

Supplemental Material

CBE—Life Sciences Education

Cghyf\ Uj Y *et al.*

Supplementary Methods

1. Study 1 Survey

Only question 1 was analyzed for this study.

BIO 148

You will receive two in-class activity points for completing this. Your individual responses will not be seen by Dr. Osterhage.

Answer questions 1-3 **before you take the exam.**

1. In the box, please write the numeric score (0-100) that you expect to get on this exam:

2. About how long did you spend studying for this exam? (Check one.)

Less than one hour

4 hours

1 hour

5 hours

2 hours

6 hours

3 hours

7 hours or more

3. Which of the following resources did you use while studying? (check all that apply)

PowerPoint presentations

Review of dicker questions

Textbook

In-class notes

Deep learning/effective study strategies handout

Practice questions

Reading the Learning Objectives for Unit 1

Unit 1 study recommendations

Online resources (Echoes, etc.)

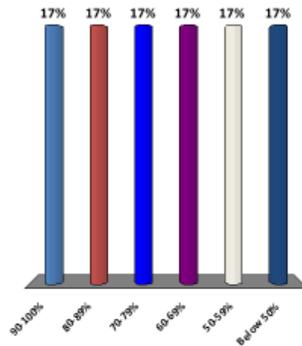
Other _____

2. Slides and discussion points used for Study 2, Activity 1

Students were not given context for the first clicker below, in which they were asked what score they think they earned on the pre-assessment given the first day of class.

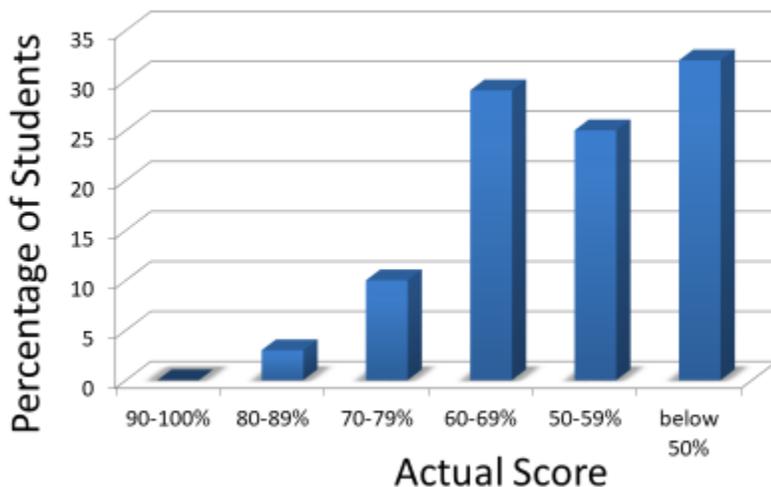
What score do you think you earned
on Wednesday's pre-assessment?

- A. 90-100%
- B. 80-89%
- C. 70-79%
- D. 60-69%
- E. 50-59%
- F. Below 50%



Students were then shown the results from the above poll: Fifty-seven percent of the class estimated that they earned above a 70% and only 8% of the class estimated that they earned below 50%.

Next, students were shown the actual distribution of grades on the pre-assessment:



The instructor toggled back and forth between the estimate of pre-assessment scores and the actual distribution of scores to illustrate the difference. She then summarized the results: that, on average, the class was not very good at realizing what they do and do not know. Students were then shown the slide below showing the results from Study 1, that students in the previous semester, on average, overestimated their performance on the exam.

**Average Predicted Exam I
score last semester: 85%**

**Average Actual Exam I
score last semester: 71%**

The instructor reiterated that students in the course the previous semester overestimated how well they would perform on the first exam. The slide below was then used to introduce ways to ensure that students actually know what they think they know.

**Learning Tip: Make sure
that you actually know
what you think you know**

How?

The instructor then introduced self-regulated learning with the slide below. She outlined self-regulatory learning strategies such as planning (“What is my goal?”), monitoring progress (“Do I understand?”), and changing strategies when necessary (“What can I do differently?”).

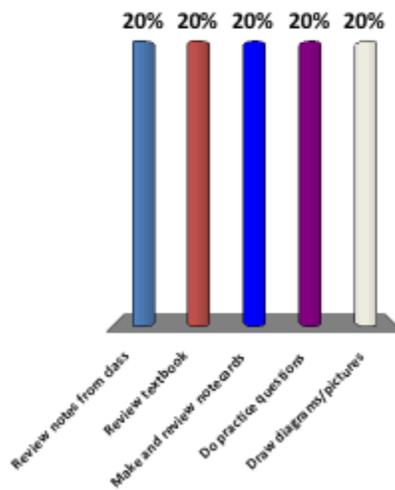
**Self-regulated Learning: Taking control
of one’s own learning behaviors**



3. Slides used for Study 2, Activity 2

What study strategy do you plan to use the **most**?

