How Real-world Problems Enhance Motivation in Students and Teachers

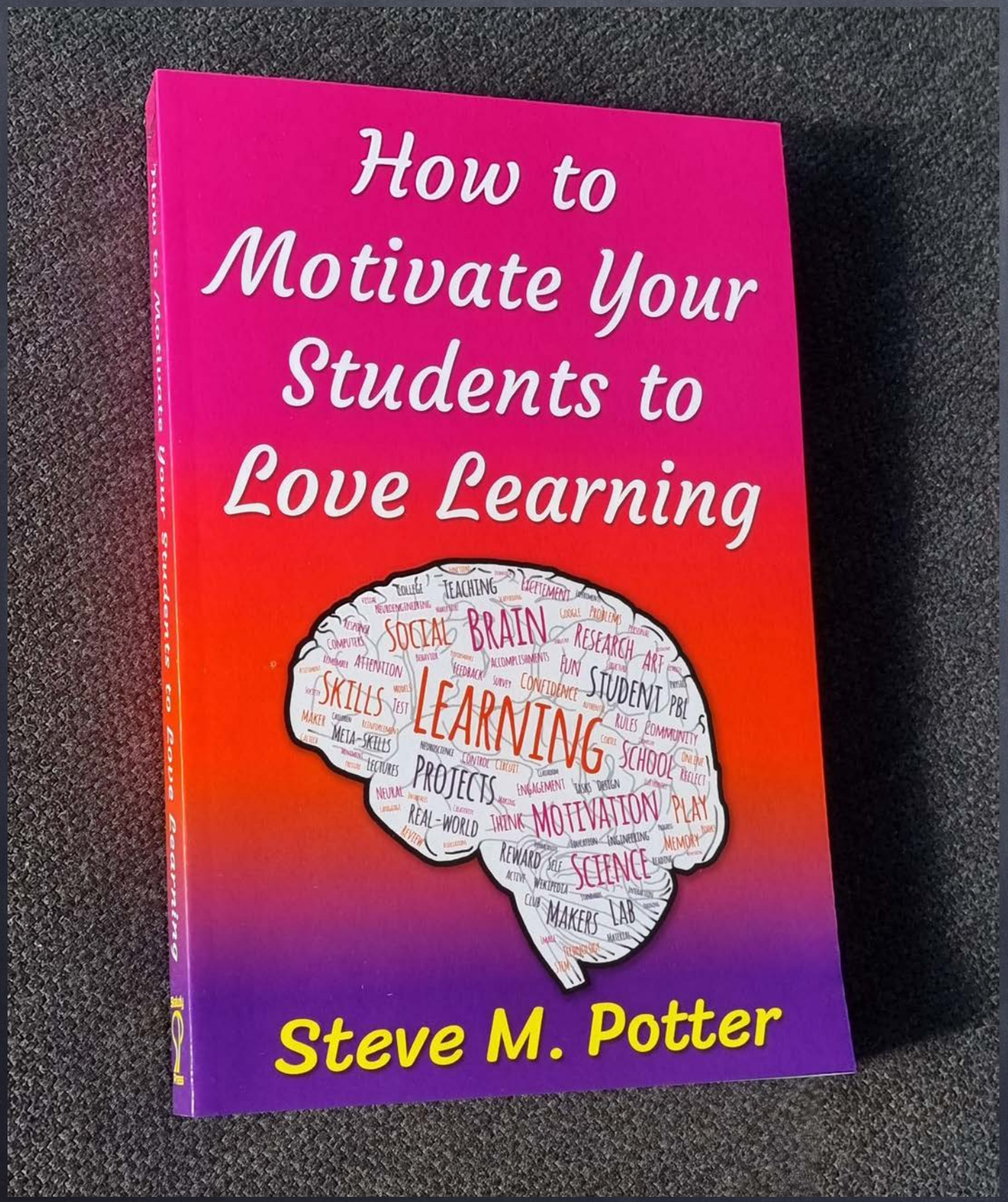
Steve M. Potter, PhD
Adjunct Associate Professor
Coulter Department of Biomedical Engineering
Georgia Institute of Technology
and Emory University School of Medicine

Make: Education Forum Sept. 24, 2021

Outline of my talk:

- **PROJECT-BASED** learning motivates students.
- **Visible** and **enduring** projects from two of my courses.
- Student testimonials about my Real-World curriculum.
- Ideas for how you can make **your** courses real and highly motivating.

