



JOHNS HOPKINS
BIOMEDICAL ENGINEERING

The Department of Biomedical Engineering

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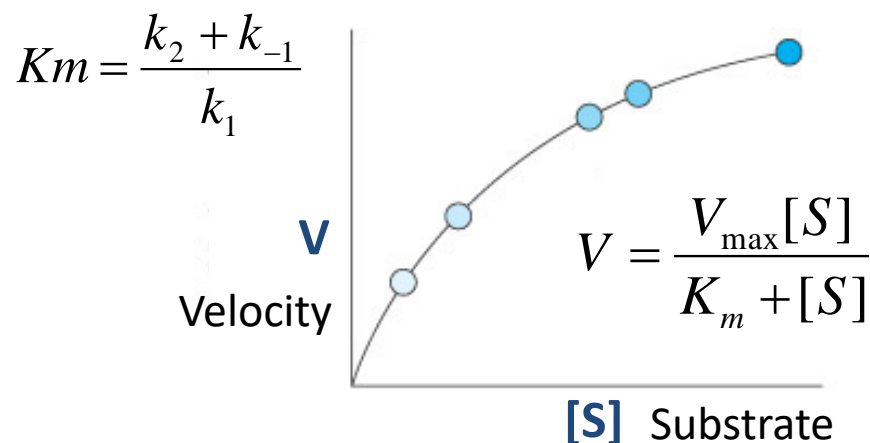


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SCHOOL *of* MEDICINE



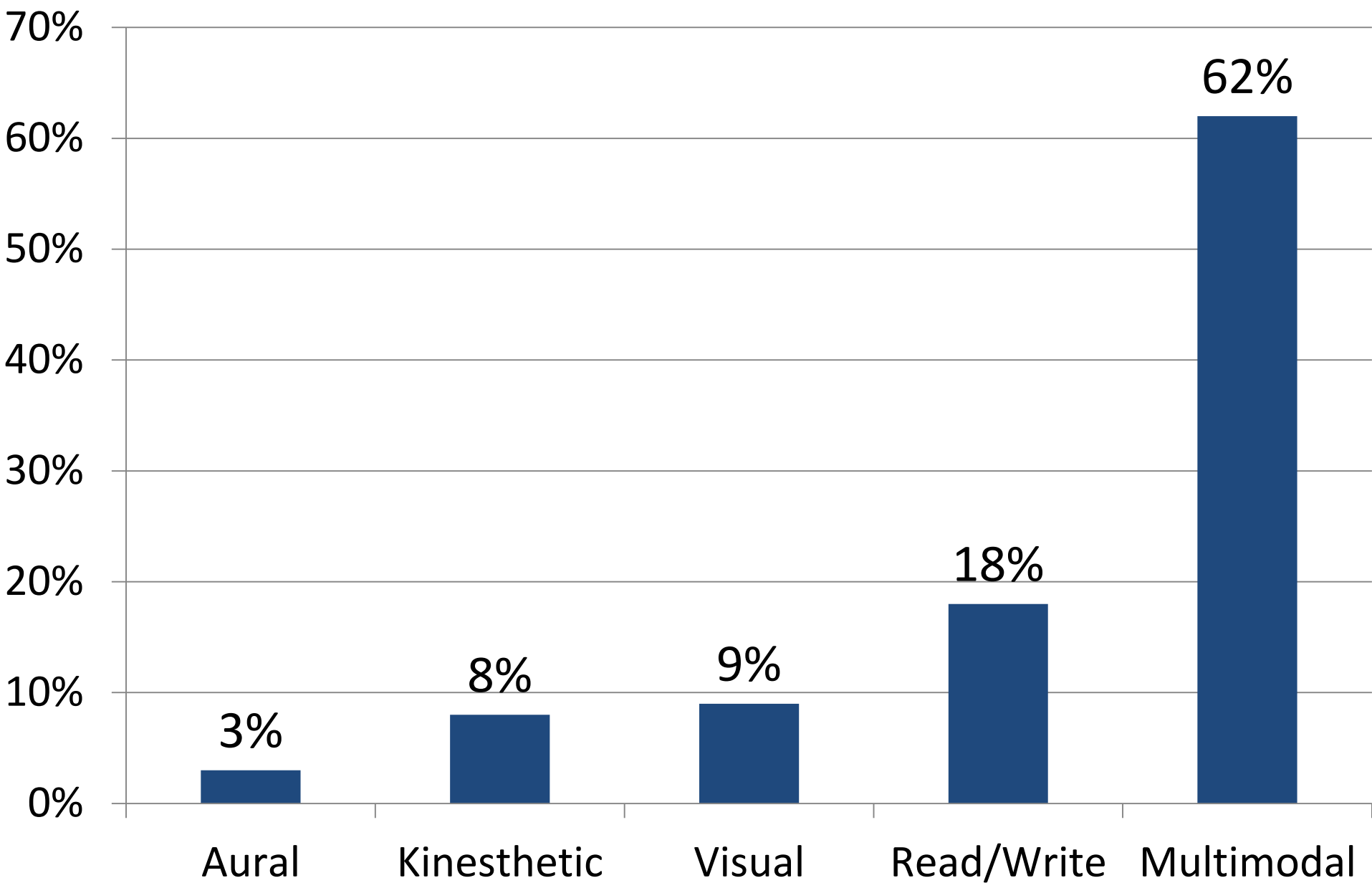
JOHNS HOPKINS
WHITING SCHOOL
of ENGINEERING

