WELCOME!

QUESTIONS TO PONDER:

(JOT SOME NOTES AND GRAB A HANDOUT!)

Think of a course you're currently teaching:

-What out-of-class **homework** are you assigning to students?

-What **goals** do you hope to achieve through this work?

-What are your **frustrations or challenges** with this work?

All session materials available at **biologyprof.com/homework**

GETTING MORE OUT OF LESS:

Designing short homework assignments that focus on application and analysis

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National Association of Biology Teachers
Professional Development Conference - Denver, CO
November 4, 2016

#NABT2016

AGENDA

1. Introductions and discussion of homework goals & frustrations
2. My story: "homework is broken."
3. Defining the problem
4. What (some of) the literature says about homework
5. In practice: examples of short homework from my classes
6. Wrap-up discussion & future work

all session materials available at **biologyprof.com/homework**

MY STORY

Courses taught at Columbia College Chicago:

-Introductory Biology

-Sensation & Perception

-Genetics & Honors Genetics

Out-of-class work wasn't advancing my students' understanding…

WHAT IS HOMEWORK FOR?

1. Reinforcing course material
2. Practice acquired skills
3. Preparation for future classwork
4. Application of knowledge
5. Extension of class material
6. "Covering more material"
7. Several other reasons not listed here…

The literature has ideas too:

Marzano, R.J., D.J. Pickering, and J.E. Pollock, Classroom instruction that works: research-based strategies fot increasing student achievement. 2001, Alexandria,VA: ASCD.

Epstein, J.L. and F.L. Van Voorhis, More than minutes: teachers' roles in designing homework. Educational Psychologist, 2001. 36(3): p. 181-193.

Lee, J.F. and K.W. Pruitt, Homework assignments: classroom games or teaching tools? Clearing House, 1979. 53: p. 31-35.

Austin, J.D., Homework research in mathematics. School Science and Mathematics, 1979. 79(2): p. 115- 121.

HOW'S HOMEWORK GOING?

- Low student engagement / completion
- Too much grading (but not enough feedback)
- Next week's class depends on student completion / understanding!?

Too many goals. None of them are happening.

DEFINING MY PROBLEM

How do I give out-of-class work that is **high impact**, that **students will actually do**, and allows me to grade and **offer feedback** (formative assessment) in a timely fashion?

RESEARCH ON HOMEWORK

- WHAT MAKES A **HIGH IMPACT** ASSIGNMENT?
- WHAT TASKS ARE STUDENTS **MORE LIKELY TO COMPLETE**?
- WHY IS **TIMELY FEEDBACK** (FORMATIVE ASSESSMENT) IMPORTANT?

RESEARCH ON HOMEWORK:

WHAT MAKES A **HIGH IMPACT** ASSIGNMENT?

Literature recommends:

Akasheh, F., & Echempati, R., & Sala, A. L. (2012, June), Assessment of Student Learning through Homework Intervention Method Paper presented at 2012 ASEE Annual Conference & Exposition, San Antonio, Texas.

Bransford, J.D., A.L. Brown, and R.R. Cocking, How People Learn. 2000, Washington, D.C.: National Academy Press.

Marzano, R.J., D.J. Pickering, and J.E. Pollock, Classroom instruction that works: research-based strategies for increasing student achievement. 2001, Alexandria, VA: ASCD.

- Students apply concepts
- Directly link to class work
- Perception of achievement

RESEARCH ON HOMEWORK:

WHAT TASKS ARE STUDENTS **MORE LIKELY TO COMPLETE**?

Literature recommends:

Svinicki, M.D., Learning and motivation in the postsecondary classroom. 2004, San Francisco: Jossey-Bass Publishers.

Passow, H.J., et al., Factors influencing engineering students' decisions to cheat by type of assessment. *Research in Higher Education*, 2006. 47(6): p. 643.

Bembenutty, H., Self-regulation of homework completion. Psychology Today, 2009. 6(4): p. 138-153.

- Perception of achievement
- "Distributed in small doses"
- Instructor praise/recognition

RESEARCH ON HOMEWORK:

IMPORTANCE OF **TIMELY FEEDBACK** & FORMATIVE ASSESSMENT

Literature recommends:

Ruiz-Primo, M. A., & Furtak, E. M. (2007). *Exploring teachers' informal formative assessment practices and students' understanding in the context of scientific inquiry*. Journal of Research in Science Teaching, 44(1), 57-84.

