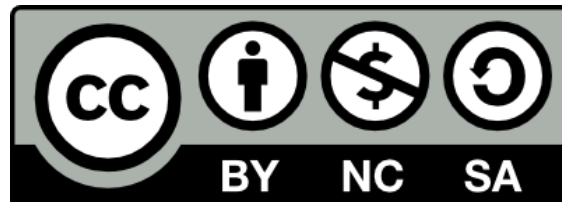




SYMPOSIUM ON LEARNING  
ANALYTICS AT MICHIGAN



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# Damn These Data!

The More I Know About Student Effort  
The Less I Understand Student Outcomes

---

Perry Samson  
Department of Atmospheric, Oceanic & Space Sciences  
University of Michigan

April 4, 2012

# Driving Questions

---

1. How can I, as an instructor, increase student engagement?

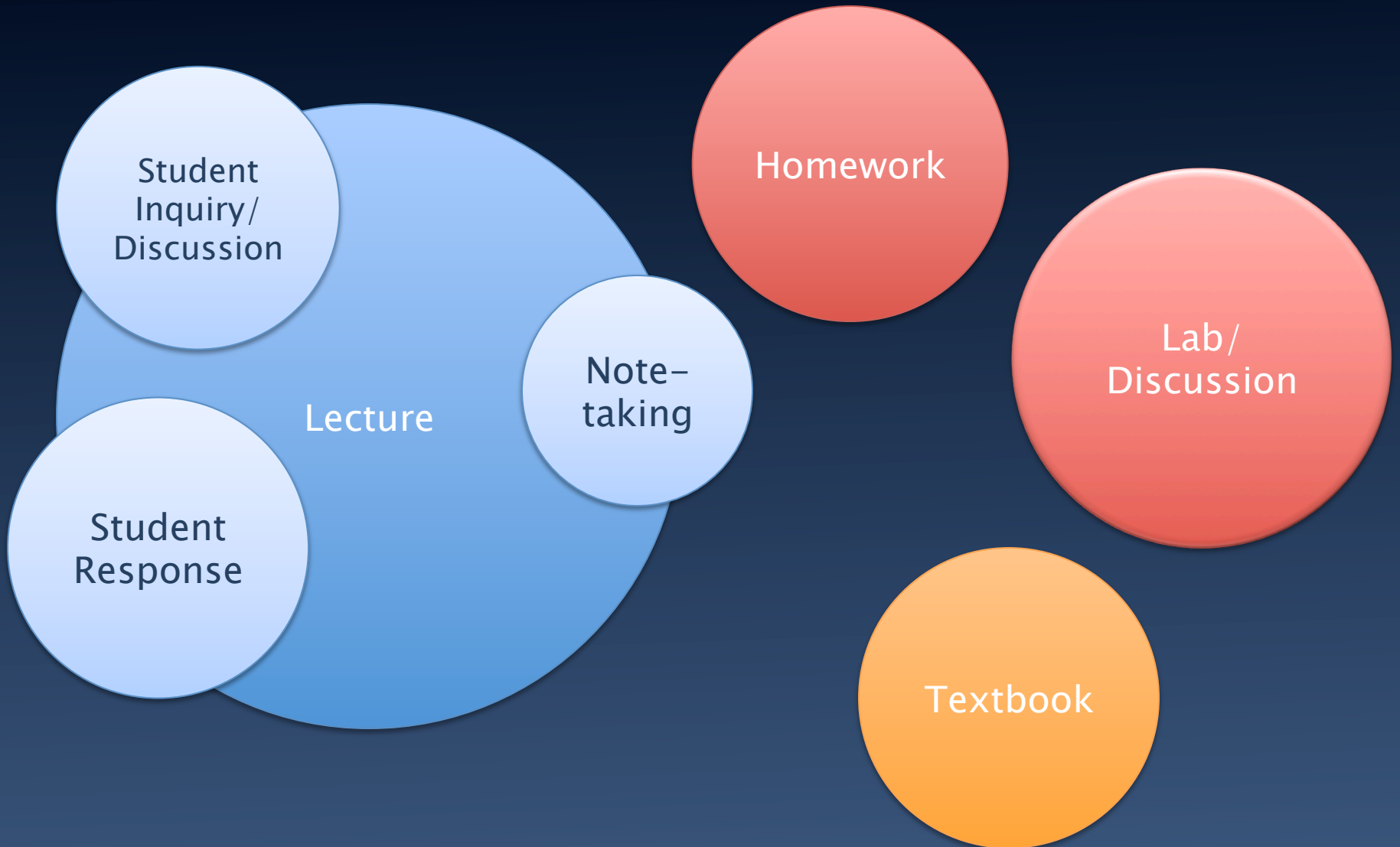
...and to what degree does this affect student learning?



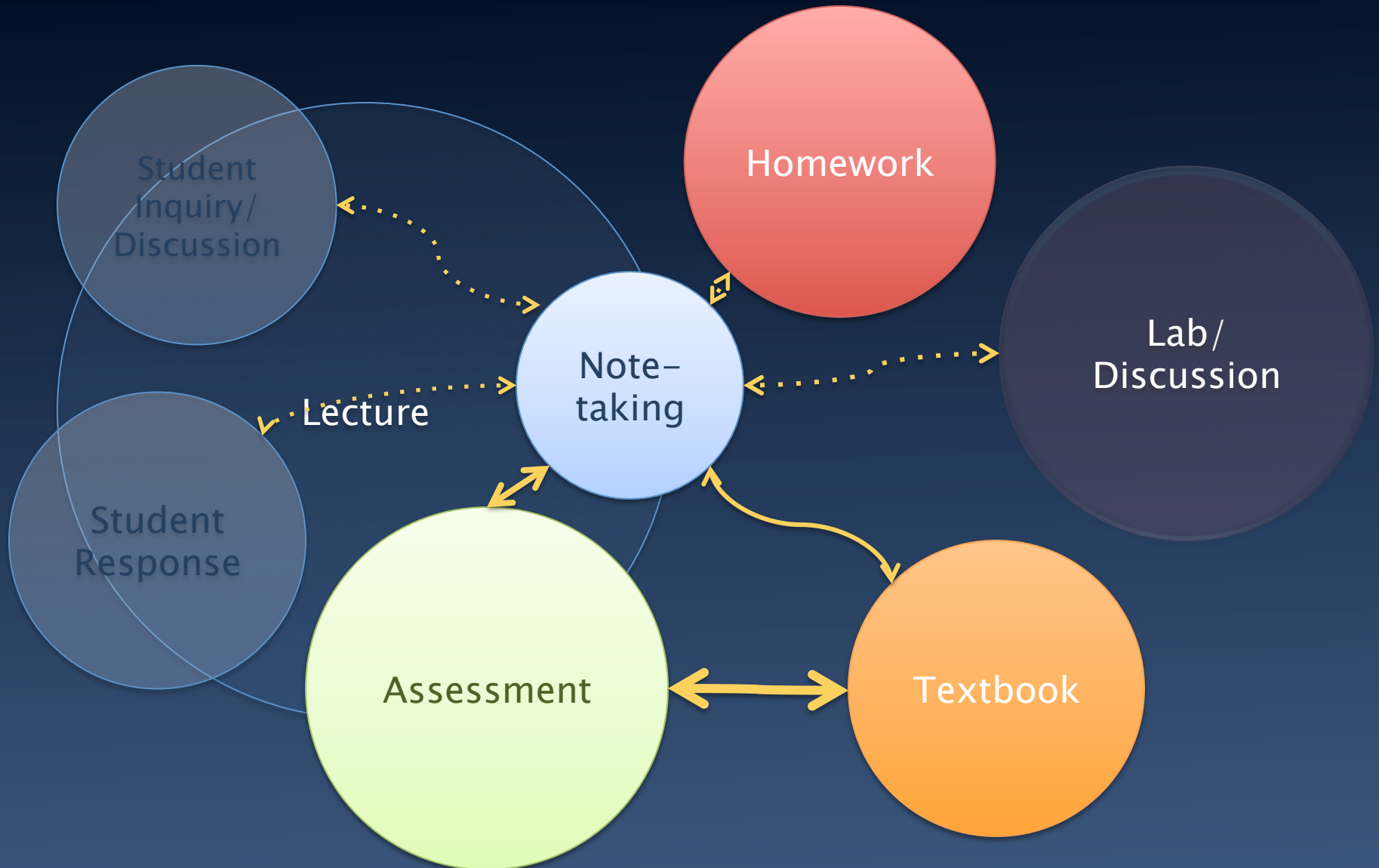
2. How does a switch from traditional to hybrid lecture format affect engagement and learning?
3. What signals exist that identify students at risk of failure earlier?

# The Student Learning Environment

---



# How Students Prepare for Exams



# New tools for teaching and learning

I'm confused!

Draw on slides

Ask questions

Bookmark slides

Get feedback

LECTURETOOLS

AOSS 102 Friday 2/17/2012 Perry Samson Help

Slides Questions



Ask a Question

Notebook: General Circulation



19

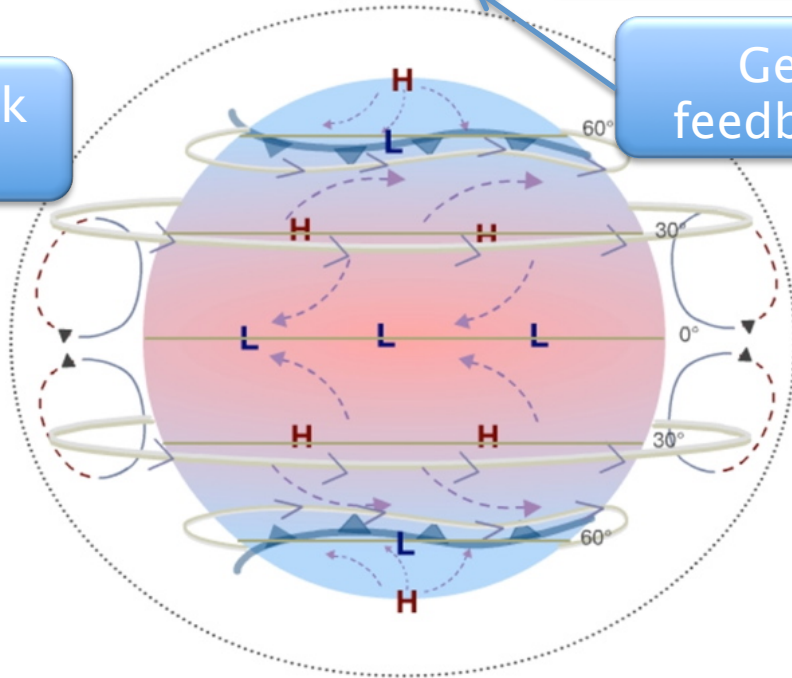
The Hadley cell extends to 30°

20

The ITCZ is also called the "Doldrums"

Take notes

21



19

Browse Slides

Browse slides

# New tools for teaching and learning

## 4 Chapter 1

Normally, our atmosphere is a sheltering and stable environment that has sustained and nurtured life for millions of years. It protects us from the bitter cold of space and from most of the sun's dangerous radiant energy. Its gases trap a portion of the radiant energy emitted by the earth, and this energy warms the lower atmosphere. Precipitation that falls over large areas helps support a wide variety of life, which over time, has adapted to the normal range of weather and climate we find on earth.

Over most of the earth, the atmosphere is quiescent, with a mix of blue skies and white clouds enveloping the globe (see Fig. 1.1). However, there are times when the sky turns ominous and the power of the atmosphere becomes focused on specific areas in events of wild fury that often last for short periods of time. These days of "extreme and unusual weather" are the focus of public fears, and are often the impetus behind our quest for knowledge about the atmosphere. While atmospheric scientists must understand the processes that govern the atmosphere even on the relatively quiet days, it is

the ability to foretell the extreme and unusual weather events that ultimately prove the greatest challenge, as well as the greatest value, to society. It is these extreme weather events that attract the largest portion of our attention.

### Threats from the Sky

Extreme and severe weather captures our imagination because of its sheer power and potential to cause personal injury, destruction, and death. In the United States, the risk of death due to a weather event is relatively small (about two per million people) when compared to other risks (see Table 1.1). Violent weather, however, deserves and demands study because it delivers its damage both unexpectedly and in catastrophic ways.

Even though the risk of losing one's life due to a weather event is low, such deaths, and the fact that weather-related events cause an estimated \$10 billion



anyway, the point of this lecture is that there is stuff.