580.221 Molecules and Cells (required, fall sophomore yr)



*“The best part of molecules and cells is that **contrary to what I expected**, the material is interesting. I expected it to be more of memorizing concepts type of class, but it is nice to see that we actually **apply math and engineering** to explain the science.”*

Data from VARK survey



Team Based Learning

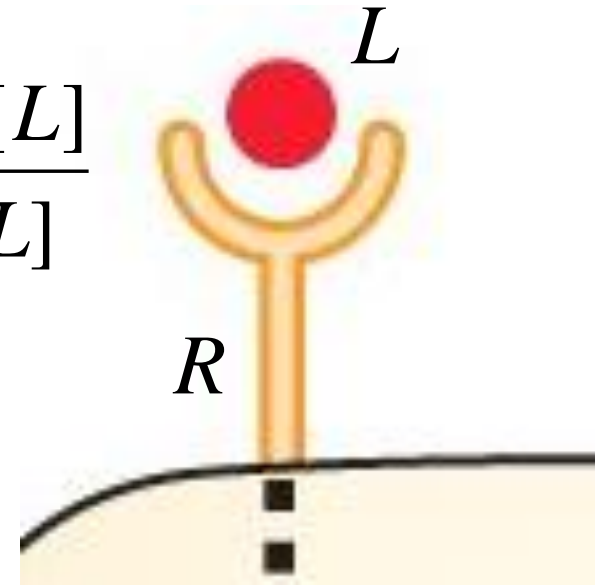


- Students will take a 10-question, multiple choice individual quiz (iRAT), followed by a group quiz (gRAT) (50% each)
- Teams of **five** students based on section
- Most Fridays

iRAT (individual Readiness Assessment Test)



$$K_d = \frac{[R][L]}{[RL]}$$



Sample iRAT question

The basal plasma concentration of insulin in an experimental subject is 1×10^{-11} M. The K_D for the insulin receptor in adipose cells of this subject is 2×10^{-8} M. Approximately what percentage of the insulin receptors is occupied under these basal conditions?

