by scientific jargon and content in the scientific literature. Popular press books are an excellent way to make material more accessible, particularly in introductory courses. These books can also improve retention as they provide real-world examples that bridge the gap between coursework and students' lives (Hurtado et al., 2010; Gasman and Nguyen, 2014), a connection often lacking in traditional textbooks.

Finally, the use of popular press books can ease financial barriers for students, a factor that impedes both underrepresented student's academic success and retention (Hurtado et al., 2010). Textbooks are increasingly

more expensive, and are often a financial barrier of student success, as they are often not covered by financial aid. One way to ease this financial burden is through the use of popular press books, which can often be purchased for only a few dollars, and can replace cost-prohibitive textbooks (Cengage, 2018). Popular press books rather than textbooks will ease financial burdens, and in turn, promote academic success and retention of underrepresented students.

The current article will outline several books that have been successfully implemented in different levels of neuroscience courses. The current review is far from exhaustive, and the author encourages readers to look into additional books from the authors mentioned in this review (e.g., Oliver Sacks and Carl Hart), in addition to books that have successfully been implemented in previous neuroscience courses (Lom, 2018; Palissery et al., 2018). These neuroscience courses serve undergraduates in both the neuroscience and psychology curriculum. In addition to reviewing each book, this review will outline how each book is implemented in the classroom, and tips for successful course integration.

INTRODUCTORY NEUROSCIENCE COURSE

Our introductory neuroscience course is a lab-based course for both majors and non-majors (it ranges from 15-50% neuroscience majors). There are no pre-requisites for the course, so the preparation ranges from high school science courses to students who have successfully completed a few years of the college's biology or chemistry curriculum. I decided to incorporate *The Tale of the Dueling Neurosurgeons* by Sam Kean (Kean, 2014) in order to introduce and engage students, regardless of their course preparation. Kean's book is written for a lay audience and weaves together both well-known and more obscure neuroscience studies/stories into a narrative format. For example, when discussing phantom limb syndrome, Kean tells the story of George Dedlow who lost his leg during the civil war and experienced phantom limb syndrome before it