1/25/12 ▼

📄 12:28pm

Culpa farm-to-table commodo cardigan fixie, VHS nulla. Stumptown voluptate quis pariatur farm-to-table iure, velit keffiyeh pitchfork magna incididunt adipiscing nesciunt.

Trust fund eu nihil, #keytar craft beer accusamus laborum readymade brunch. Aliqua food truck wolf master cleanse artisan, echo park veniam high life vegan labore. VHS leggings exercitation fugiat marfa incididunt. Lomo iure nisi tumblr, locavore readymade dreamcatcher farm-to-table. In single-origin coffee deserunt, aliquip blog magna twee scenester.

#homework1 #midterm

📄 12:30pm

Hmm, I think I need to ask the TA about this. #asklater

📄 2 notes hidden. Click here to expand.

1/30/12 ▶

2/1/12 ▼

+ Click here to add a note

# New tools for teaching and learning

Publish Lecture

Pick a Course

Navigate Lectures

Import PowerPoint or Keynote Slides

Create Activities

Add Videos

The screenshot displays the LECTURETOOLS interface. At the top, the course is identified as 'AOSS 102' on 'Monday 1/9/2012' by 'Perry Samson'. The interface includes a navigation bar with 'Prepare', 'Present', and 'Assess' tabs. Below this, there are buttons for 'Publish Lecture', 'Import Slides', 'Create Interactive Slides', and 'Edit Slides'. The main content area shows a grid of 44 lecture slides, each with a 'Hide' button and a play icon. The slides are titled with various atmospheric topics, including 'Objectives', 'BASIC AIR', 'Free Response Activity', 'Multiple Choice Activity', 'Media Slide', 'Stages of Atmospheric Formation', 'Chemical/Pre-Biological Era', 'Weathering Removes CO<sub>2</sub>', 'Lapse Rate', 'Layers of Atmosphere', 'Thermosphere', 'CME (NAS)', 'Ejection of mass from...', 'CME moving toward...', 'Disturbed magnetic ...', 'Coronal Mass Eject...', 'CME encountering E...', 'CME encountering E...', and 'Creation of Aurora'. The interface also shows a 'Publish Lecture' button and a 'Publish Lecture' button in the top left corner.



# New Methods for Student Assessment/Feedback

## Image Quizzes

Where would you expect the ligament to tear?



Image Map Question

Image Map Question

## Free Response

Defend your previous answer.

Free Response Question

## Ordered Lists

Rank these environments from greatest to least species.

Ordered

List

Question

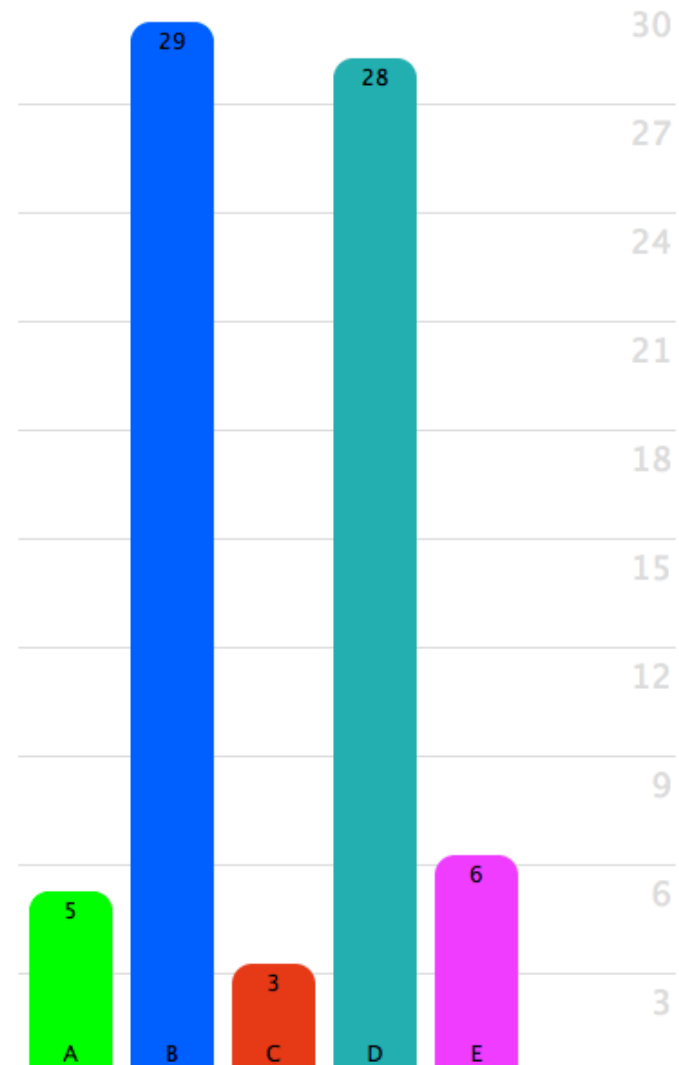
Question

# New Methods for Student Assessment/Feedback

## Multiple Choice

What is the future of the sovereign state?

- A** States will remain the sole, dominant form of political organization in the world.
- B** States will choose to allow international institutions to grow to help them cooperate on economic and environmental issues.
- C** Terrorism and international economic competition will lead states to create new barriers between them.
- D** Globalization will limit state sovereignty as national economies integrate and people become transnational.
- E** World government will be created through the spread of global governance.



To text in your answer send '82542 [your answer]' to (734) 666-0004

71 of 285 (25%)

Finish



Polling Closed  
Results Visible  
Answers Visible

Polling



Result



Answer



Reset



# New Methods for Student Assessment/Feedback

Name one thing that is similar and one thing that is different between tendons and ligaments

80 responses

similar: both consist of fibrocartilage different: tendon --> mostly of collagen ligament --> more elastin

Both tendons and ligaments are dense regular connective tissue. However, ligaments contain more elastin fibers than tendons.

ligaments connect bone to bone, while tendons connect muscle to bone. both of them are help you move

similar: they attach things different: what they attach together and their structures

tendons attach to muscle and ligaments do not

tendons are made of more collagen and ligaments are made of more elastin

They are made of the same material. But they both have different structures.

collagen in tendons vs. elastin in ligaments

tendons are muscle to bone ligaments are bone to bone

similar-both attach to bone difference- ligaments do not attach to muscle

Ligaments are more elastic than tendons. Both are used to keep bones in place/secure.

Both connect to bone Ligaments are more elastic like

they are both connective tissues. ligaments connect bones to bones while tendons connect bones to muscles

Ligaments attach bone to bone, where as tendons attach muscle to bone.

they both have transitions. their function is different

They are both connective tissues Ligaments are more stretchy

tendons bind muscle to bone, while ligaments bind bone to bone

Similarity- Both made from fibroblasts Difference- Ligaments are bone to bone tendons are bone to muscle

Tendons and Ligaments both attach to bone Ligaments do not attach to muscles and Tendons do.

Free Response



To text in your answer send '44857 [your answer]' to (734) 666-0004

80 of 137 (58%)

Finish



Polling Closed  
Results Visible  
Answers N/A

Polling



Result



Answer

N/A

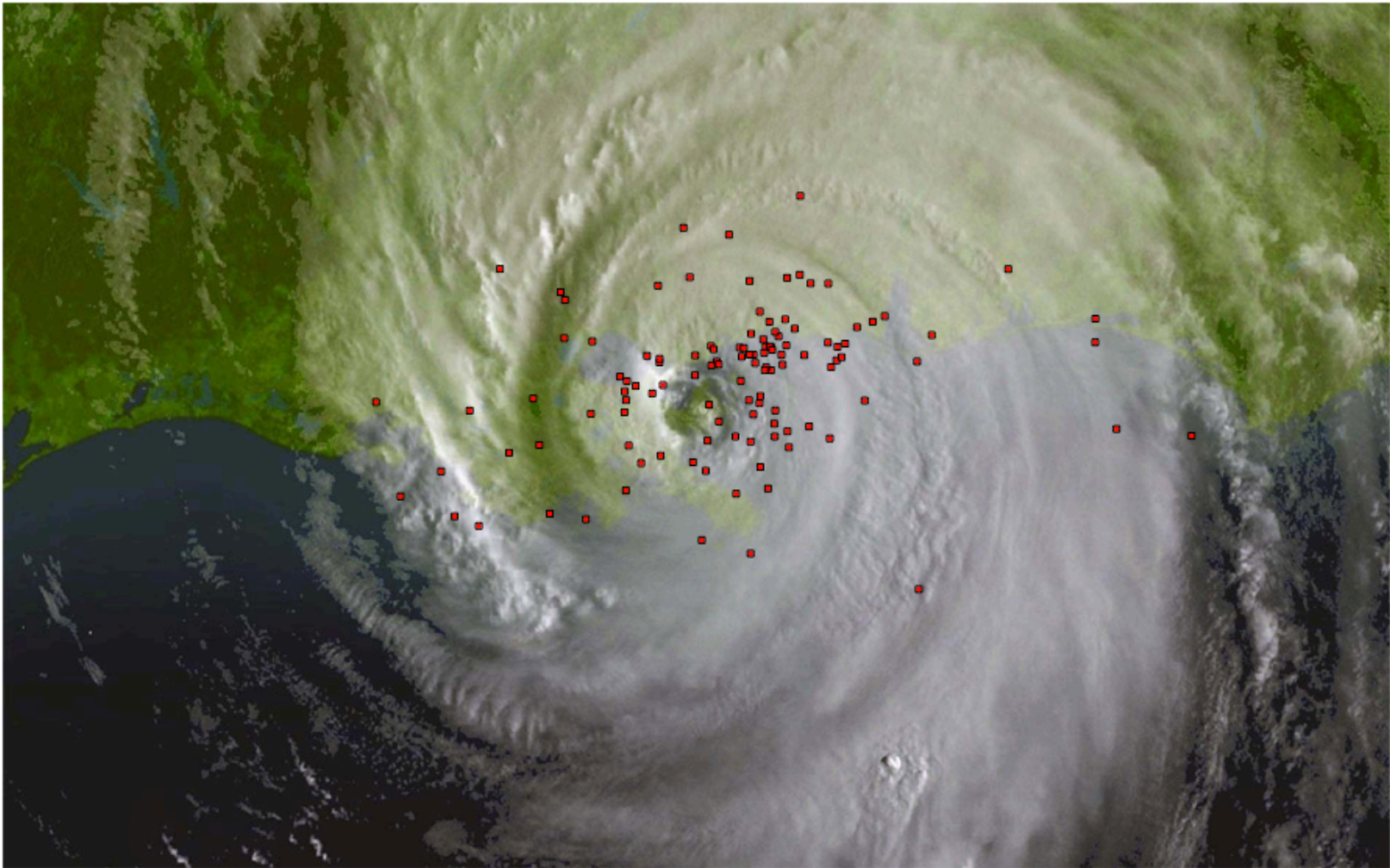
Reset



# New Methods for Student Assessment/Feedback

Image-Based

Where would you expect the greatest storm surge?



117 of 237 (49%)

<b>Finish</b> ↻	<b>Polling Closed</b> Results Visible Answers N/A	<b>Polling</b> ✎	<b>Result</b> ☰	<b>Answer</b> N/A	<b>Reset</b> ↺
--------------------	---	---------------------	--------------------	----------------------	-------------------

# New Methods for Student Assessment/Feedback

Feedback

2

*Euler Integral for positive integers n,m:*

$$B(n, m) = \frac{(n-1)! (m-1)!}{(n+m-1)!} = \frac{n+m}{nm \binom{n+m}{n}}$$

Browse Slides <<

Confusing !



Slide Comprehension Problems


50% of students confused

Confusing !