a. 0.0005%

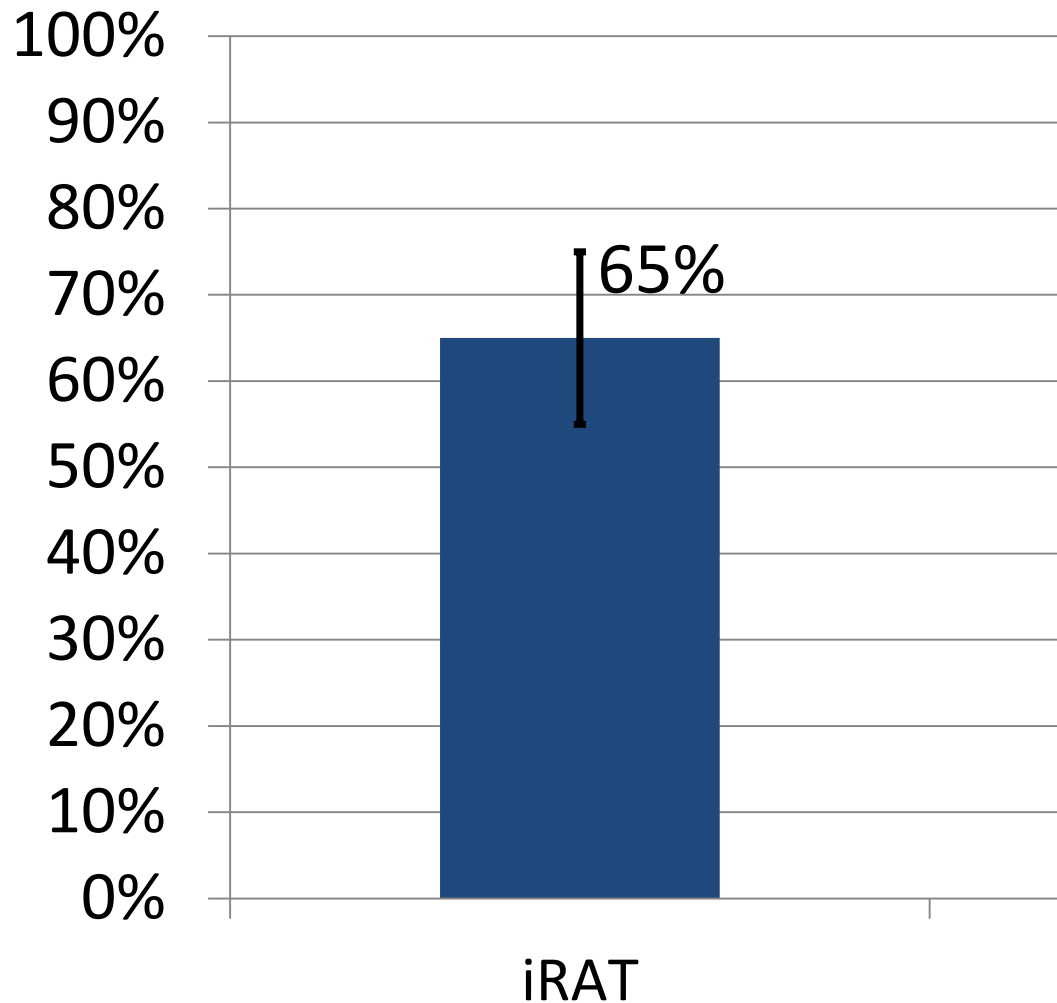
b. 0.005%

c. 0.05%

d. 0.5%

e. 5.0%

iRAT (individual Readiness Assessment Test)



$$\text{iRAT} = 65 \pm 22$$

n=137 students, averaged over 9 TBLs

gRAT (group Readiness Assessment Test)



$$\text{gRAT} = 90 \pm 12^*$$

93% felt Team Based Learning was a useful learning experience

IMMEDIATE FEEDBACK ASSESSMENT TECHNIQUE (IF AT®)