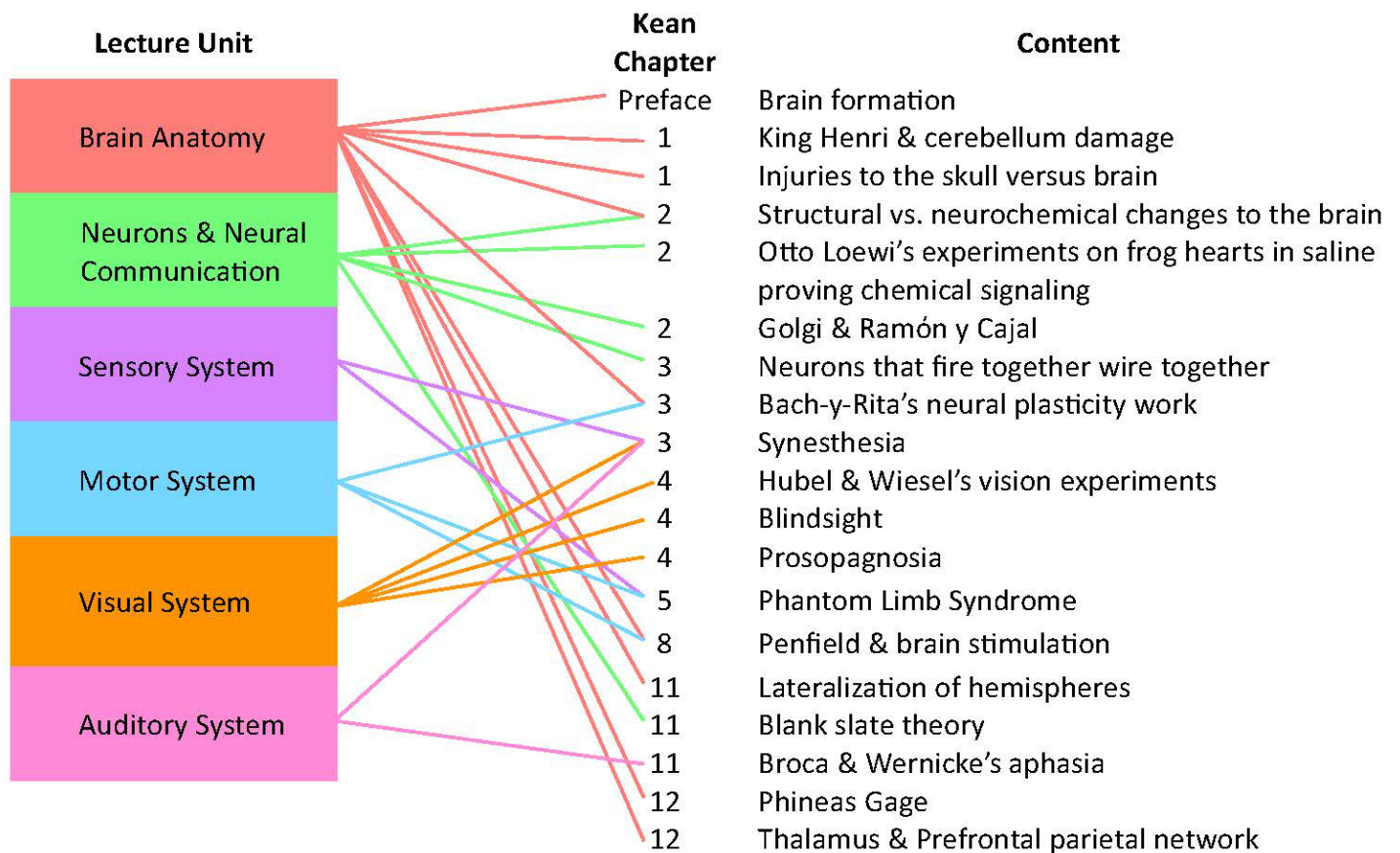


Figure 1. Lecture unit and corresponding chapter and chapter content from *The Tale of the Dueling Neurosurgeons* (Kean, 2014).

was recognized by the medical field, but also talks about the neurologist Silas Weir Mitchel's and V.S. Ramachandran's work on phantom limb syndrome. In each chapter Kean artfully weaves together the stories surrounding a neuroscience theme. I've outlined the well-known neuroscience studies/stories and corresponding course section with which they are assigned in Figure 1. Because of the range of stories Kean includes, the book introduces novel content for every of student, independent of past curriculum exposure. Each chapter is self-contained, so chapters that correspond with course material can be easily selected, and don't need to be read sequentially. Additionally, faculty could choose to provide students a single section from a text as long as it adheres to fair trade guidelines. The narrative format has helped make course content more accessible for students, as students enjoy Kean's dry humor, and report that it has helped them make connections in class.

Chapters are assigned throughout the course as they correspond with course content, and students complete online short answer quizzes covering the assigned chapters. The chapter discussions are then woven into course lectures as we discuss the topics in the book. For example, during the brain anatomy unit, students read chapter 1 that outlines King Henri II of France who was injured in a joust, as well as chapter 8 that discusses Penfield's brain stimulation experiments that allowed him to map the primary motor and somatosensory cortices. Following discussions,

content is assessed on exams as it relates to lecture material.

DRUGS AND BEHAVIOR COURSE

Drugs and Behavior is a mid-level course that has introduction to psychology or introduction to neuroscience as a pre-requisite. Students are typically juniors or seniors when they take the course, and the majority of students are psychology or neuroscience majors. Because of the content of illicit drugs, there are a plethora of popular press books that could work for this course. I have chosen two, *High Price* by Carl Hart (Hart, 2013), and *Dreamland* by Sam Quinones (Quinones, 2016), based on the themes and content of the books.

High Price follows Carl Hart's journey from his childhood as an African American growing up with few resources in Florida to his position as addiction researcher at Columbia University, and the factors that kept him away from drugs/impacted his journey. Hart also does an excellent job weaving in classic neuroscience studies and current literature to back up his experiences. I chose *High Price* because it contrasts the drug use/abuse narrative often portrayed in our educational system, and addresses many myths surrounding substance abuse. Additionally, as many faculty seek to incorporate diversity, equity, and inclusion into their courses, this text is a great way to elicit discussion surrounding drug legislation and structural barriers for marginalized groups.