- A. Review notes from class
- B. Review textbook
- C. Make and review notecards
- D. Do practice questions
- E. Draw diagrams/pictures



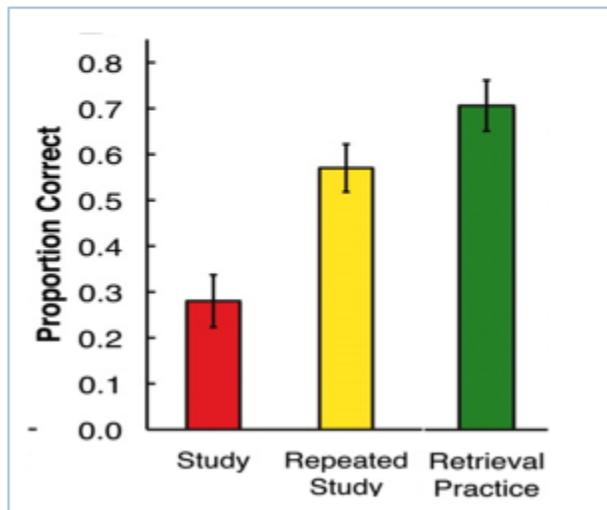
Students were shown the results of this poll, which showed that reviewing notes was the most popular answer. Students were then shown the slide below that included data from Karpicke and Blunt (2011) indicating that retrieval practice activities were more effective than reviewing notes.

Active studying

"Students predicted that repeated studying would produce the best long term retention and that practicing retrieval would produce the worst retention, even though the opposite was true."

Retrieval practice:

practice exams, clicker questions with exam-like questions, homework with exam-like questions, etc.



The following slide, which included a quote from the New York Times article that covered the Karpicke and Blunt article, was used to illustrate that repeated review of notes is not an effective study strategy.

Reference: Belluck, P. (2011, January 21). To Really Learn, Quit Studying and take a Test. *New York Times*, p A14.

“To Really Learn, Quit Studying and Take a Test”

“Other methods (reviewing notes over and over) not only are popular, the researchers reported; they also seem to give students the illusion that they know material better than they do.”

Using the slide below, the instructor expanded on retrieval practice activities available. Students were encouraged to complete both practice exams and were advised to look at the answer keys only after they attempted the entire practice exam on their own to objectively assess their current understanding. The instructor discussed how feedback from the practice exams could be used to adjust one’s study strategies.

Retrieval practice activities:

- **re-do in-class activities**
 - **Practice questions in course pack (blank versions on website)**
 - **Clicker questions (blank versions on website)**
 - **re-work Mastering Biology for practice**
 - **Two practice exams on course website**
- *DO NOT look at answer keys until you attempt first on your own**

4. Study 2 Survey

Only question 1 was analyzed for this study.

BIO 148 - February 9, 2015

Please write your 8-digit UK ID # (without the "9")

Please answer honestly. You will receive in-class activity points for completing this. Individual responses will not be seen by your instructor.

- Please write the numeric score (one number from 0-100) that you expect to get on this exam: _____
- Which of the following resources did you use while studying? (check all that apply)

_____ PowerPoint presentations	_____ Studying in a group
_____ Textbook	_____ In-class notes
_____ Deep learning/effective study strategies handout	_____ Practice exam
_____ Reviewing the unit Learning Objectives	_____ Unit study recommendations
_____ Clicker questions	_____ Online resources
_____ Echo 360 recordings	_____ Other: _____

- On the calendar to the right, put a large "X" on any day prior to Exam 1 that you studied biology outside of class time (reviewed, took the practice exam, reviewed unit recommendations, etc.).



- I would change the way I prepared for this exam (circle one).

Definitely False	Mostly False	A little bit False	A little bit True	Mostly True	Definitely True
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- I have a good idea of how I am going to do on this exam (circle one).

Definitely False	Mostly False	A little bit False	A little bit True	Mostly True	Definitely True
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- I studied the most important information that will be presented on this exam (circle one).

Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
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January-February 2015						
M	T	W	T	F	S	S
First day		14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	Feb 1
2	3	4	5	6	7	8
9	← Today (Exam 1)					