- Provides students with insight on their own progress

Chappuis, J. (2015). Seven strategies of assessment for learning. Boston: Pearson.

- Gives instructor info to tailor classwork to student needs

ONE MORE REASON TO KEEP IT SHORT:

IMPLEMENTING RECOMMENDATIONS FROM "VISION & CHANGE"

(5) Core Concepts for Biological Literacy	**(6) Core Competencies** and Disciplinary Practice

ONE MORE REASON TO KEEP IT SHORT:

IMPLEMENTING RECOMMENDATIONS FROM "VISION & CHANGE"

(5) Core Concepts for Biological Literacy	**(6) Core Competencies** and Disciplinary Practice
1. Evolution 2. Structure and Function 3. Information Flow, Exchange, and Storage …	1. Ability to apply the process of science 2. Ability to use quantitative reasoning 3. Ability to use modeling and simulation …

So, we have A LOT to accomplish & the recommendation is less is more…

all session materials available at **biologyprof.com/homework**

PUTTING IT INTO PRACTICE:

EXAMPLES OF SHORT HOMEWORK ASSIGNMENTS THAT WORKED

Instead of a long problem set, definitions, and comprehension items…

Gave students 1-2 engaging problems that addressed aspects I was after.

1. (5) The spiral direction of a snail's shell is a trait determined by a single gene. A snail shell can spiral either in a left hand or a right hand direction. A series of crosses were performed between snails with clockwise and counterclockwise-spiraled shells, the data is shown below.

	P1 Crosses:		**F1 Offspring:**
1	Left x Left	**1**	28 Left, 0 Right
2	Left x Right	**2**	34 Left, 0 Right
3	Right x Right	**3**	0 Left, 33 Right

Some of the offspring from the F1 generations were then chosen for mating in order to produce an F2 generation. The offspring to be mated were chosen from either cross 1, 2, or 3. Which crosses offspring is indicated in parenthesis.

	F1 x F1 Crosses:		**F2 Offspring:**
1	Left (**1**) x Right (**3**)	**1**	30 Left, 0 Right
2	Left (**2**) x Right (**3**)	**2**	16 Left, 17 Right
3	Left (**2**) x Left (**2**)	**3**	27 Left, 9 Right
4	Left (**1**) x Left (**2**)	**4**	35 Left, 0 Right

How is left and right directionality of shells being inherited? Use the data collected from the crosses in the tables above to help you discern the inheritance pattern. Justify your answer using information from the crosses shown above. Which crosses in particular helped you determine this and why?

Adapted from Essentials of Genetics, Klug et al, 9th edition.

2. (5) Consider the traits that we talked about in class with the Labrador retrievers. We followed the genes for coat color (black, chocolate) and vision (normal, PRA: progressive retinal atrophy). Look at the crosses between some Labradors with these traits below and **determine the genotypes of the parent dogs** in each of the four examples by analyzing the phenotypes of their offspring.

	Parents:		**Offspring:**
1	Black, Normal x Black, Normal	**1**	3/4 Black, Normal 1/4 Chocolate, Normal
2	Chocolate, Normal x Black, Normal	**2**	6/16 Chocolate, Normal 2/16 Chocolate PRA 6/16 Black, Normal 2/16 Black, PRA
3	Black, Normal x Black, Normal	**3**	9/16 Black, Normal 3/16 Black, PRA 3/16 Chocolate, Normal 1/16 Chocolate, PRA
4	Black, Normal x Chocolate, PRA	**4**	1/4 Black, Normal 1/4 Black, PRA 1/4 Chocolate, Normal 1/4 Chocolate, PRA

Adapted from Essentials of Genetics, Klug et al, 9th edition.