My new book

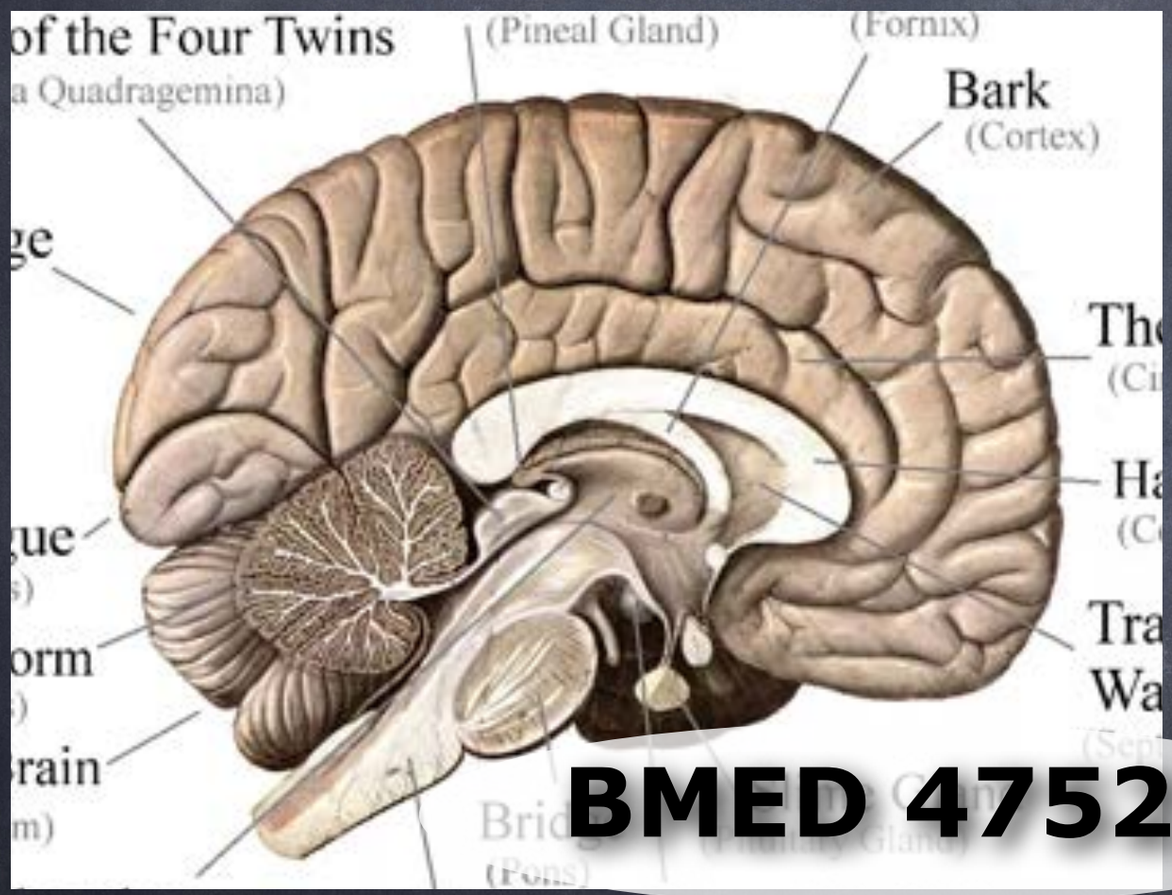


Specific advice for teachers at all levels, mixed with my personal story

- Amazon link -