50% of students confused

# eTextbooks



[Home](#)
[My Account](#)
[Log out](#)

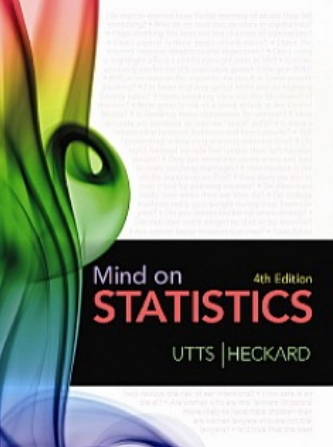


Table of Contents

- ▶ Chapter 1. Statistics Success Stories And Cautionary Tales
- ▶ Chapter 2. Turning Data Into Information
- ▶ Chapter 3. Relationships Between Quantitative Variables
- ▶ Chapter 4. Relationships Between Categorical Variables
- ▶ Chapter 5. Sampling: Surveys And How To Ask Questions
- ▶ Chapter 6. Gathering Useful Data For Examining Relationships
- ▶ Chapter 7. Probability
- ▶ Chapter 8. Random Variables
- ▶ Chapter 9. Understanding Sampling Distributions: Statistics
- ▶ Chapter 10. Estimating Proportions with Confidence
- ▶ Chapter 11. Estimating Means With Confidence

**STATS250 Instructor Dashboard [ WINTER2012 ]**

<Prev
Today
Next>

**February 2012**

Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29			

**March 2012**

Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

**April 2012**

Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21

Add an Assignment

List Custom Questions

Student Look-up

Add a Question

List Chapter Exercises

TAGSI View

Click on the link to the assignment to open up a view of the questions. Click on the "Edit" (pencil) to edit an assignment. Click on the "Answer Key" (key) button to view the answer key. Click on the "Delete" (x) to delete an assignment.

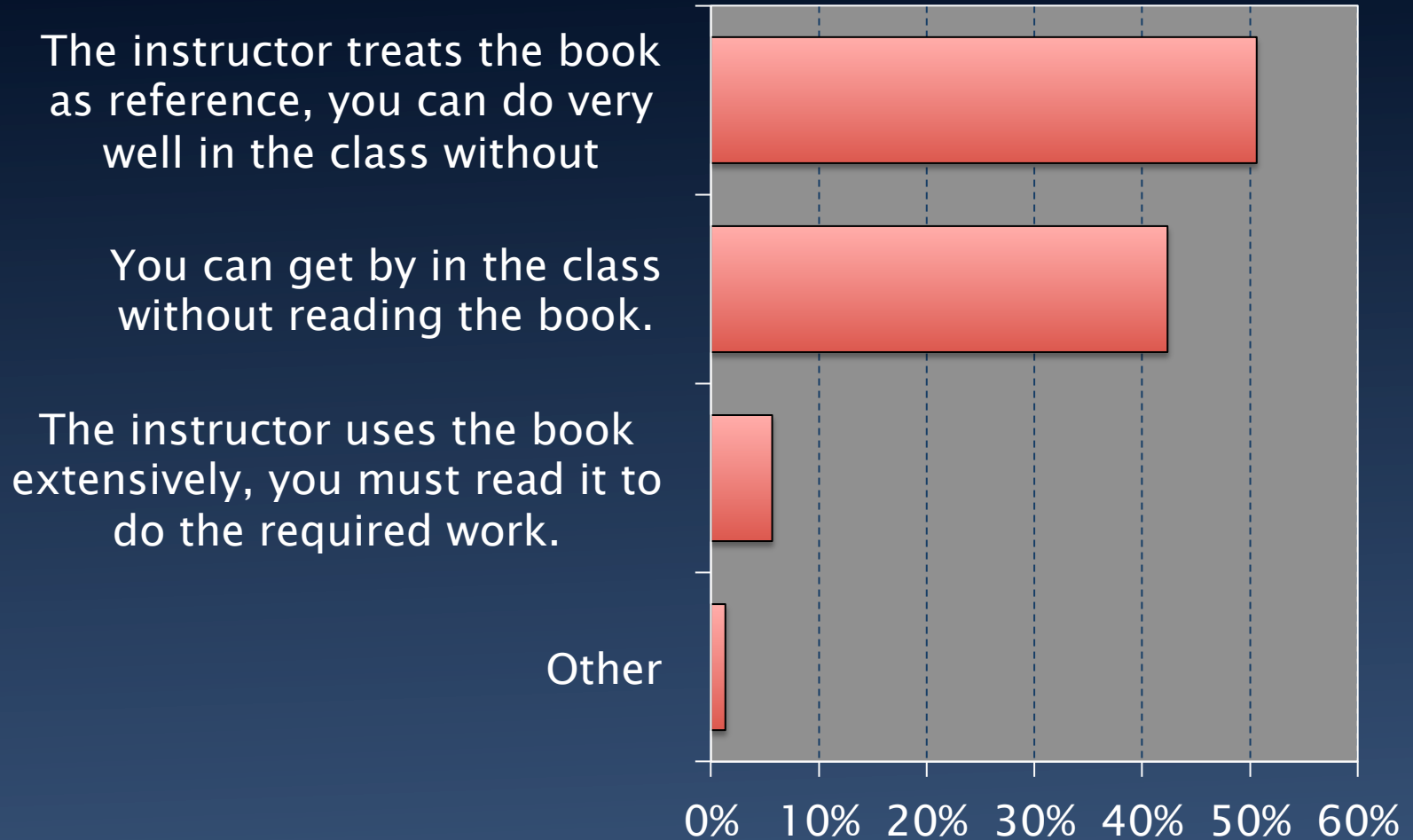
**Current Assignments**

Recommended HW 1 [ Start: 2012-01-19 Due : 2012-04-23 ]	✎	🔑	✕
Recommended HW 2 [ Start: 2012-01-26 Due : 2012-04-23 ]	✎	🔑	✕
Recommended HW 3 [ Start: 2012-02-02 Due : 2012-04-23 ]	✎	🔑	✕
Recommended HW 4 [ Start: 2012-02-16 Due : 2012-04-22 ]	✎	🔑	✕
Recommended HW 5 [ Start: 2012-02-23 Due : 2012-04-22 ]	✎	🔑	✕
Recommended HW 6 [ Start: 2012-03-08 Due : 2012-04-22 ]	✎	🔑	✕
<b>Required Stats 250 HW 7 [ Start: 2012-03-15 Due : 2012-03-22 ]</b>	✎	🔑	✕
Recommended HW 7 [ Start: 2012-03-15 Due : 2012-04-22 ]	✎	🔑	✕

**Past Assignments**

Stats 250 HW 6 Required [ Start: 2012-03-08 Due: 2012-03-15 ]	✎	🔑	✕
---	---	---	---

# Choose the statement that best describes your instructor's use of the assigned textbook



# eHomework

## Book

**Mind on Statistics**  
Cengage Learning, 2011

## Course

**Introduction to Statistics (STATS 250)**  
Brenda Gunderson (instructor)  
Winter 2012, University of Michigan

### REQUIRED Homework Assignment

Due: 3/29/2012 at 08:00 am



Show the countdown timer

Question 1

Question 2

Question 3

Question 4

Question 5

**Question 6**

Question 7

#### Question 6 (Chapter 13)

[View related textbook content](#)

**Time to Relief** – Medical researchers carried out an experiment to compare two headache treatments (1 = standard, 2 = new). A random sample of 20 headache sufferers met the protocol and were approved for the experiment. These 20 patients were randomly allocated to one or the other treatment group. When the next headache occurred, the patient took their treatment and recorded the time to relief (in minutes), where time to relief was operationally defined and related to cessation of throbbing. The researchers would like to assess if the new treatment bring relief more quickly on average as compared to the standard treatment using a 5% level of significance. The following descriptive statistics are provided.

Treatment	Sample size	Mean	Standard Deviation
1 = Standard	10	33.6 minutes	6.3 minutes
2 = New	10	26.1 minutes	2.3 minutes

- a. Let  $\mu_i$  represent the mean time to relief for the population of all patients who will receive the  $i^{\text{th}}$  treatment ( $i = 1$  for the standard treatment,  $i = 2$  for the new treatment). State the appropriate hypotheses to be tested in terms of these parameters. Remember the response is time to relief and it is better to feel relief more quickly. (1 pts)

(CLICK TO ENTER ANSWER)

- b. The summary report contained the following statement:  
The relief time measurements for the patients taking the standard treatment were much more variable than the relief times for the patients taking the new treatment. What descriptive statistics provided that insight? (Include the numerical values) (0.5 pts)

(CLICK TO ENTER ANSWER)



# Does anything else matter?

## Learning Analytics

Individual Student Performance

Activity Answers | Number Correct | Number Answered | Export as CSV

Name	09-07	09-12	09-14	09-19	09-21	09-28	10-05	10-10
Total Activities   % Answered	0   0%	2   38%	1   85%	2   82%	6   74%	3   79%	3   71%	2   83%
[Handwritten Name]								
[Handwritten Name]		1	1					
[Handwritten Name]		1	1	2	4	2	3	2
[Handwritten Name]		1	1	2	6	3	3	2
[Handwritten Name]		1	1	2	6	3	3	2
[Handwritten Name]		1	1	2	1	1	2	2
[Handwritten Name]		1	1	2	6	2	3	2
[Handwritten Name]		1	1	2	2	3	2	2
[Handwritten Name]		1	1	2	6	3	3	2
[Handwritten Name]		1	1	1	6	3	2	2
[Handwritten Name]		1	1	2	5	3	3	
[Handwritten Name]		2	1	2	6	3	3	2
[Handwritten Name]		1	1	2	2	1	2	2
[Handwritten Name]		2						

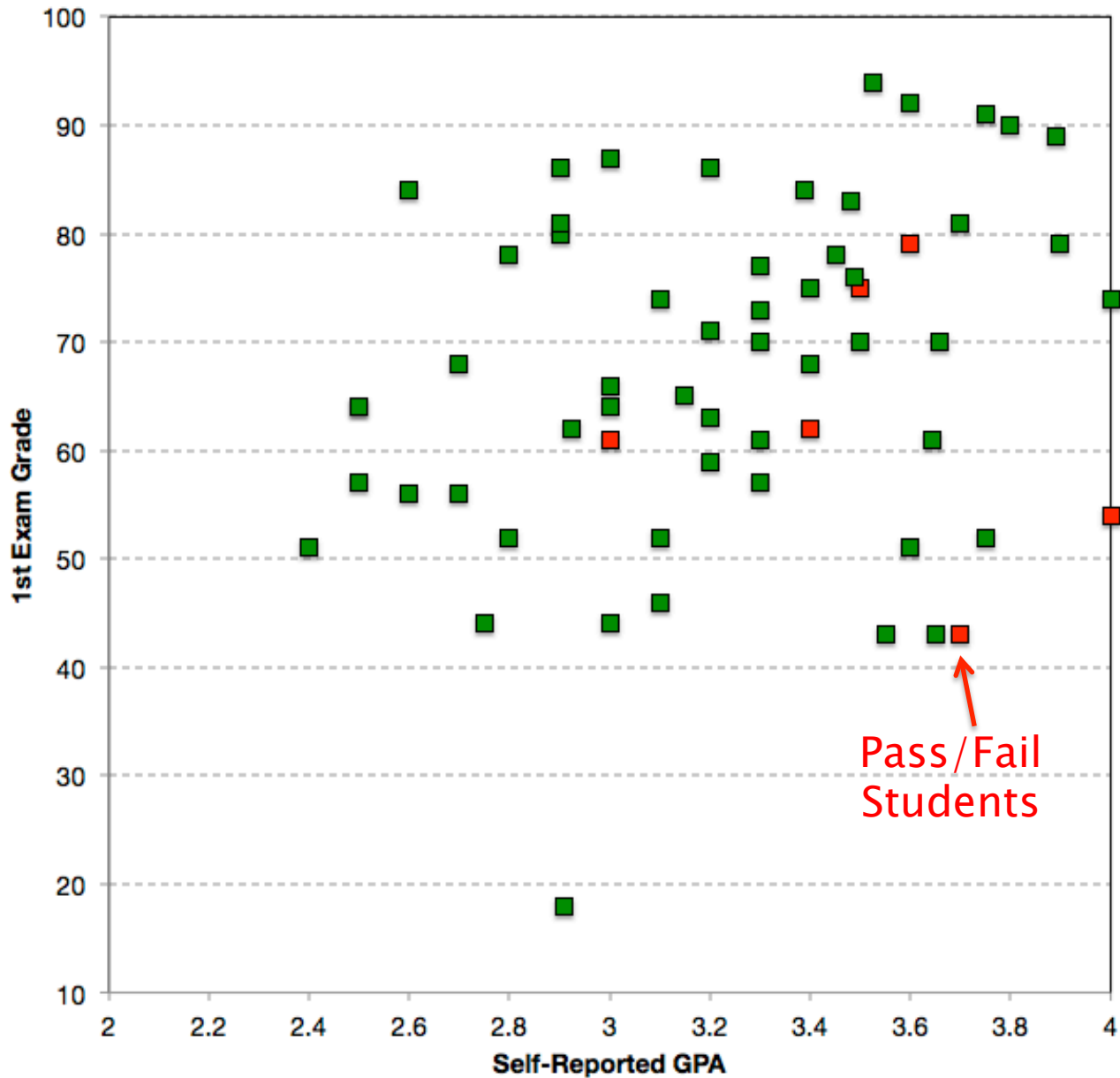
Number Correct • Number Answered • Comprehension • Questions Asked • Attendance