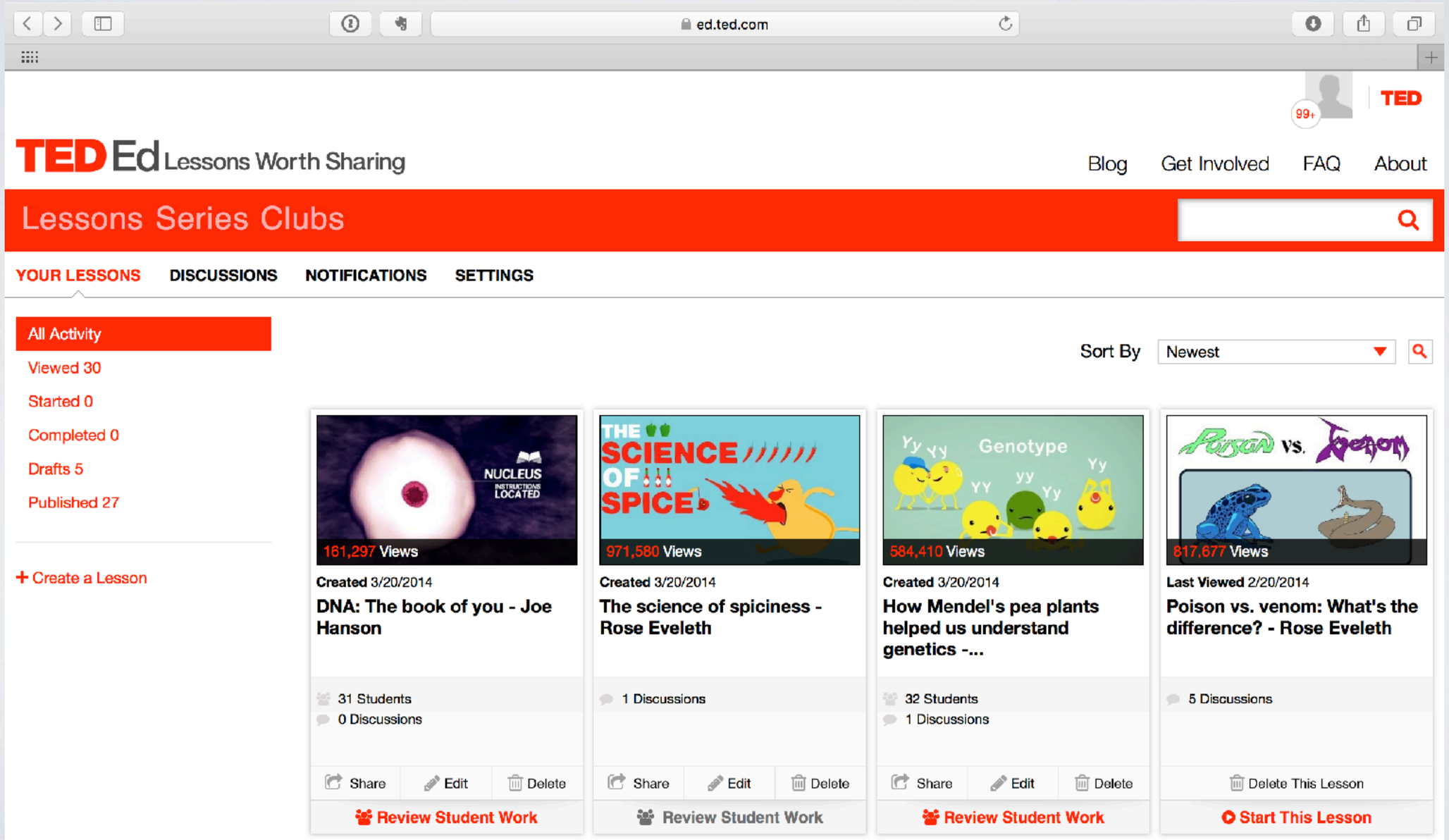
PUTTING IT INTO PRACTICE:
EXAMPLES OF SHORT HOMEWORK ASSIGNMENTS THAT WORKED

A two problem assignment allowed class time for follow-up:

- Ground rules were set before class
- Students were allowed to ask questions about completed homework
- Other students could answer / explain / diagram on board
- Allowed group to reason through hangups together without my help

I'M A BIOLOGIST!

MANY TOPICS DON'T LEND THEMSELVES TO "PROBLEM SETS"

