Making pre-class readings into a community learning experience

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"If the experiments analyzed here had been conducted as randomized controlled trials of medical interventions, they may have been stopped for benefit."

Do you buy this? 
A) Definitely
B) Maybe
C) Nope

Meta-analysis of 225 studies

Active learning increases student performance in science, engineering, and mathematics
But what is active learning?

“Heads-on (always) and hands-on (usually) activities which yield immediate **individual feedback** to every student through discussion with peers and/or instructors.”

Fraser et al., ROPP 77, 032401 (2014) based on Hake (1998)

Need to move content delivery out of the lecture hall.
How about you?

A) I have never assigned regular pre-class prep work.
B) I have tried it but most of my students did not do it.
C) I have with mixed results so I stopped.
D) I assign regular pre-class prep work.

Solution: sophisticated multimedia learning modules?

Stelzer et al. (2009): even with JITT, 70% of students never or rarely read the textbook before class.

Founders: iclicker
“85.0% of Physics 101 students and 79.3% of Biology 260 students report reading the assigned sections every week or most weeks.”
Best practice suggestions (from Wieman et al.)
1. Focus on what you plan to discuss in class.
2. Explicitly explain the purpose of pre-readings and value to students. Do this repeatedly.
3. Guided reading with explicit prompts, e.g., figure numbers.
4. Each student gets feedback (e.g., graded quiz).
5. In class, refer to things from their pre-reading—but do not re-teach them.
Best practice suggestions (from me)

1. Grade responses on “best effort”.
2. Each student gets feedback (sometimes from me).
3. Lecture does not go beyond the reading!
4. Lecture controlled by student misconceptions and questions.
5. Lecture filled with opportunities for students to discuss with groupmates.
Queen's course #1: 2nd year required course (N=130)

Overall average: 91%
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Is this optimal? How can this be scaled up?
My sons
Their learning community

Astronomers Capture First Image of a Black Hole

For those confused about the orientation of the M87 black hole.
Conflict of interest: I am friends with Miller, Lukoff and Mazur.

Perusall.com

Use of a Social Annotation Platform for Pre-Class Reading Assignments in a Flipped Introductory Physics Class

Kelly Miller¹, Brian Lukoff², Gary King¹ and Eric Mazur¹

¹Harvard University, Cambridge, MA, United States, ²Perusall LLC, Brookline, MA, United States

Miller et al., Front. Educ. 3 (2018)
What Perusall™ looks like

Figure 4: Upvoting of questions in Perusall (note: the depicted individual provided written informed consent for the publication of their identifiable image).

Figure 11: Histogram of the average number of hours students spend on the reading per week.

Figure 12: Histogram of the average number of reading sessions per assignment.

Results from Harvard class.
Queen’s course #2

PHYS P22: Physics Frontiers (aka “Physics for Future Prime Ministers”)

Weekly prep work

![Graph showing the relationship between grade and prep work with a red dot indicating a high prep work and grade close to 1.](image-url)
Time spent reading?

Prep work #5: 8 pages and 5 videos

Average (including zeros): 1hr, 48 minutes

Average (no zeros): 2hrs, 1 minute
Use your own lecture notes! **FREE**

From peers!

**Best practice suggestions**
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Show correlation between prep grades and test results

Use their questions to guide lecture discussions
To focus class time on active learning, delegate content delivery.

Grades not enough motivation. Make the links!

Course #2 results: 87% completion rate, 2 hrs reading time

Harness social interactions

Course #1: 87% said readings were useful

Help your students create their learning community!