# Design Goals

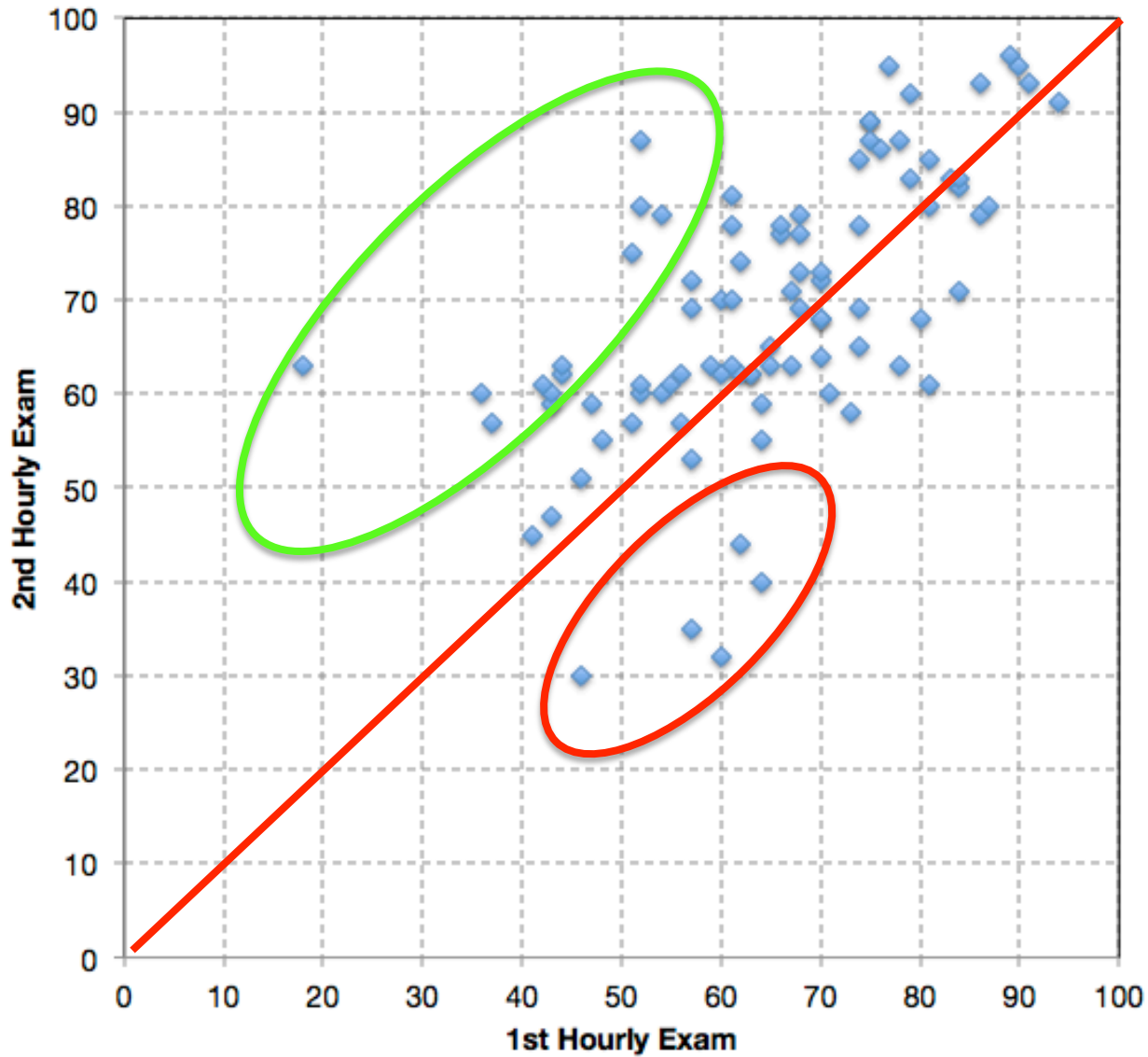
---

1. What data are important measures for learning, motivation & engagement?
2. Who is the audience?
  - a. Students (pull –or- push?)
  - b. Instructors
  - c. Advisors
  - d. Administration(!)
3. What options are desired for the presentation of these data?