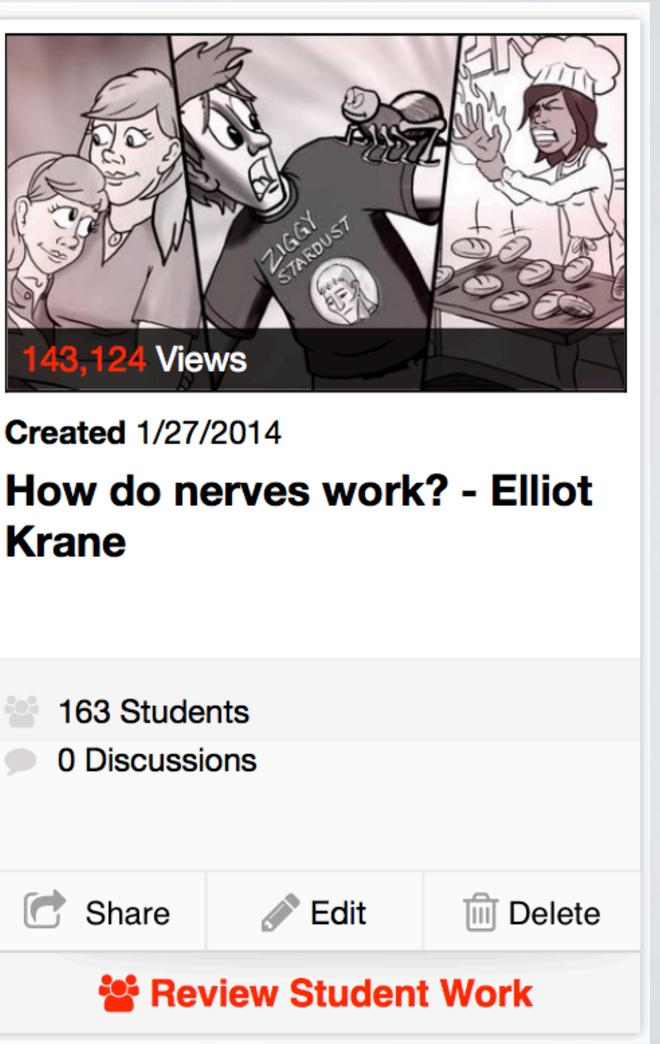


PUTTING IT INTO PRACTICE:

EXAMPLES OF SHORT HOMEWORK ASSIGNMENTS THAT WORKED

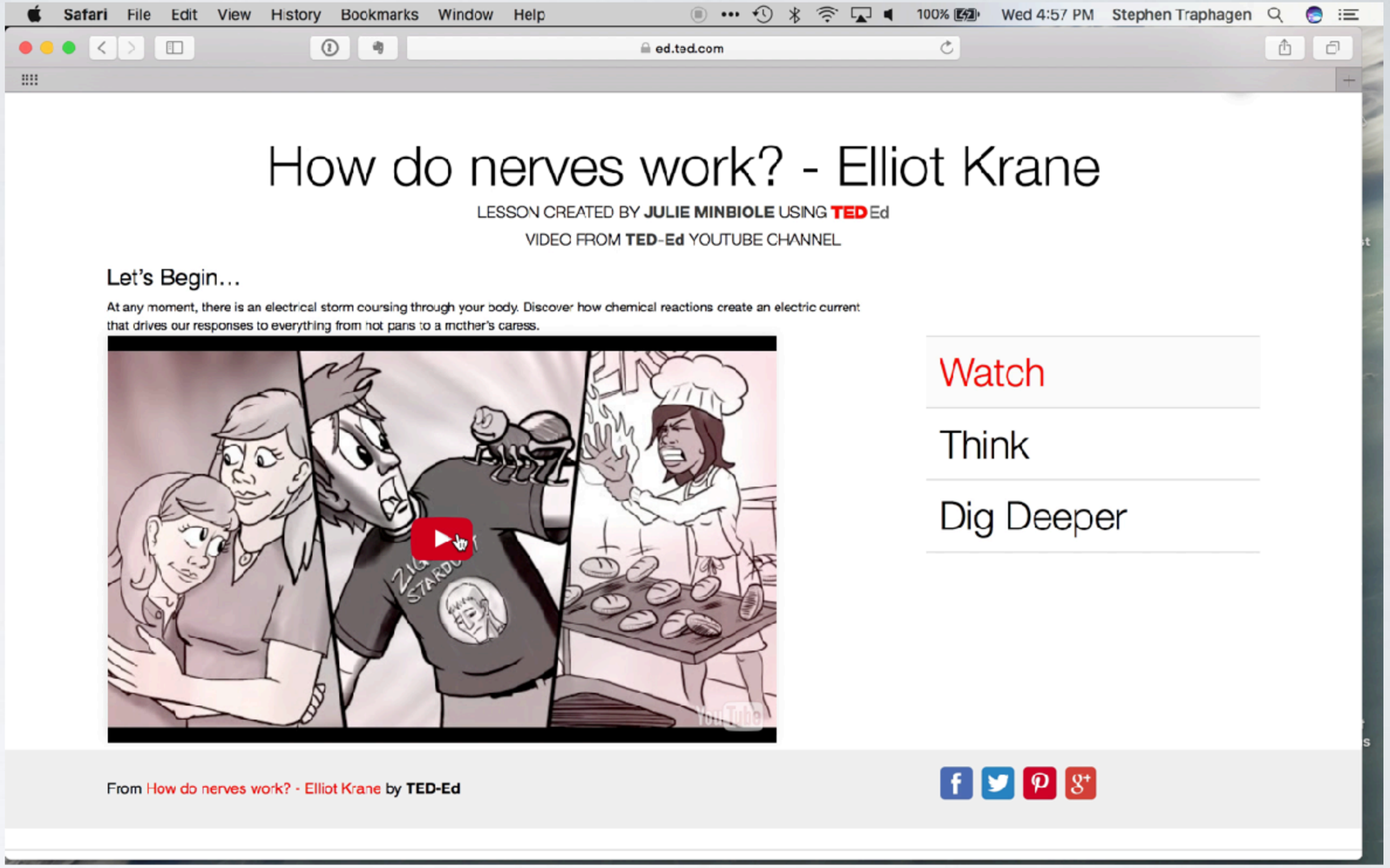
HOMEWORK WITH TED Ed Lessons Worth Sharing