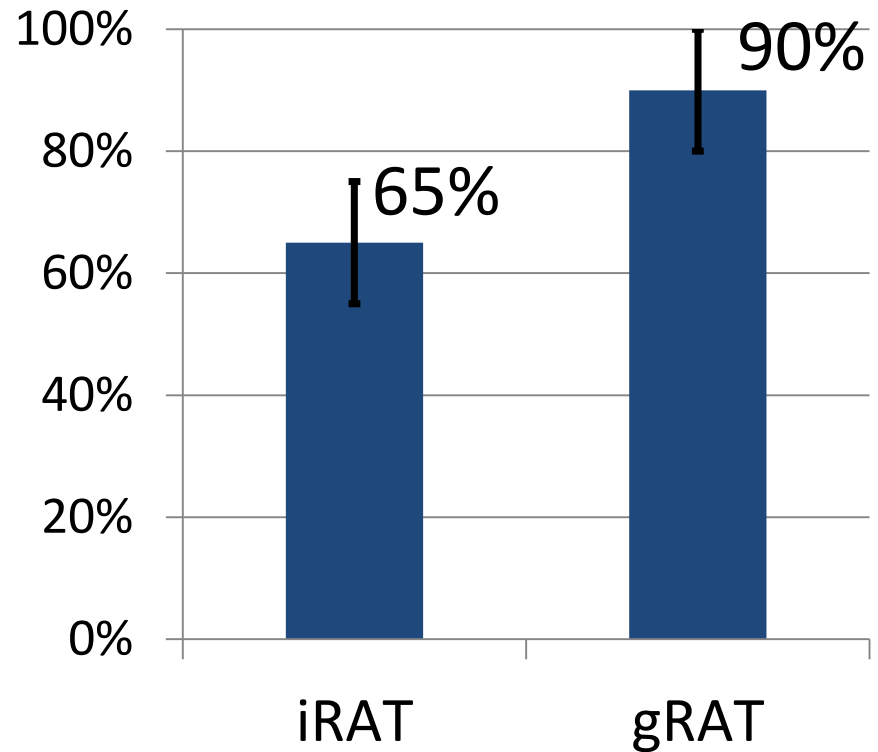
Name MC Test # _____

Subject _____ Total _____

SCRATCH OFF COVERING TO EXPOSE ANSWER

	A	B	C	D	Score
1.		★			1
2.				★	4
3.			★		4
4.		★			4
5.	★				4
6.	★				2
7.				★	2
8.			★		0
9.		★			2
10.	★				4
11.	★				4
12.			★		4
13.		★			4
14.				★	4
15.	★				4

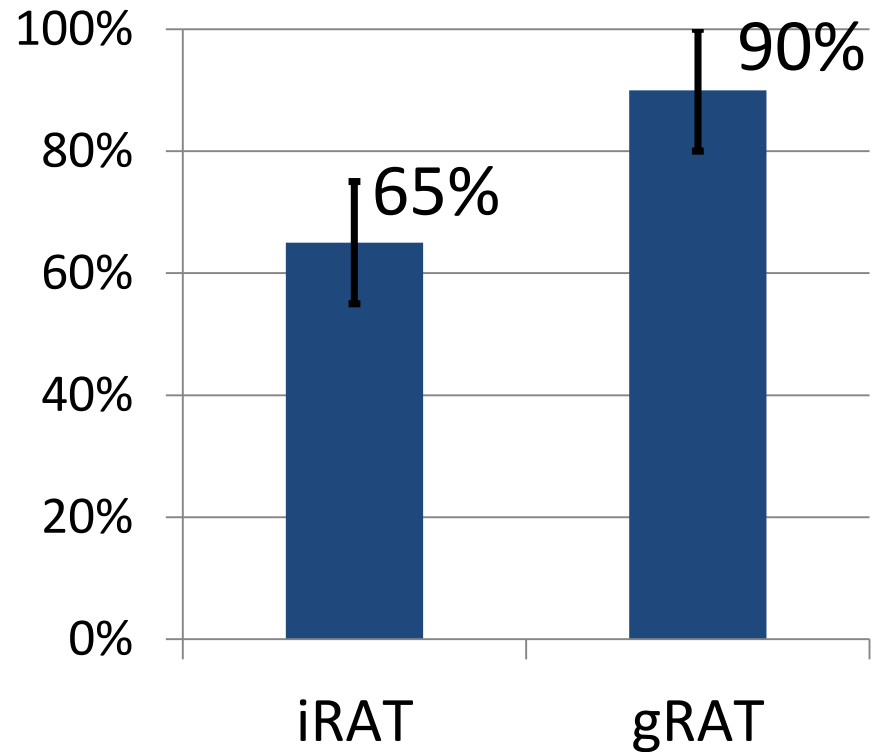
The best part of Molecules and Cells is...



“having to work with teams for the gRAT. It taught me how exciting and useful it is to work as a team.”