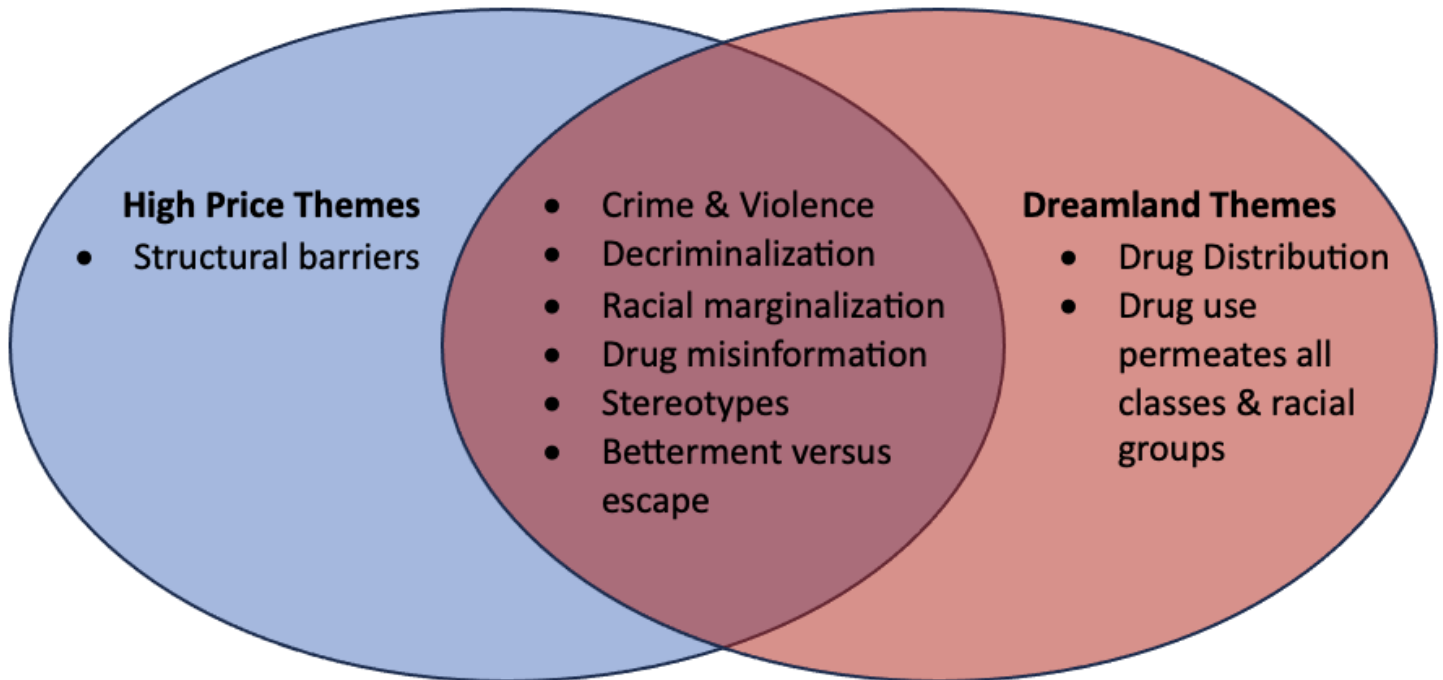


Figure 1. Concurrent themes in *High Price* by Carl Hart and *Dreamland* by Sam Quinones.

Dreamland follows the rise of black tar heroin across the United States, the rise of pill mills in the Ohio Valley, and how the collision of the two led to the opiate epidemic. Throughout the book, many social issues are addressed, such as the ethical dilemma of Mexicans from Xalisco, Mexico travelling to the United States to distribute heroin, how drug abuse permeates all classes of individuals, or the shift in thinking away from incarceration, towards treatment for those abusing drugs. *Dreamland* is incorporated into the course because it discusses the current opioid epidemic, which is of interest to many students, while still examining many of the themes presented in *High Price*, though through a very different lens. Where Hart examines substance abuse through his personal experiences growing up during the crack epidemic as a non-user, as well as a researcher, pulling from the literature to back up his claims, Quinones examines the opioid epidemic through personal stories of those who abuse or are impacted peripherally by the opioid epidemic. Thus, the two books often provide contrasting views on themes. For instance, Hart argues that individuals steal to get what they need to survive, not for drugs, where Quinones presents evidence of individuals stealing merchandise to trade for drugs. These contrasting viewpoints often set the stage for lively discussions in class to examine what the literature says on the matter.

Students have a choice whether to read *High Price* or *Dreamland*, and they sign-up on a first-come first-serve basis to ensure half the class is assigned to each book. Chapters in both books are assigned in sequential order, and students have quizzes over a section or 3-4 chapters five times throughout the semester. Each quiz is due 3-5 days prior to the in-class discussion of the book. I then

randomly assign four person groups, each with two students who have read each book. Students discuss what has occurred in their books, and questions that explore larger themes with their groups, prior to a class discussion on the books. On exams, students are then asked broader questions/themes that apply to both books. Thus, students aren't evaluated on the books they don't read, though this information is integrated into lecture content. Examples of themes include crime and violence or racial marginalization, all of which are presented in Figure 2. Students appreciate the narrative/story-like nature of both books and are often surprised by the themes that go against their formal education (e.g., illicit drug use does not equate to dependence or abuse). Overall, both books allow students to examine illicit drug use through different lenses.