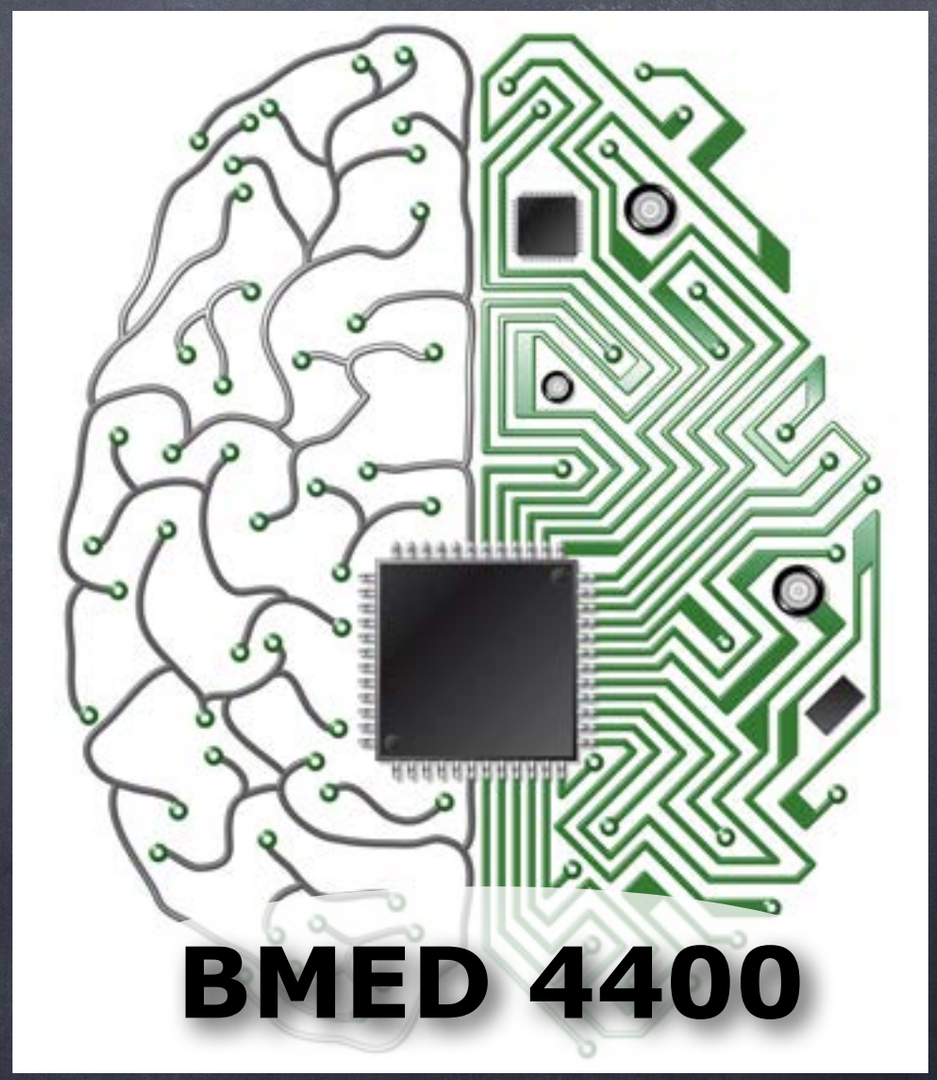
My Real-world courses at Georgia Tech: Introduction to Neuroscience and Neuroengineering Fundamentals