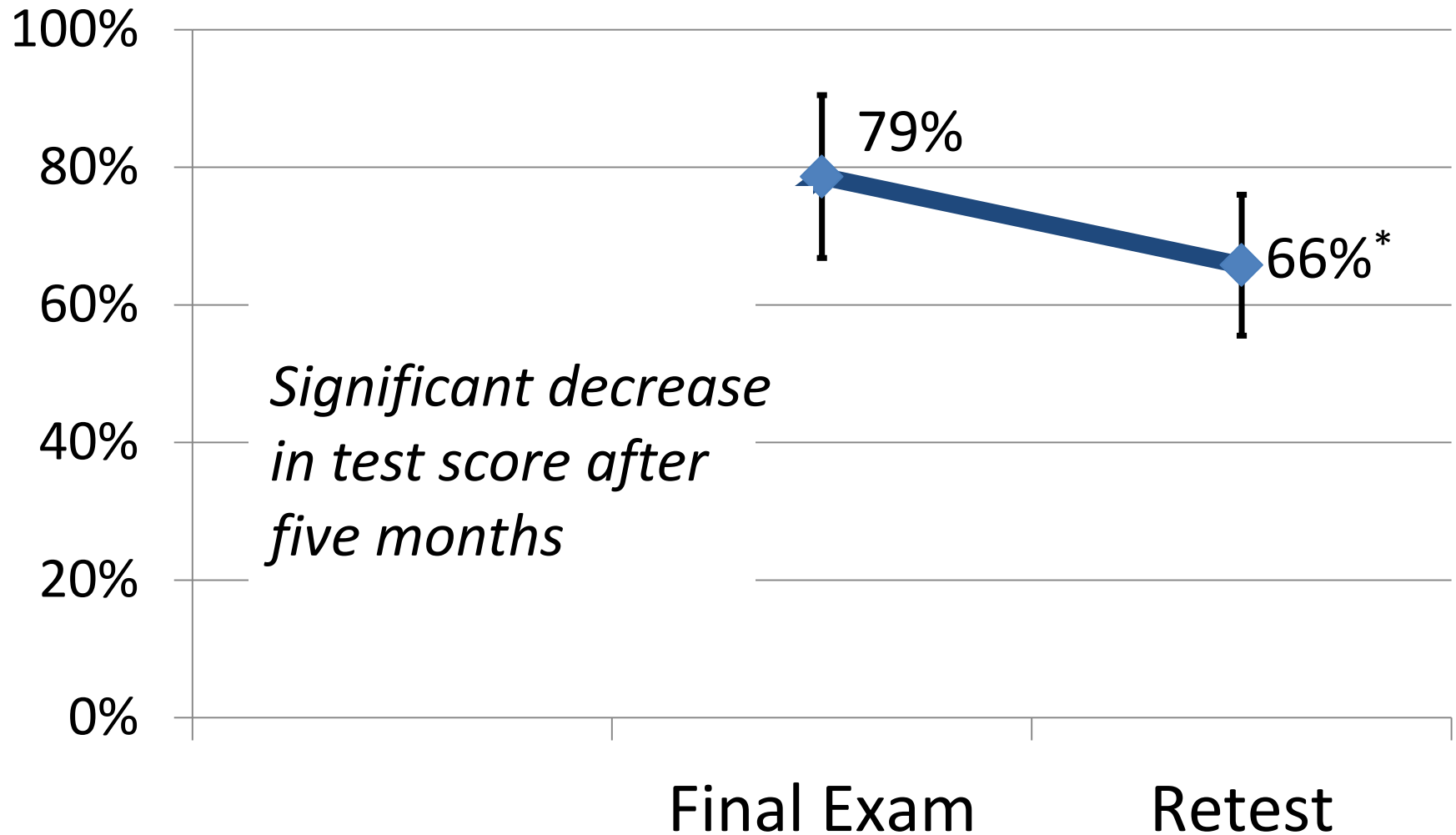
“Working with my study group for both completing the homeworks and studying for the tests”

The best part of Molecules and Cells is...