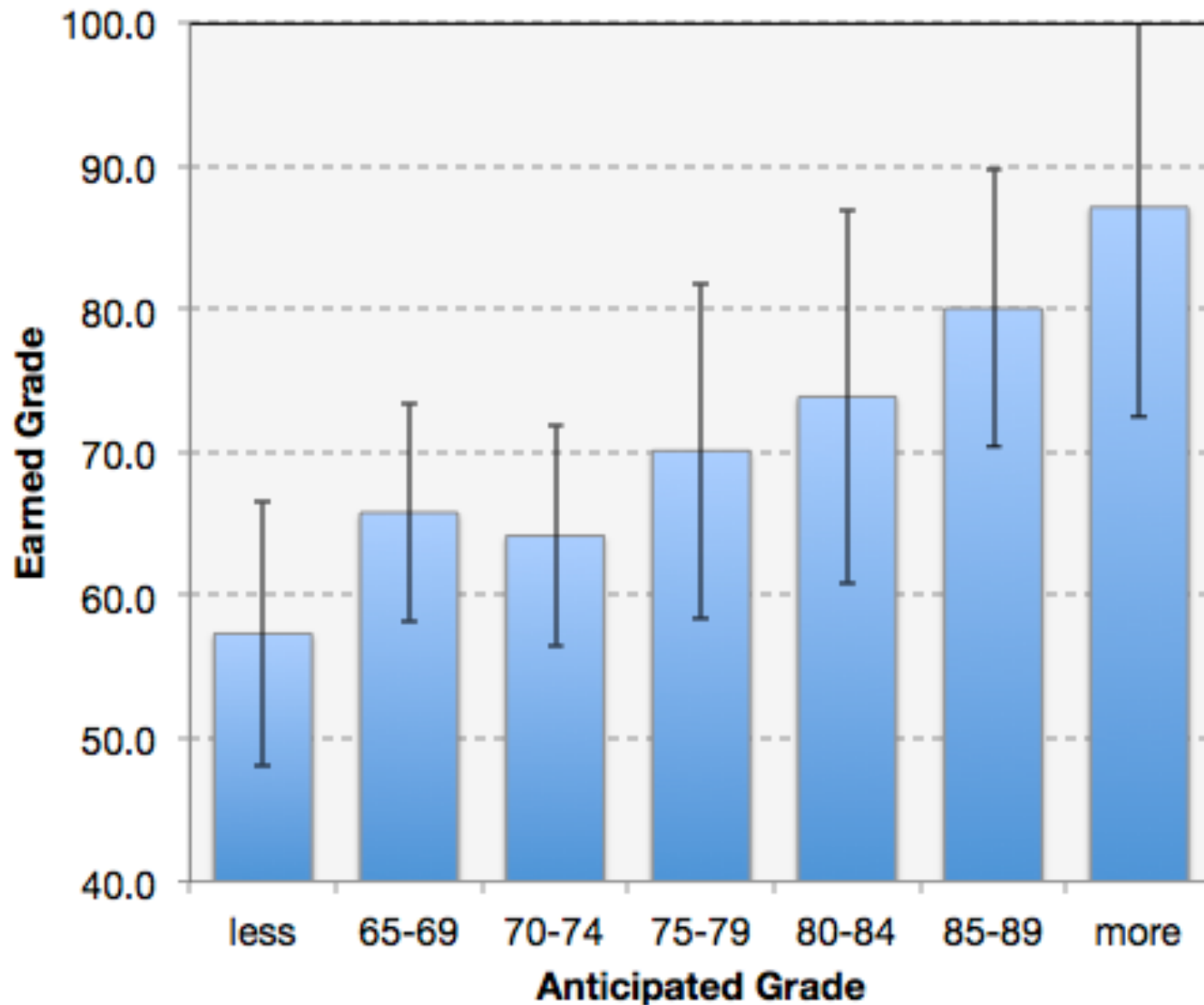
# GPA vs. 1st Exam Grade



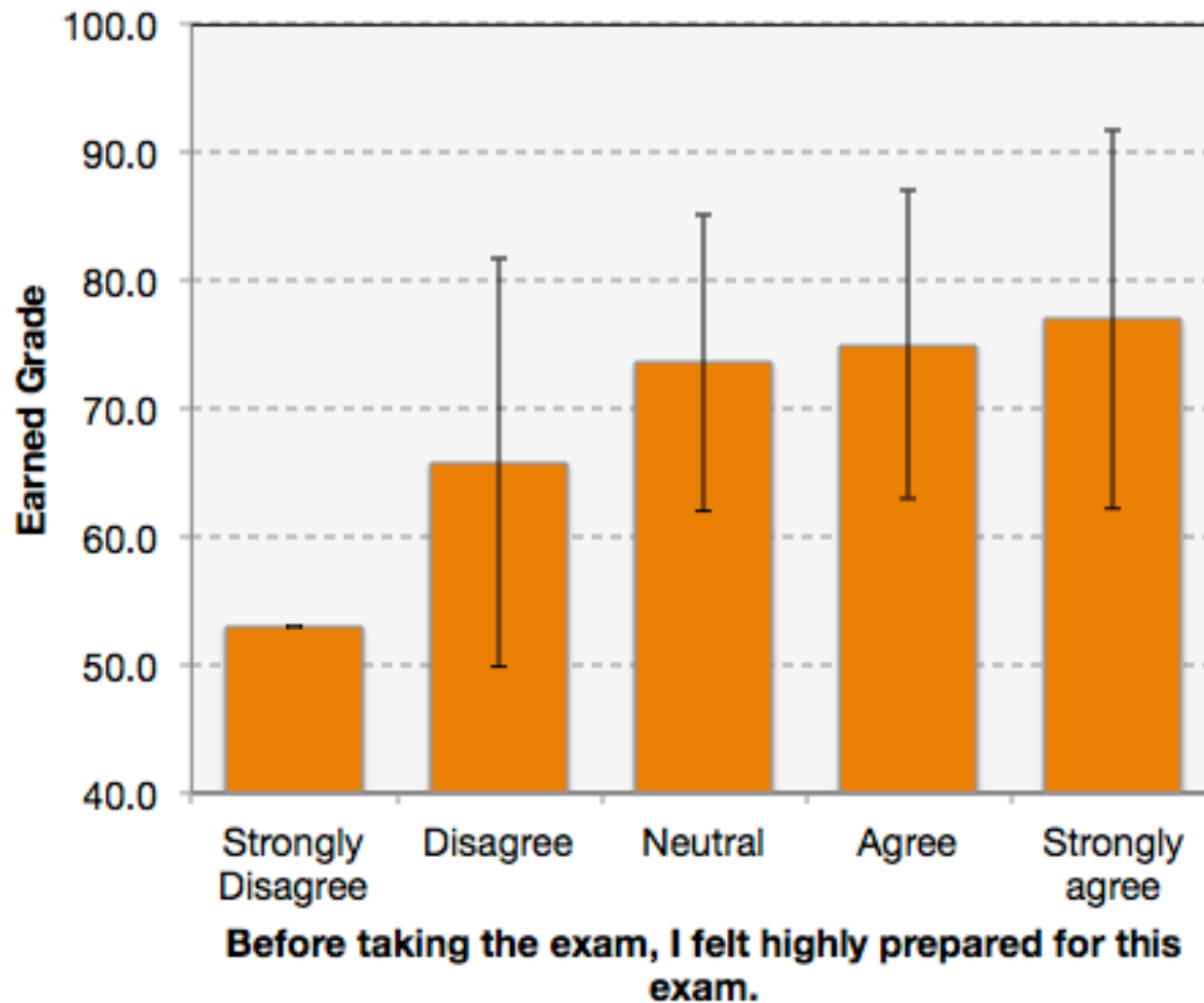
# Self Improvement



# What is it that students know?

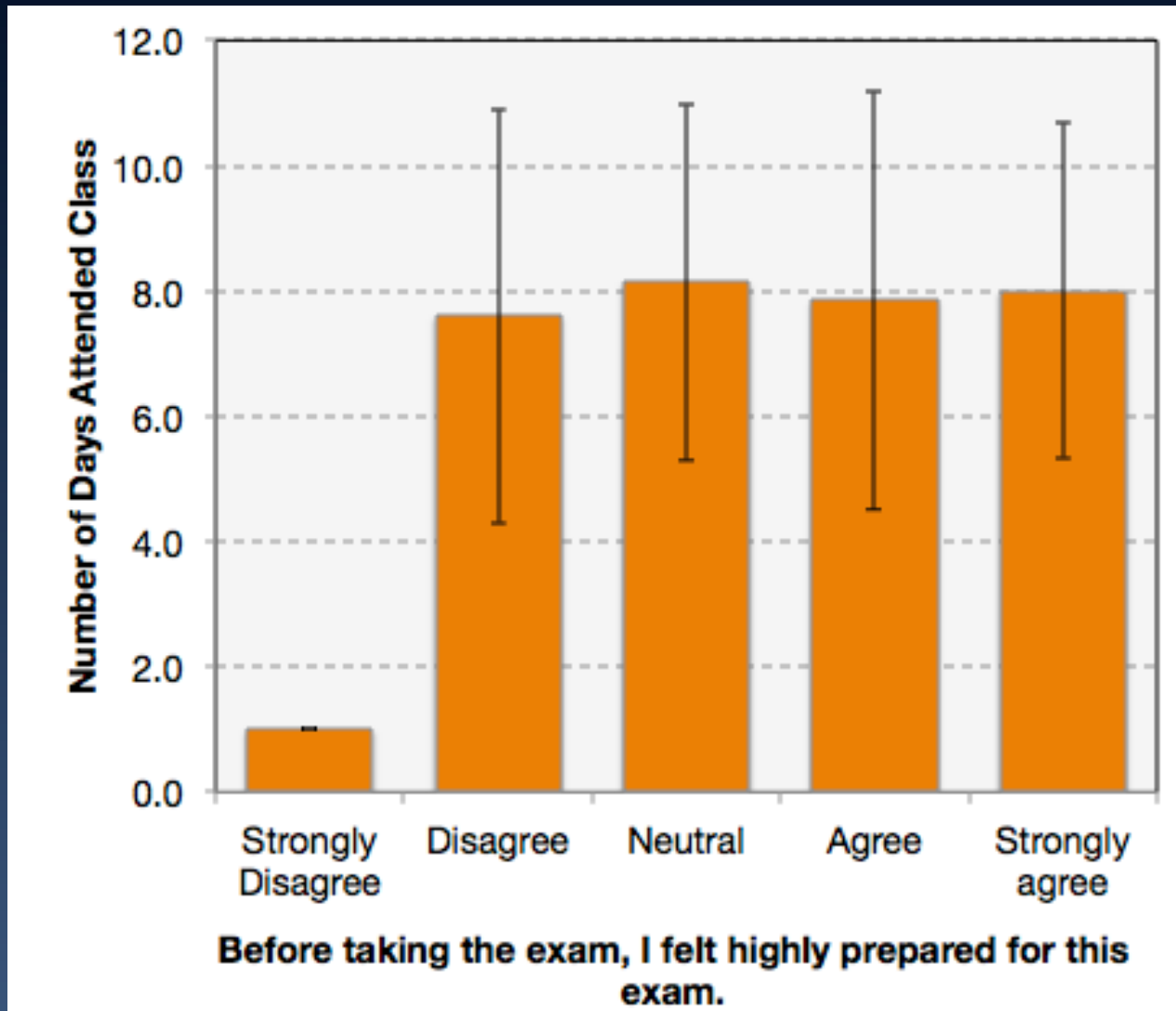


# Self Assessment of Preparation



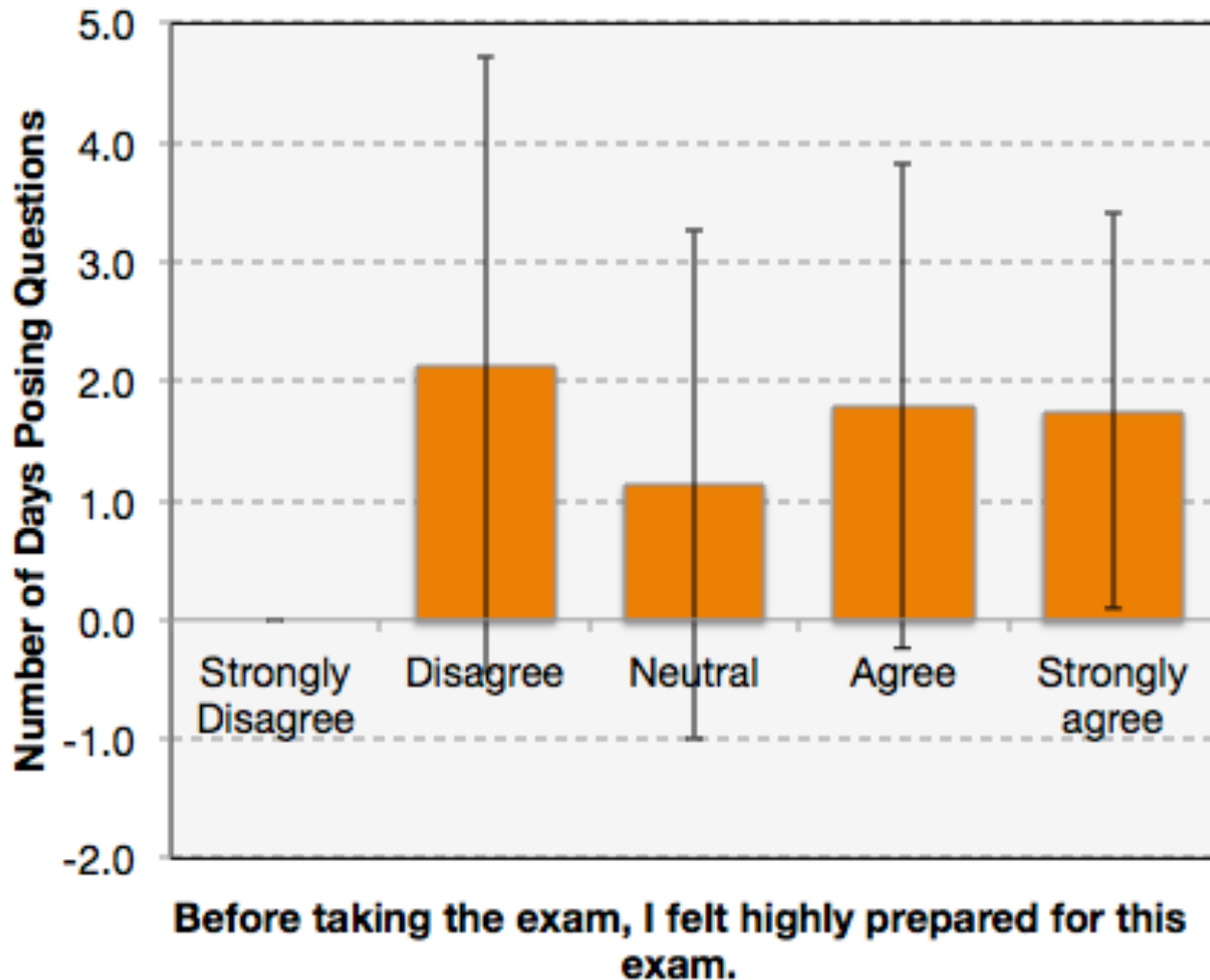
# Self Assessment vs. Reality

Does “Preparation” include attending class?



# Self Assessment vs. Reality

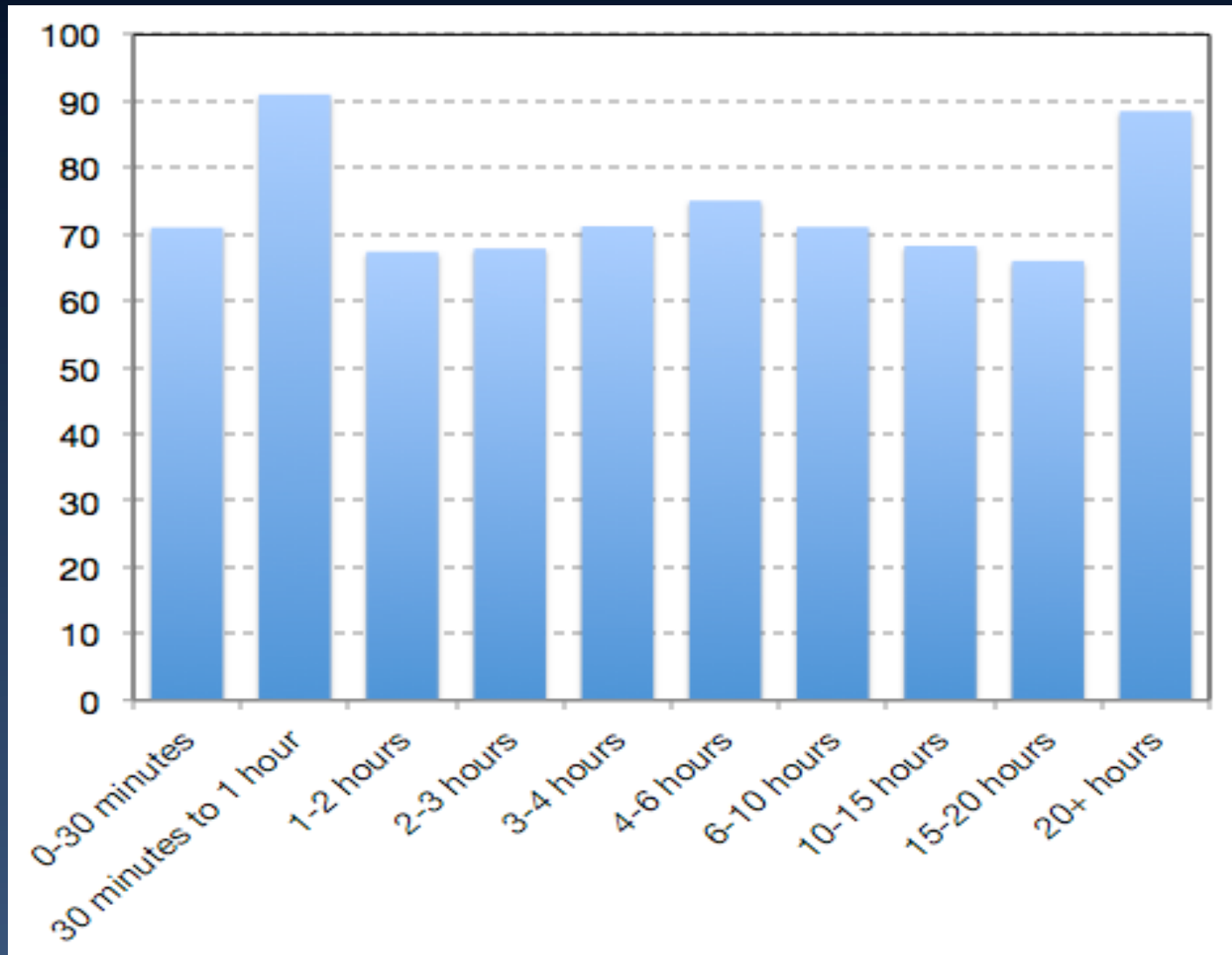
Does “Preparation” include asking questions?