Neuroscience…



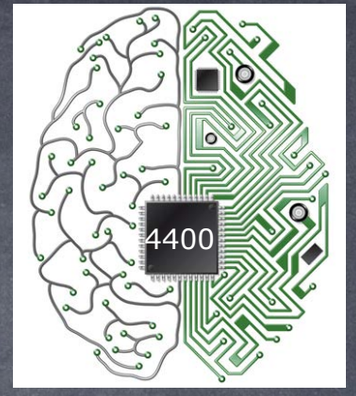
BMED 4752

…Applied neuroscience



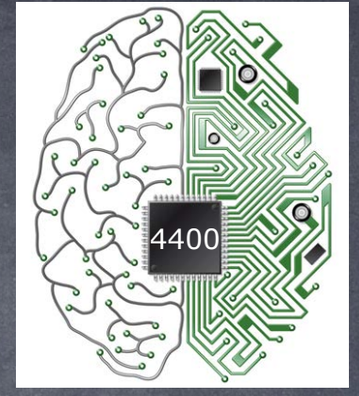
BMED 4400

Neuroengineering Fundamentals
BMED4400 Lab + lecture



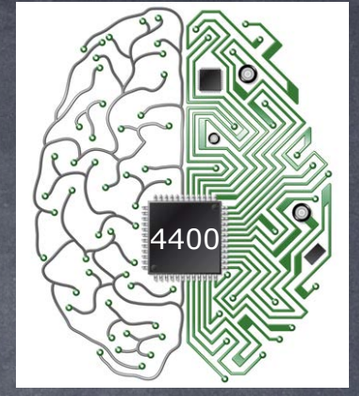
- Goal: to be a microcosm of the grad school experience, jammed into one semester.
- **Project-based** lab class: students researched the literature to come up with a real, semester-long project they can do with the equipment available. (Multi-electrode array neural cultures).

Neuroeng. Fun.: Real-world aspects



- Guest lectures from local and distant experts in neuroengineering. (e.g. Michael Chorost on cochlear implants)
- Plan and execute complex group project with lots of iteration, failures, and class discussion.
- Design and build equipment, write software, analyze data.
- Highly motivating: potentially publishable research projects on the most cutting-edge equipment. Give useful feedback to manufacturers, e.g., Axion Biosystems.
- Prototyping for Backyard Brains.
- Field trips...

Field trips to the Center for Advanced Brain Imaging to do their fMRI experiments and to Melody Moore-Jackson's lab for their EEG experiments



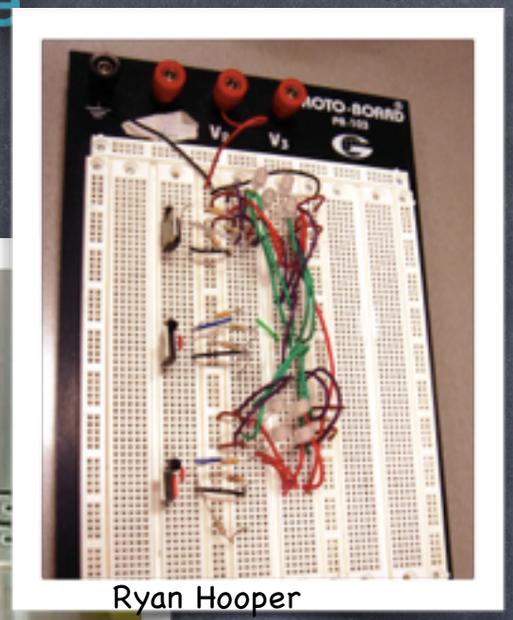
Important course goal:
How to learn from failure

Grades were based on how much
effort and **learning**
their lab notebook reflected, regardless of
whether their projects and experiments
worked or not.

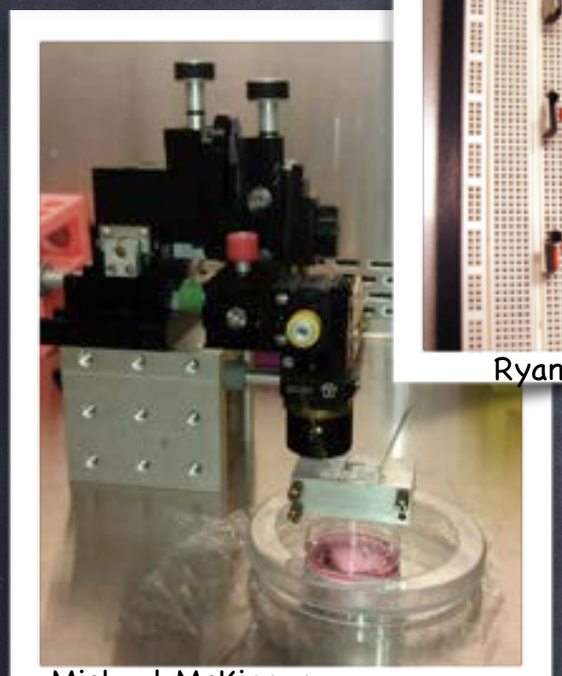
Real world aspect: Their notebooks were put in our library and used by later students to anticipate failures and learn from past mistakes.