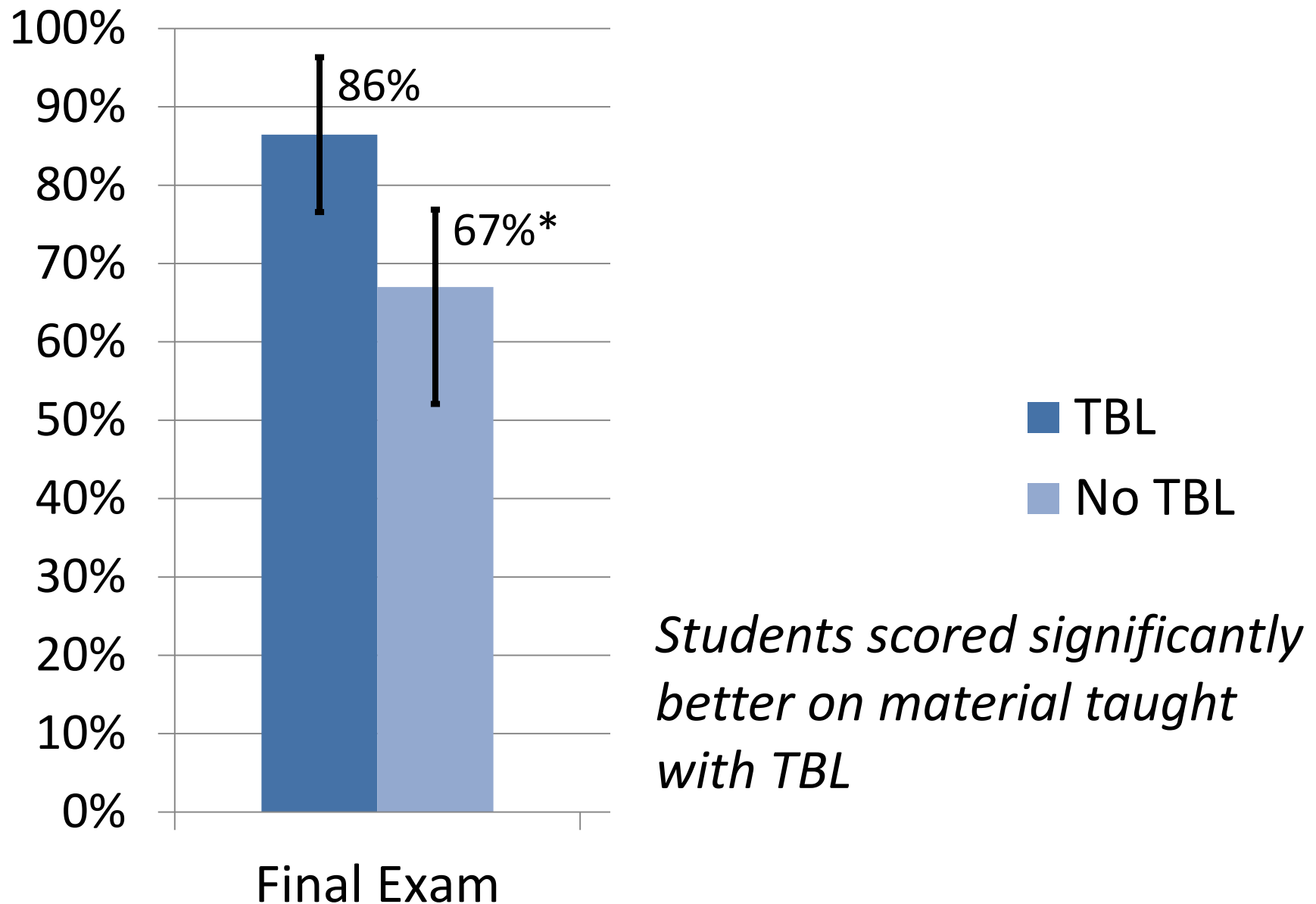


*“I get to **have my ideas challenged** when going over questions where others disagree. In these situations, whether I am right or wrong, I always am more likely to come out of the situation with a **greater likelihood of retaining** the knowledge pertaining to the question.”*