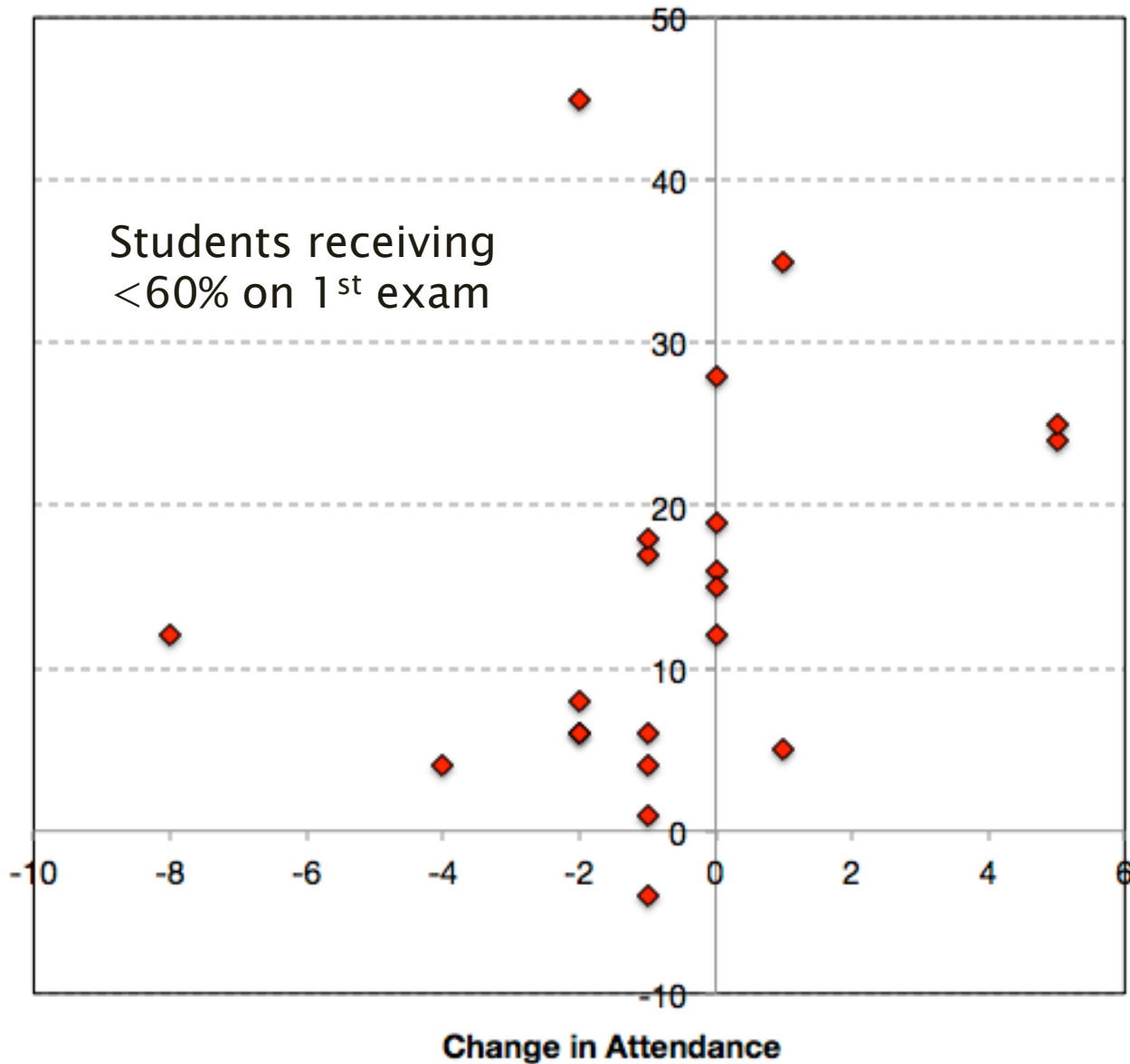
# Student Preparation

Q: “What is your best estimate for the number of hours you spent studying for this class in the past week?”



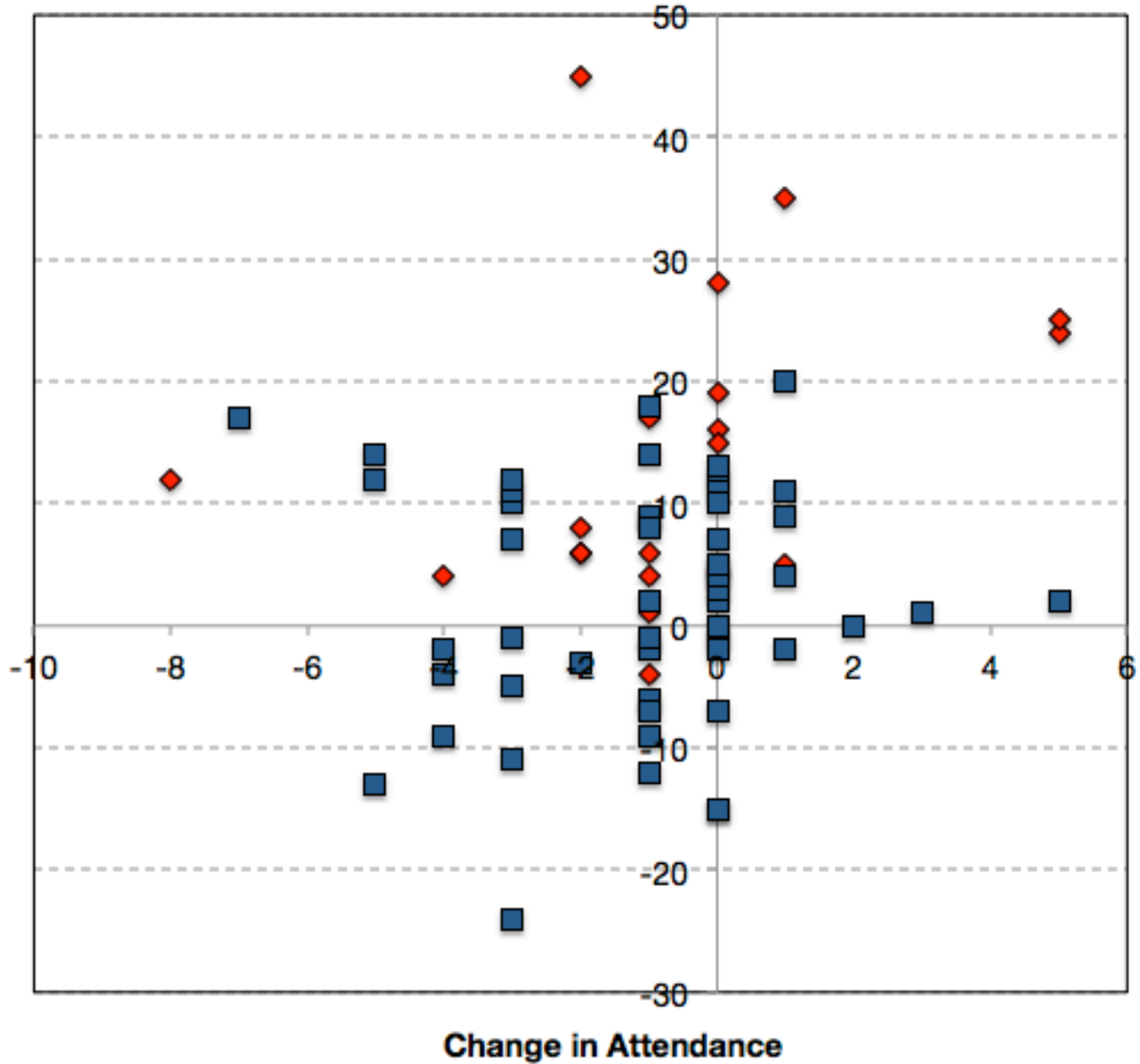
# Student Motivation

Exam 2- Exam 1

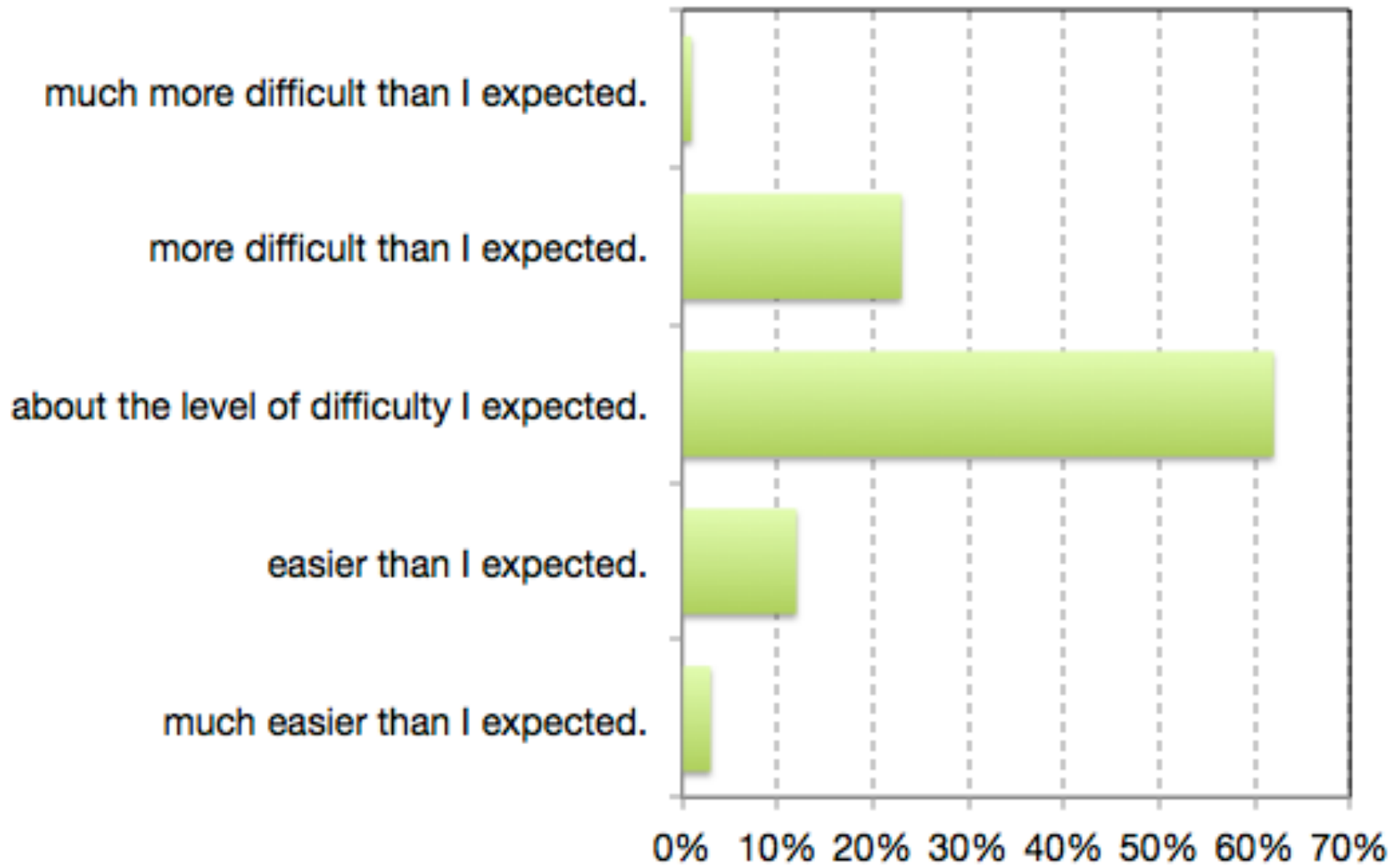


# Student Motivation

Exam 2- Exam 1

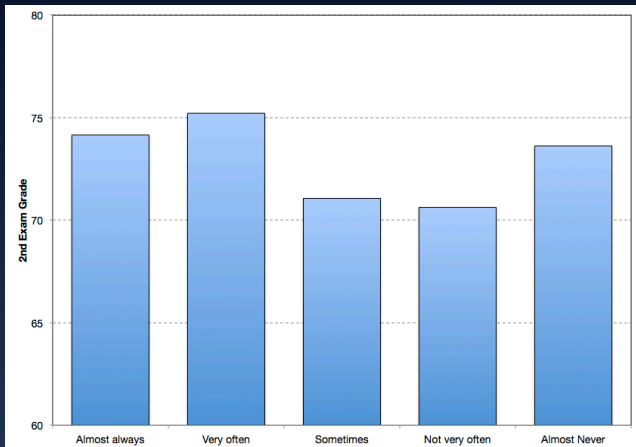


# Diagnosing the Assessment

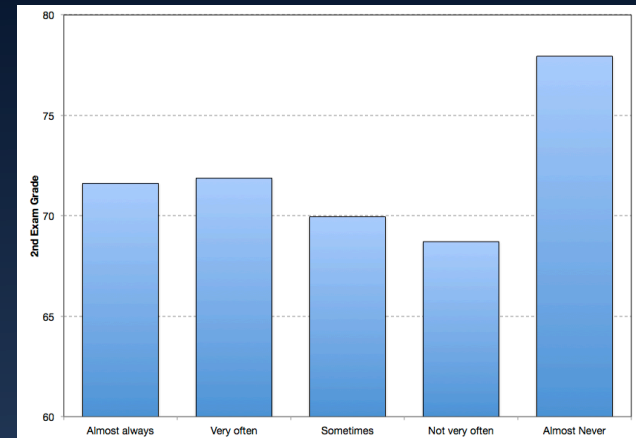


# Student Preparation

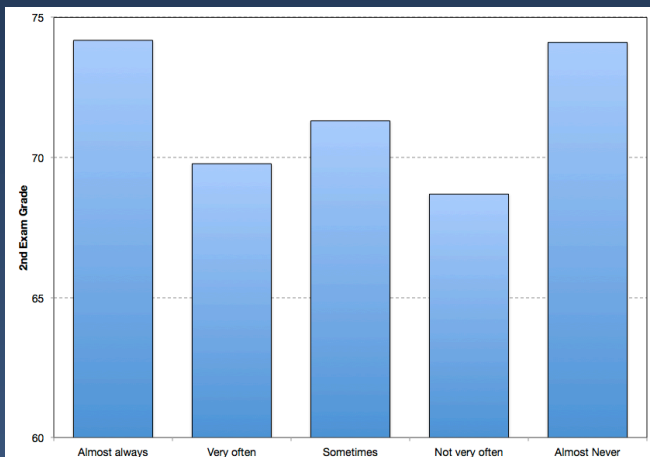
Q: “How often do you make outlines while reading?”