open source hardware

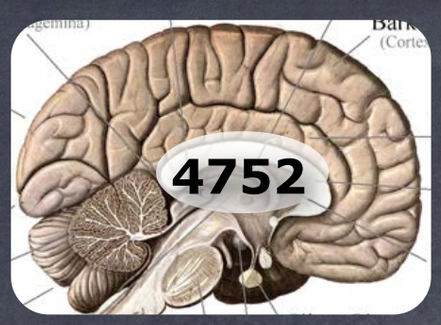
Now we move from making physical objects in lab class...



Ryan Hooper

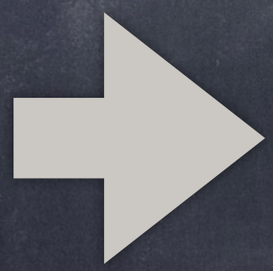

Michael McKinnon

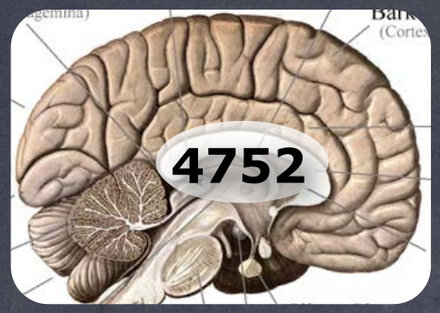
...to making enduring digital artifacts on the web.



Introductory Neuroscience
BMED/BIOL 4752

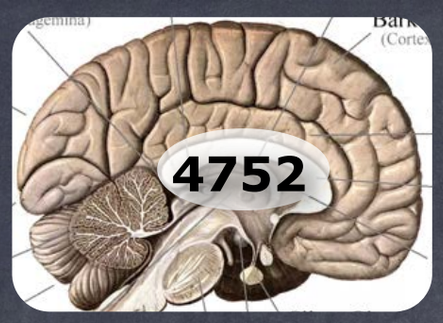
- 60-100 biology and BMED seniors.
- Difficult for an elective - students must be motivated.
- Semester-long assignment: Become an expert in a chosen neuro topic that is not yet on Wikipedia, and write a real Wikipedia article about it.





Wikipedia Article Assignment

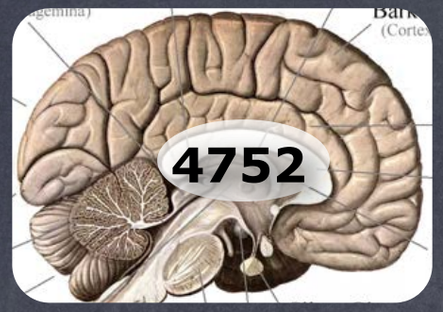
- Since 2006, my students wrote over 250 **new** neuro articles for Wikipedia, and expanded many stubs.
- The fact that this was for the Real World was a fantastic motivator for students!
- Many sub-assignments helped build enough expertise to write a good article.
- The all-volunteer community of Wikipedia editors was very helpful.
- Wikimedia.org has a **Wikipedia Education Program** to help teachers incorporate Wiki article editing into their curricula.