1. Choose a video
2. Select, modify, or write own questions
3. Publish & make available to students
4. Wait for responses…



HOMEWORK WITH TED Ed Lessons Worth Sharing

1. Big Concepts
2. When textbook or figures are inadequate
3. The "power of the pause button"
4. They're engaging

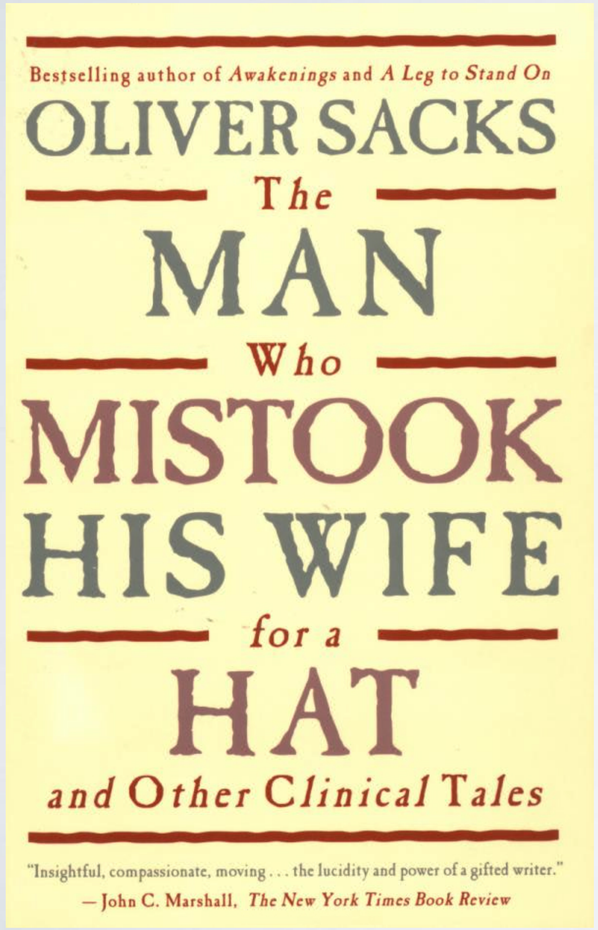


"The online Ted Ed assignments were very effective and a huge hit with my classmates. I'd recommend using them more often."

(Comment from an end of semester student evaluation)

PUTTING IT INTO PRACTICE:

EXAMPLES OF SHORT HOMEWORK ASSIGNMENTS THAT WORKED



Neuroimaging techniques:

- MEG scan
- CT scan
- MRI
- fMRI

What's the best technique and why?

SO, HOW ARE THINGS NOW?

- Not all my assignments are short or focus on application & analysis.
- Student completion rate is highest on TED-Ed assignments
- My evaluations show preference of "innovative" homework over my more traditional assignments
- Drawback - takes time to create & doesn't always work first time

DISCUSSION:

- What do you prioritize when giving homework?
- How can we increase the impact of our assignments?
- How can we motivate students to complete assigned work?
- What kinds of info might you glean from student work?

THANKS AND QUESTIONS

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