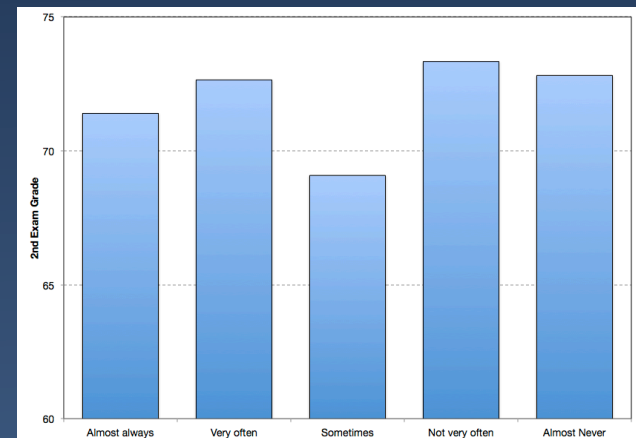
Q: “How often do you underline or highlight while reading?”



Q: “How often do you use flashcards to test yourself?”

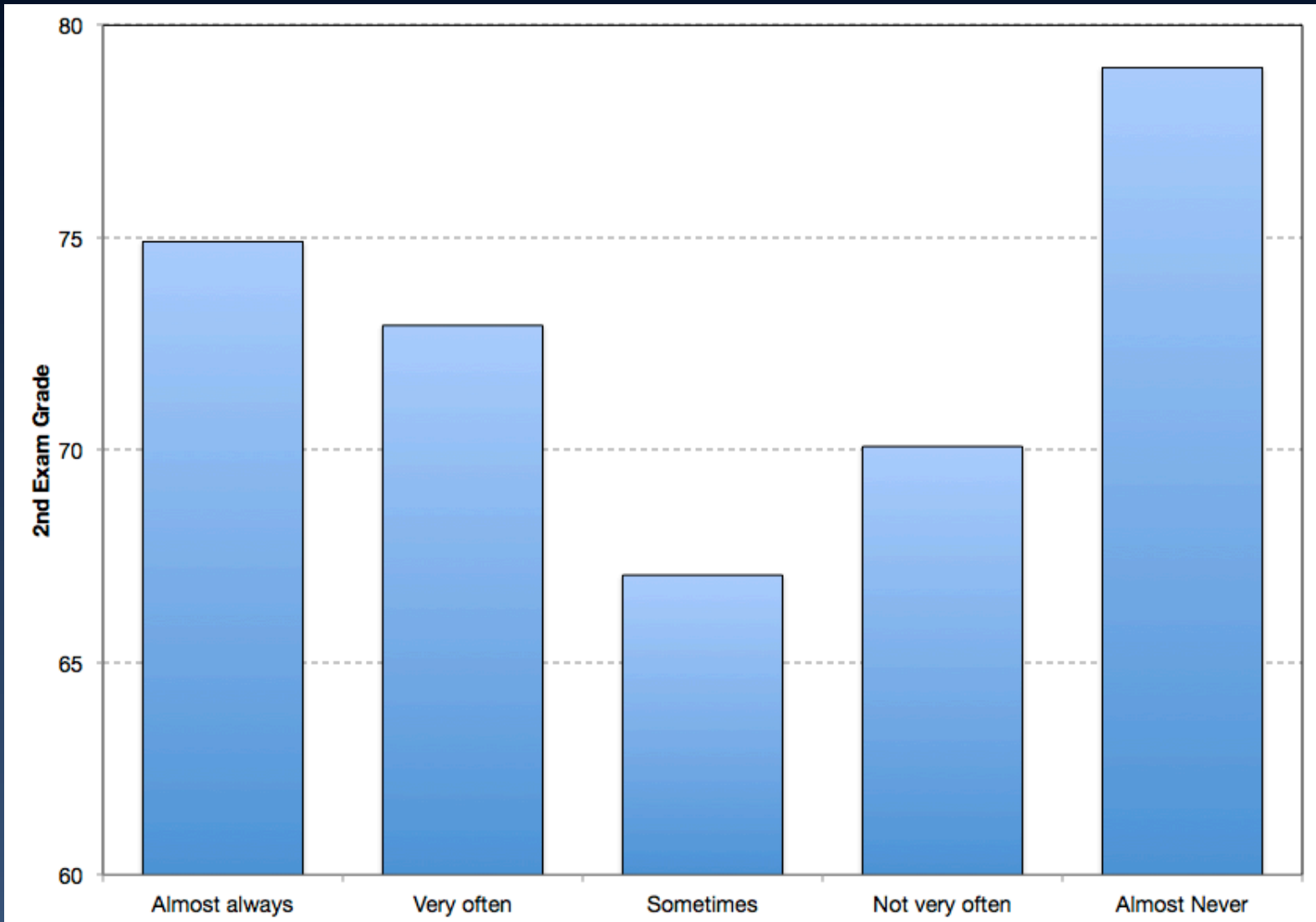


Q: “How often do you study with friends?”



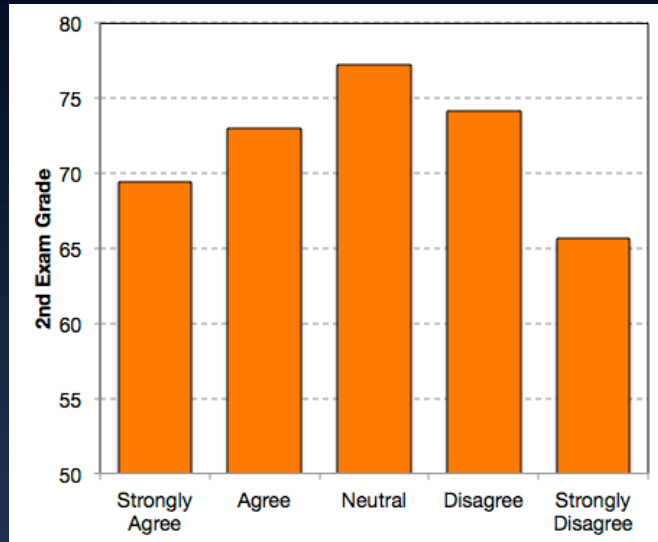
# Student Preparation

Q: “How often did you create review sheets for your studies?”

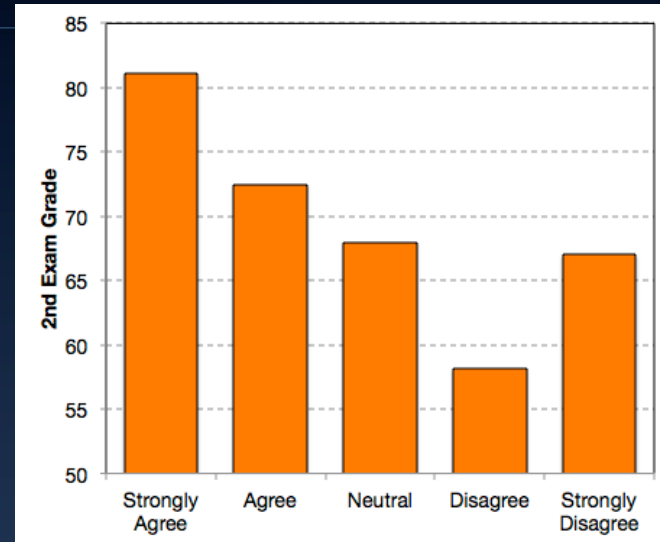


# Student Preparation

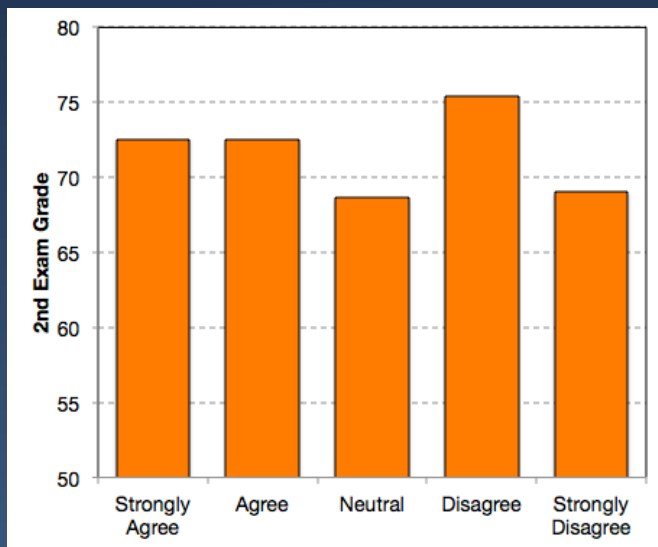
Q: "I enjoy humanities classes"



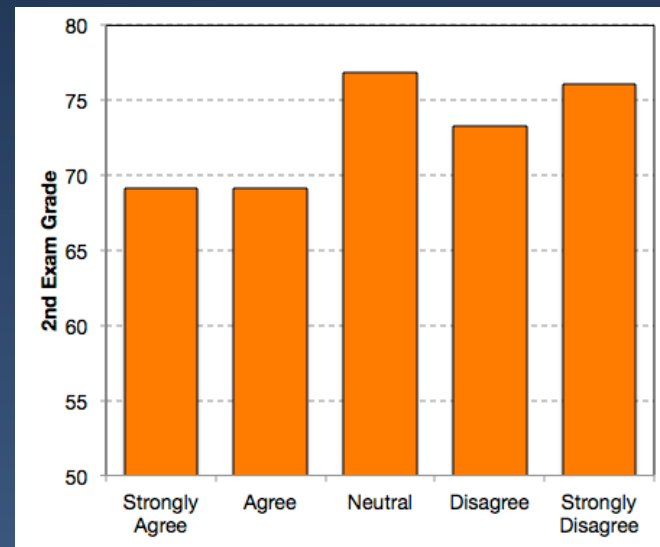
Q: "I enjoy natural science classes"



Q: "I enjoy social sciences courses"

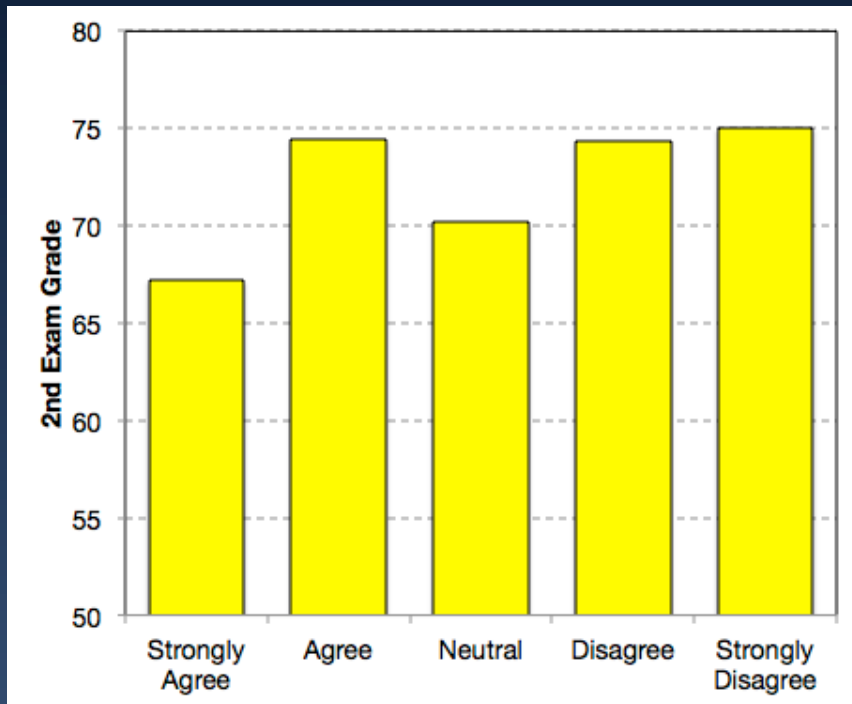


Q: "I enjoy creative arts courses"