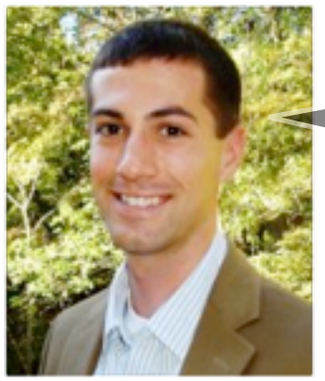
I polled my alumni a few years after they graduated

Alumna Christa Caesar

"Intro to Neuroscience was completely different from all my other courses because of its real world approach. This approach made the material relevant, interesting, and useful at the same time, therefore making learning a fun process. In addition to learning some great neuroscience, I also picked up on some very practical skills that I greatly value today - such as creating a Wikipedia article, directing, recording, and uploading a Youtube video, interviewing an expert in a neuroscience sub-topic, and writing an Amazon review article based on a book out in the market. I never did any of this in any other course and this made Intro to Neuroscience extremely refreshing and novel."



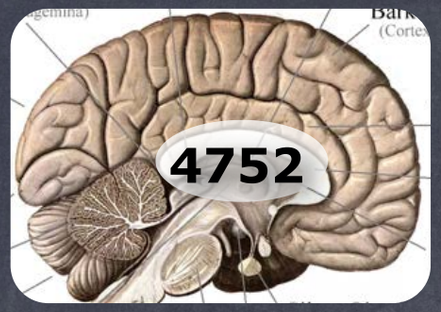
Alumni comments on IntroNeuro…



Alumnus Mike Weiler

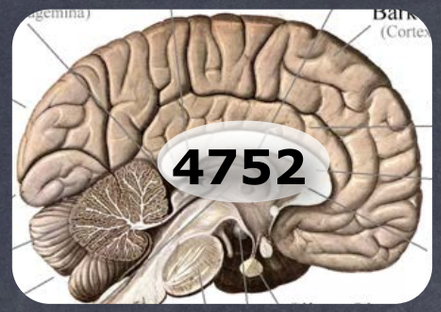
"...The real world assignments made a significant impact on me, both at the time of completion and to this day. The process of gathering information, publishing it in a public venue and taking credit/responsibility for the content of the writing was almost an entirely unique concept to me as an undergraduate. To that point my classes had required a significant writing component, however, there was never a requirement to put my name on the line and make my writing available to the public. To my surprise, that actually significantly altered the way I approached the writing and substantially improved the quality of my final product. The assignments motivated me to become engaged in the topic and do an excellent job because I wanted to represent myself well. This is the same process that I am now going through as a graduate student because all my work will be published, thus representing myself, my lab and my school.

In addition to publicly displaying my work, the assignments helped to expose me to the types of activities I now find myself doing on a regular basis in graduate school. The amazon book review assignment helped me to think critically about the writing of others and be able to compose a thorough and thoughtful review of the main points. This skill has become invaluable as I assess journal articles for my research. The wikipedia article was also extremely unique and was actually my favorite element of the class. That was my first exposure to truly "publishing" scientific information. I still read the wikipedia entry occasionally to this day, and I'm very proud of the work I put into that article. The experience has helped me to write journal articles of my research and I now have two published papers."

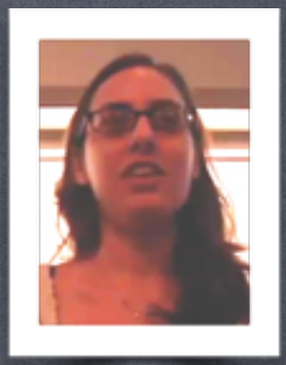


Other Real-world aspects of IntroNeuro

- Learned about real lab research from other neuroscientists.
- Read a neuro book of their choice and wrote a detailed review on Amazon.com using their Real Name.
- Read and ranked other students' book reviews.



Case study: Amazon neuro book reviews



Jennifer Carlson read and reviewed "Rewire Your Brain"

Comments

Track comments by e-mail
Tracked by 1 customer

Sort: **Oldest first** | Newest first
Showing 1-7 of 7 posts in this discussion

7 people commented on it!

Initial post: Jan 24, 2011 2:12:56 PM PST

Alison Poulsen says:

Thanks for your effort in writing this long review!