SENIOR NEUROPLASTICITY SEMINAR

The senior seminar is a capstone course for seniors in psychology and neuroscience, meant to be a culminating literature-based course that is an in-depth examination of a topic. Because the course caters to both psychology students who have never taken a neuroscience course and are familiar with psychology literature; and neuroscience students who have never taken broad-based psychology courses but have a large foundation in the neuroscience literature, I choose to use popular press books to bridge the knowledge gaps. For the current course on neuroplasticity, I chose the popular press books *The Brain That Changes Itself* by Norman Doidge (Doidge, 2008), and *The Man Who Mistook His Wife for a Hat* by Oliver Sacks (Sacks, 2006).

Doidge's book introduces topics related to neuroplasticity

Topic	Doidge Chapter	Sacks Chapter
Neuroplasticity During Development	Chapter 11	Chapter 15
Sensory Systems Plasticity	Chapters 1 & 3	Chapter 7
Motor Systems Plasticity	Chapters 5, 7, 8, & 10	Chapter 6
Memory & Long-term Potentiation	Chapter 9	Chapters 2 & 12

Table 1. Topic in neuroplasticity seminar and corresponding chapters in *The Brain that Changes Itself* by Norman Doidge, and *The Man Who Mistook His Wife for a Hat* by Oliver Sacks.

in each chapter and incorporates the historical literature in a narrative format. Many of the chapters overview the historical progression of that research field and Doidge does a great job referencing the primary literature, while writing for a lay audience. One to two chapters are assigned to introduce topics prior to reading primary literature articles for subsequent classes. Sack's text is incorporated as case studies on a given neuroplasticity topic (see table 1 for content/subject alignment). After reading a chapter for class, we discuss detailed questions that highlight the historical studies and broader themes of the chapter. Students then analyze Sack's case studies often using Doidge's chapters or primary literature to explain what is being observed. On exams, the themes are incorporated with the literature in fully essay-based questions. Because of differences in preparation between psychology and neuroscience students, using popular press books helps bridge knowledge gaps, and makes the primary literature articles on a topic more accessible for all majors once students develop a framework for the topic.

TIPS FOR SUCCESS

Utilizing popular press books in classes the past few years has garnered many benefits, but there have also been many shortfalls in implementation. I have found that reading and exam assessment, note-taking, and course integration are essential for successful implementation.

Students need to have reading assessment in the form of online or in-class quizzes as they read the chapters. I utilize short answer assessments, but multiple choice or fill in the blank questions could also work. I have found that without an assessment, students either don't read the book, or they fail to process/retain the information that they are reading in the book. In the same vein, it helps if the professor instructs students on how to read and take notes both when they are reading the popular press books, and during in-class discussions of the book. Because of the nature of popular press books, the majority of students don't take notes while reading, or during in-class discussions when the main themes from the reading are pulled out. Thus, without instruction, students are overwhelmed when it comes time for the exam. I've also found that asking students to write papers examining or reflecting on a theme they read about doesn't work well to assess student reading, as students

struggle to identify themes on their own. Papers also don't work as well as discussions, as students compartmentalize the information, not fully integrating information from the books with lecture material. Thus, assessing reading prior to in-class discussions, and then utilizing group discussions to highlight the themes has proven to be the most effective way to assess students in my own classes.

On exams it is best to keep the assessment to large themes and how these apply to lecture content. For example, in my drugs and behavior course I ask students about drug distribution networks we've discussed in class, and how the drug distribution networks from the book build on this, and evidence that drug networks have become more dispersed and difficult to enforce over time. Because the goal of integrating popular press books in my classes is to increase accessibility, and provide alternative perspectives, in-depth questions beyond the themes results in students trying to memorize information rather than understanding the application, which is a higher level of learning in Bloom's taxonomy (Anderson and Krathwohl, 2000). Thus, I have found the greatest success in assessing larger themes and applications.

Finally, popular press book content should always be integrated into the lecture information. To assist with integration, note that not all books need to be read sequentially (see figure & table 1 for examples of this). The benefit of popular press books is increasing accessibility, and providing relatable real-world examples (Hurtado et al., 2010; Gasman and Nguyen, 2014). Without fully integrating the information into lectures, students have a difficult time making these connections, and as a result, finding meaning in the lecture material.

CONCLUSIONS

Popular press books are an excellent way to promote student engagement with course material, increase accessibility of course material, and ease the financial burden to students, all of which contribute to academic success and enhanced retention in underrepresented individuals.

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