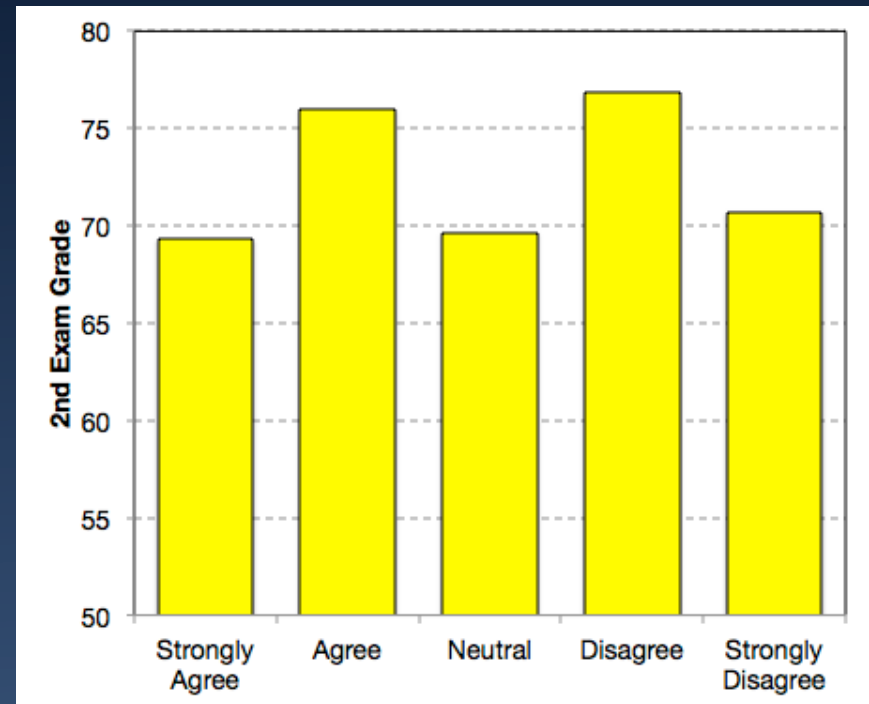


# Student Preparation

“I feel that emotional issues have reduced my performance this semester”



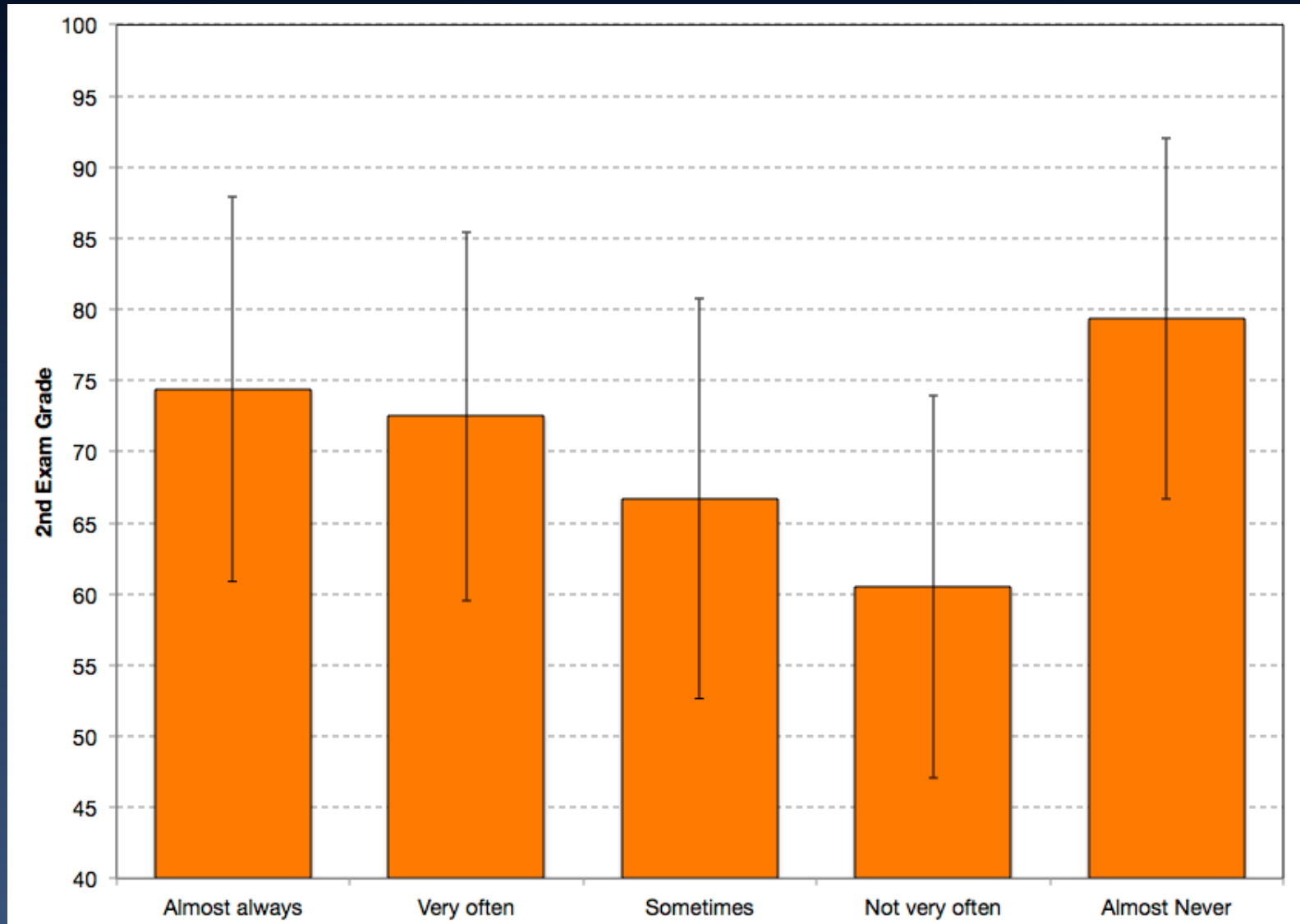
“I feel that physical issues have reduced my performance this semester”





# Student Preparation

Q: “How often did you review questions in LectureBook?”



# eHomework

## Stats 250 HW 6

[Go back to student list](#)

Choose

Q. 1

Q. 2

Q. 3

Q. 4

Q. 5

Q. 6

Q. 7

Q. 8

Q. 9

### Question 1 (Chapter 11) <- Click here to toggle grading view to AABBC

The Freshman 15 is the name of a common belief that college students, particularly women, gain an average of 15 pounds during their first year of college. A study of 31 female first-year college students resulted in a 95% confidence interval for the population mean weight gain for all female first-year college students of  $(-1.84 \text{ pounds}, 13.04 \text{ pounds})$ .

- a. Using just the confidence interval, at a 5% significance level, is it reasonable to conclude that first-year college women do in fact gain 15 pounds on average? Briefly explain why or why not.

Answer **No, it is not reasonable to conclude that first-year college women do in fact gain 15 pounds on average as the value of 15 is not in the 95% confidence interval for the population mean difference.**

Student **No, because 15 pounds does not fall in our 95% confidence interval, so it is not reasonable.**

0  0.5  1 

[\(+ Add Feedback\)](#)

- b. True or False?

About 95% of the female first-year college students will have a weight gain in the range  $-1.84$  to  $13.04$  pounds.

1. True

**2. False**

# Evidence of Effect

---

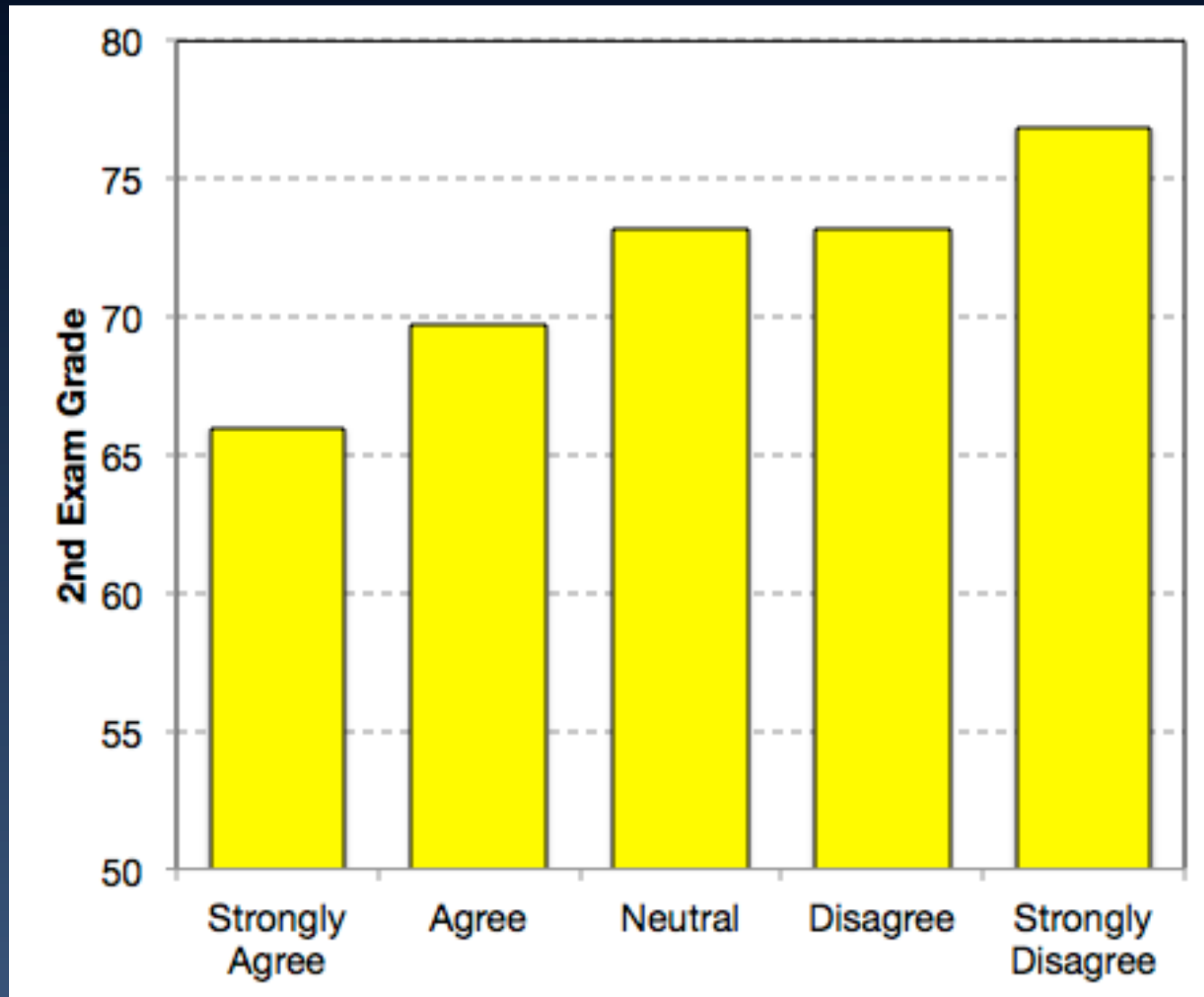
## Integrating homework with eTextbook

- **F09:** average grade = **3.09** (n = 1326)  
**F10:** average grade = **3.22** (n = 1395)  
Online HW Tool + eText only new innovation incorporated.
- **Buy-In:** ~ 25% F10 and > 50% W11

Source: Gunderson and Samson, 2011, Online Homework + eTextbook = Integrated Online Learning, Sloan-C Symposium on Emerging Technologies for Online Learning, July, 2011.

# Student Preparation

“I often feel so unmotivated when I study that I quit before I finish what I planned to do.”



# What matters?

---

- Possible Cause/Effect
  - Motivation.
  - Practice with representative problems.
- Unclear Cause/Effect
  - Class attendance
  - Use of textbooks
  - Participation in student response activities
  - Flashcards/highlighting/annotations
  - Note-taking



1. Development of API's
2. Definition of data structure
3. Protocols for maintaining anonymity.
4. Terms of use
5. IRB issues