D. CURRY says:

Ditto!
Thank you SO much for a thorough review! It was interesting, well written, and compelling. I now know about the book and why I must own it! Excellent work on your pa

miami7424 says:

thank you for your good works!i appreciate your informatic

Daniel D. Phillips says:

Jennifer- Wonderful review :) I wish more books had revie
please!

Meg says:

Thank you for your detailed and informative analysis. Beca
book.

Thomasina says:

excellent review of this book. Thanks so much!

Late bloomer says:

Extremely comprehensive review! Thank you.

Amazon.com: Customer Revie

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"Very interes

By Jennifer Carlson
REAL NAME™

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Amazon Verified Purchase (

This review is from: Rewire Y

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I chose this book to rea
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self-help book. Now afte
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book does this beautifull
long or complicated wor
patient he had worked
advantage. There were 9 chapters in this book covering basic neuroplasticity, anxie
and sleep, the benefits of social interactions, resiliency, and attention. I will go into
below.

CH 1: Firing the right cells together
This section is essentially the meat of the whole book. Here the author introduces t
means to us. He describes how the different parts of the brain function, how neurons work, and how neuroplasticity occurs. Due to the content of this section, you may think that this part of the book would be more of a textbook type read, however that is not the case whatsoever. Dr. Arden manages to keep this section simple and interesting. He even throws in some fun facts that I really enjoyed about how a woman's brain and a man's brain differ. Here is one example: "Since woman's brains have a better connection between the two hemispheres ... words often carry more emotional meaning for women than they do for men." I definitely see this amongst the couples that I know. The most important part of this chapter is where the author introduces his method of how to

owViewpoints=18 relatable

CookingLight Flickr UO VS RS Reader Post

Although this book was mostly easy to read, there were parts of the bo
regards to the different parts of the bra In some sections, the auth or
overwhelming. While reading, I kept thi de
book even more rewarding would be to keep a sheet of paper or an nd
jot it down with its basic function, what top
the list. This way you have a sort of chea t sheet for quick reference hil
By combining readability, relatable pass ages, and fascinating content, D
reading this book while taking my own advice of FEEL As he tells you in
I wrote this review, I used Dr. Arden's me thod of FEEL. As he tells you in
heart this advice and tried my best to fo cus by turning off my TV and cl
organized way than if I hadn't.

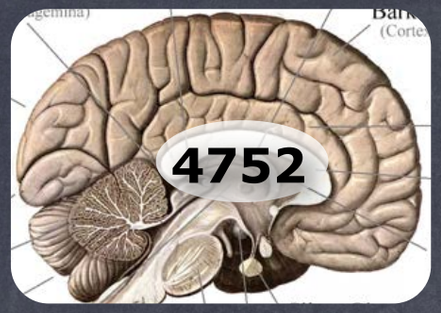
335 people found this helpful

Thank you for your feedback | Report abuse

Years later, it remains the most helpful review!

31 used & new from $25.94

The Winner's Brain: 8 Strategies Great Minds



Other Real-world aspects to IntroNeuro

- Attended and wrote up neuro lectures around Atlanta and at the Society for Neuroscience conference.
- Interviewed an Expert orally and presented what they learned.
- Did benefit walks to learn about neuro diseases.
- Created YouTube videos about research articles.

From: "Kermit and friends explain the basal ganglia" by Austin Bennett

Link to videos

Do your students make stuff?
Do they work with
real-world clients and customers?

Design, modeling
and problem solving
in the classroom are important,
but they have less impact if they are "toy"
problems
or cookbook lessons.

Get your students involved in a

Atlanta Mini-Maker Faire 2012

Have your students create Instructables of their creations

LONG line of kids eager to learn soldering

Thanks to Dale Dougherty and Mitch Altman

How to make it REAL

- Encourage group efforts that help others.
- Have students share what they make with the world.
- Iteratively improve complex projects, with external input from outsiders.
- Keep project results online after the semester. Students can build their maker portfolios.
- Use evaluation by fellow students and the whole world.

