Preparing Students for Class:
How to get 80% of students to read before coming to class

Amanda I. Banet and Cynthia Heiner

Introduction

We implemented targeted pre-reading assignments with an associated online quiz in two science classes - one biology and one physics. Our goal was to create a pre-class assignment that encouraged students to complete readings before class, and recognize the benefits of doing so.

Students were asked to take part in a survey about how and why they completed the pre-reading assignments. The structure of the pre-reading assignment and the results of the survey are presented here.

Example Targeted Pre-reading

general instructions

Read section 46.5 (Movement) of **Chapter 46: *Animal sensory systems and movement*** from your text book (p. 1095-1100) and take the corresponding pre-reading quiz on VISTA. The pre-reading quiz for Tuesday's lecture closes 9am Tuesday, April 3rd

specific figures, equations, and examples; questions posed to focus reading

Skim the sub-headings "movement" and "skeletons" on p. 1095-1096. We will not be covering this material in any depth, so just focus on being able to answer the following questions:

- Why are muscles organized into antagonistic muscle groups?
- How does this facilitate locomotion?

Read section the next section ("How do muscles contract") p. 1097-1100 carefully. This is the most important part of the chapter, and will be the main subject of the lecture

In the section "The sliding filament model" make sure you understand:

- The relationship between muscle tissue, muscle fibers, myofibrils and sarcomeres (Figure 46.19)
- Why striated muscle has bands (striations) (compare Figure 46.19 to 46.20)
- What happens to the size of the bands during contraction

In the section "How do actin and myosin interact?" focus on:

- The steps shown in Figure 46.22
- Making sure you understand the role of ATP in the process

selective reading (value their time)

- You can skip Figure 46.21

You can skip the section "Muscle Types" (p. 1101)

Example Online Quiz Questions

Quiz questions were designed to be easy for students who did the reading, but difficult for students that did not.

Definition questions prepare students to use terms in class discussion.

Antagonistic muscle groups:

a. are pairs of muscles that work together to move a bone back and forth.
b. is made up of a flexor and an extensor
c. have coordinated movement due to motor neurons
d. all of the above

Referencing specific figures encourages students to actually open the book.

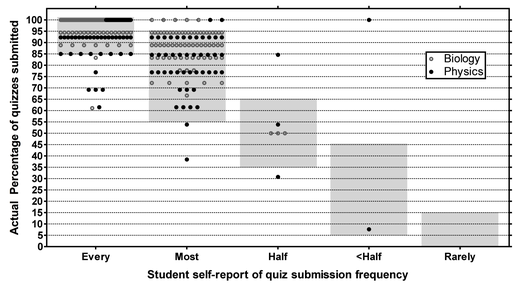
Look at figure 46.20. When a muscle fiber shortens (contracts) the:

a. thick filaments shorten.
b. Z lines shorten.
c. thin filaments shorten.
d. interaction of actin and myosin propels the thick and thin filaments past each other.

Open-ended questions about difficulty can be scanned for common themes, and then addressed in class.

Was there any material in this pre-reading that you found particularly unclear or difficult? Were there any parts that were too basic (or that you have covered extensively before)?

How reliable are student self-reports?

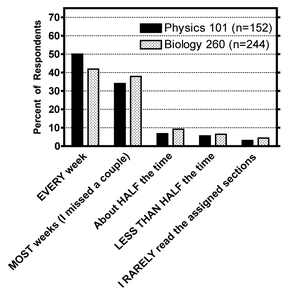


Student reports were reliable over 95% of the time.

We asked students to report how often they submitted the quiz associated with the assigned reading. By comparing their answers with electronic records, we found that over 95% of students answers fell within criteria we considered accurate (shaded areas). Students that did not fall within our criteria are excluded from all subsequent analyses.

Survey Results

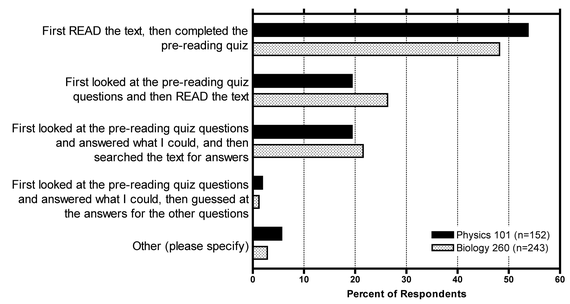
I READ the assigned pre-reading sections:



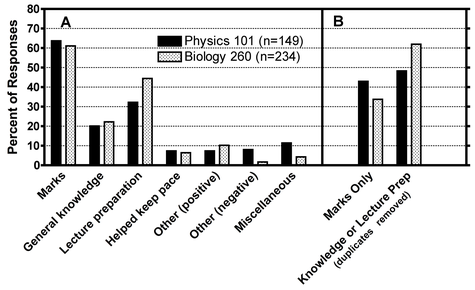
Left: 84.4% of Physics 101 students and 79.8% of Biology 260 students report reading the assigned sections every week or most weeks.

Below: The majority of students actually READ the assigned pages, rather than simply scanning for answers or guessing on the quiz.

When I did the pre-reading assignment, I usually:



Open ended question: When you did the pre-reading assignments, what MOTIVATED you to do so?

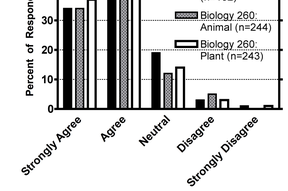


Above: Students were motivated by both marks and learning.

A) Data reported using seven categories determined by comment coders. Total number of responses adds up to more than 100% because some students expressed multiple motivators in their open-ended comments.

B) The same data as part (A), but reorganized to represent students who ONLY cited marks as a motivator, and students who cited at least one aspect of learning (general knowledge or lecture prep) as a motivator.

I found the pre-reading to be HELPFUL for my learning of physics/animal physiology/plant physiology.



Above: Students overwhelmingly found pre-readings helpful to their learning.

*"I learn better in class if I have previous knowledge of the topic. I find that I pay more attention and **my brain can make more connections and build on previous knowledge**."*

-Physics 101 student

*"Very, very helpful. This course has **opened my eyes to how beneficial prereading is**. Doing the prereading certainly helps to understand the lectures more."*

-Biology 260 student

Guidelines for Implementation

1. Focus on what you plan to discuss in class - create a clear connection between the reading and the expectations of the students for lecture.
2. Explain the purpose of pre-readings, and how the assignments are beneficial to the student - repeat a couple of times during term.
3. Reading should be guided with explicit prompts
4. Omit what is not necessary
5. Online quiz for marks (if possible) - The questions should be easy if one read and hard if one did not read.
6. Refer to things from their pre-reading – but you do not need to re-teach the basics.

Acknowledgements: CWSEI Departmental Directors Trish Schulte (Life Sciences) and Georg Rieger (Physics & Astronomy) assisted in the development of pre-reading assignments and allowed us to study their implementation in their classrooms.

Carl Wieman, Sarah Gilbert, and other members of CWSEI provided valuable feedback at all stages of the study.