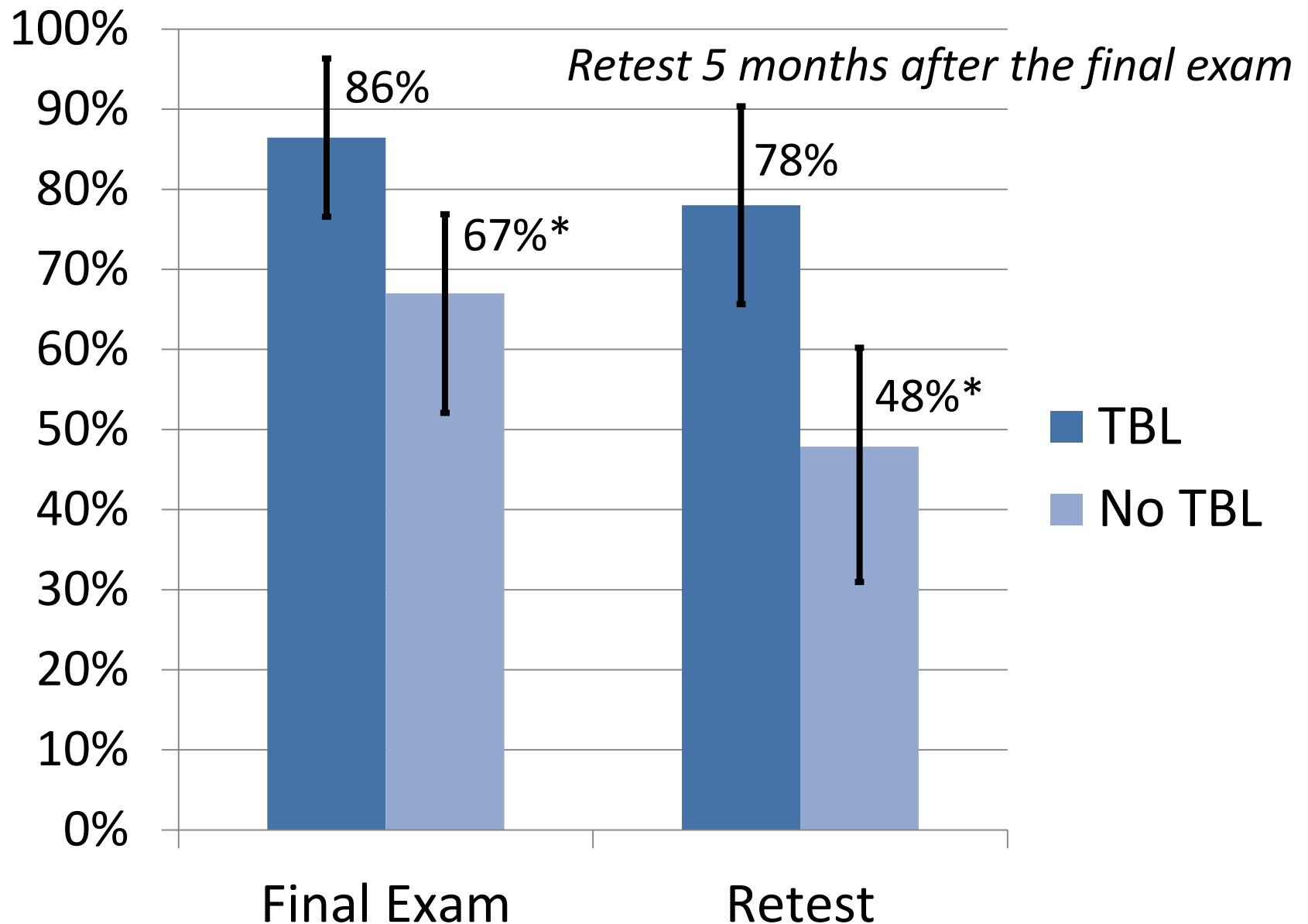
Final Exam and Retest Scores



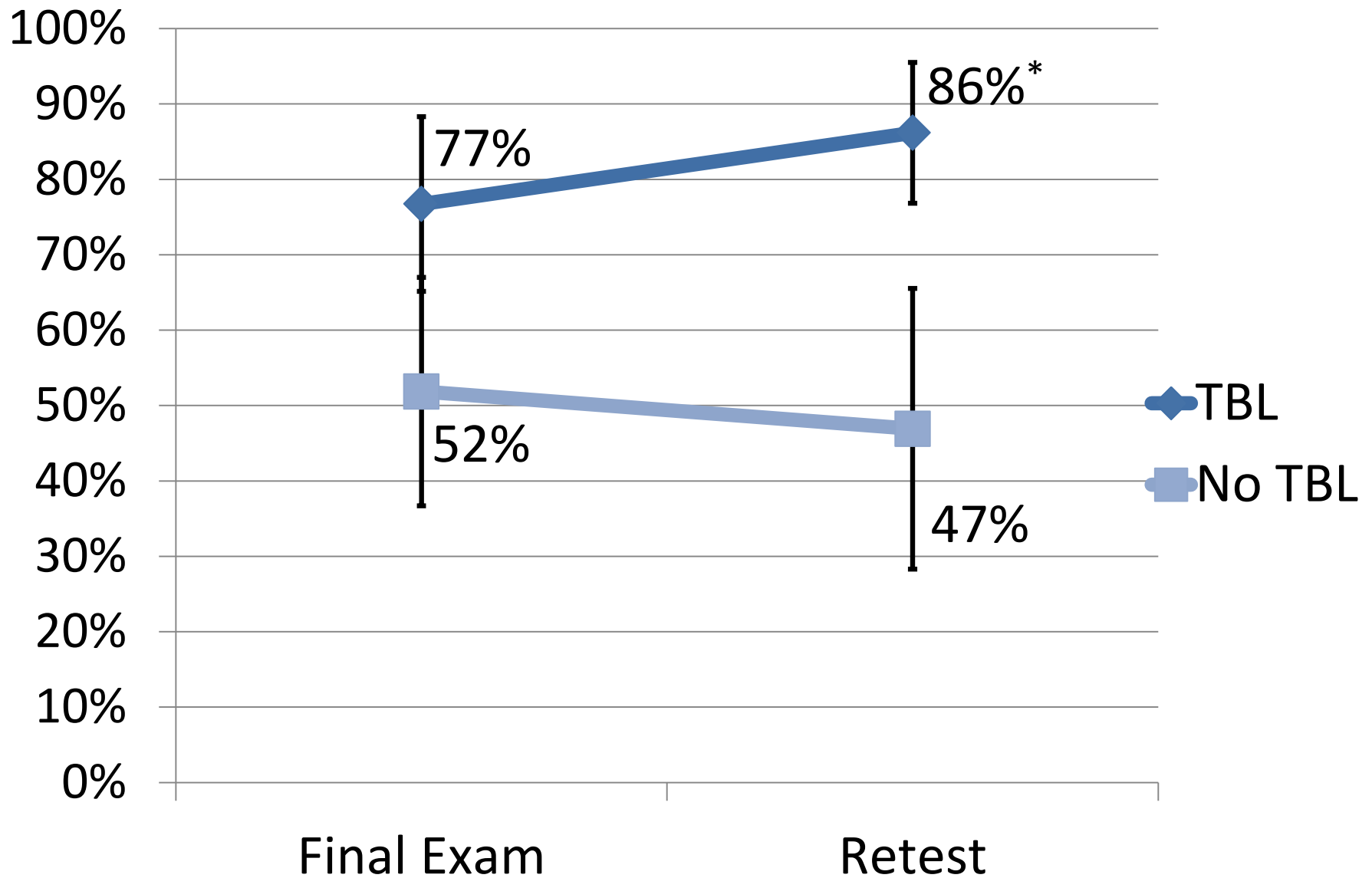
Students retained more material when taught through TBL



Students retained more material when taught through TBL



10% increased their score on retest



Take Home Message

- A diverse learning environment improves content retention
- Team-based learning can improve content retention *long after exposure* to the material



Acknowledgement:

- Center for Educational Resources for their financial support through multiple Technology Fellowships to develop resources for Molecules and Cells
- BaDoi Phan for his statistical analysis of the data



THANK YOU!



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