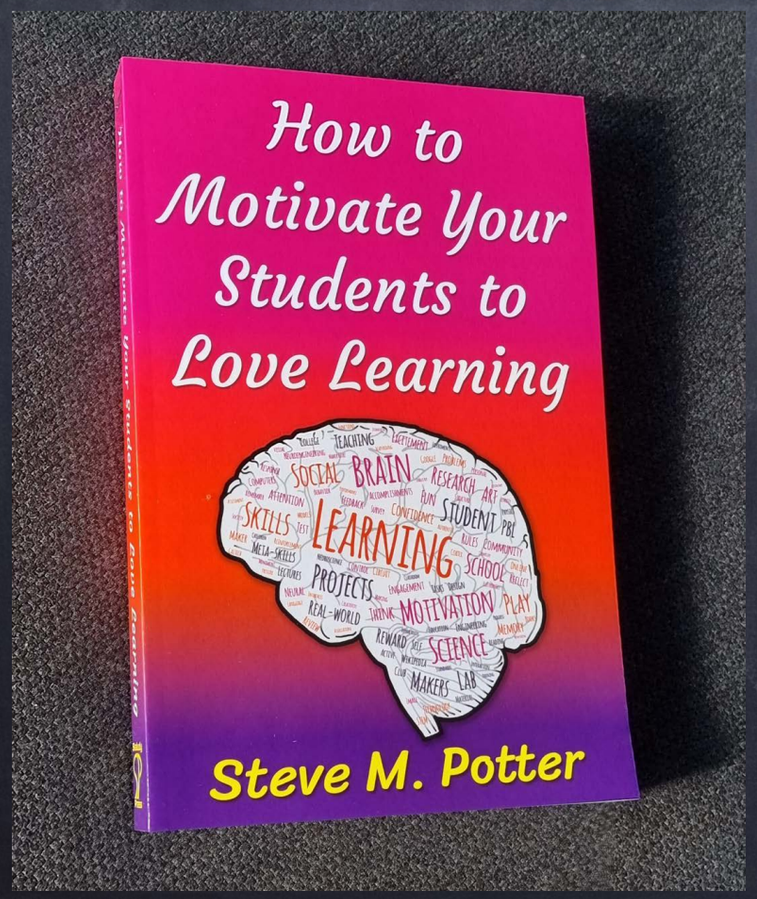
Teach *agency* with Real-world projects

Students acquire a deep sense of
agency
by tackling real-world problems.
They no longer fear failure or
having to learn new things
to get the job done.

"Whether you think you can,
or you think you can't--you're right."
-Henry Ford

Real world teaching & learning summary

- Real-world projects are highly motivating for students and prepare them for jobs in the real world.
- Student projects should be **visible** to the whole world, and **enduring**.
- A class full of motivated students motivates the teachers.
- I have had great success implementing real-world assignments and you can, too! See my book for the details...



- Amazon link -

From my book:

My Websites

- Research & Teaching: https://potterlab.gatech.edu
- Maker Workshops: https://steveMpotter.tech

email me: stevepwork at gmail.com

Take-home Messages

- *Motivation is at the root of all learning.*
- *To learn is intrinsically rewarding and should be fun.*
- *Understanding some of the brain mechanisms of motivation and learning is helpful for teachers.*
- *Student excitement in the medium-to-high range optimizes attention and learning.*
- *Social interactions are the strongest motivators.*
- *Real-world impact greatly enhances motivation.*
- *Children can and should be active contributors to society.*
- *Know your students. Let them know you.*
- *Control and ownership by the students are powerful motivators.*
- *Any difficult task can be made easier by breaking it down into sub-tasks.*
- *Make your rules and boundaries clear to your students and stick to them.*
- *Keep getting feedback and keep adjusting your methods and curricula.*
- *Keep giving feedback to students and let them help each other.*
- *Every single student is smart in some ways and can learn and improve the world if they are motivated.*