

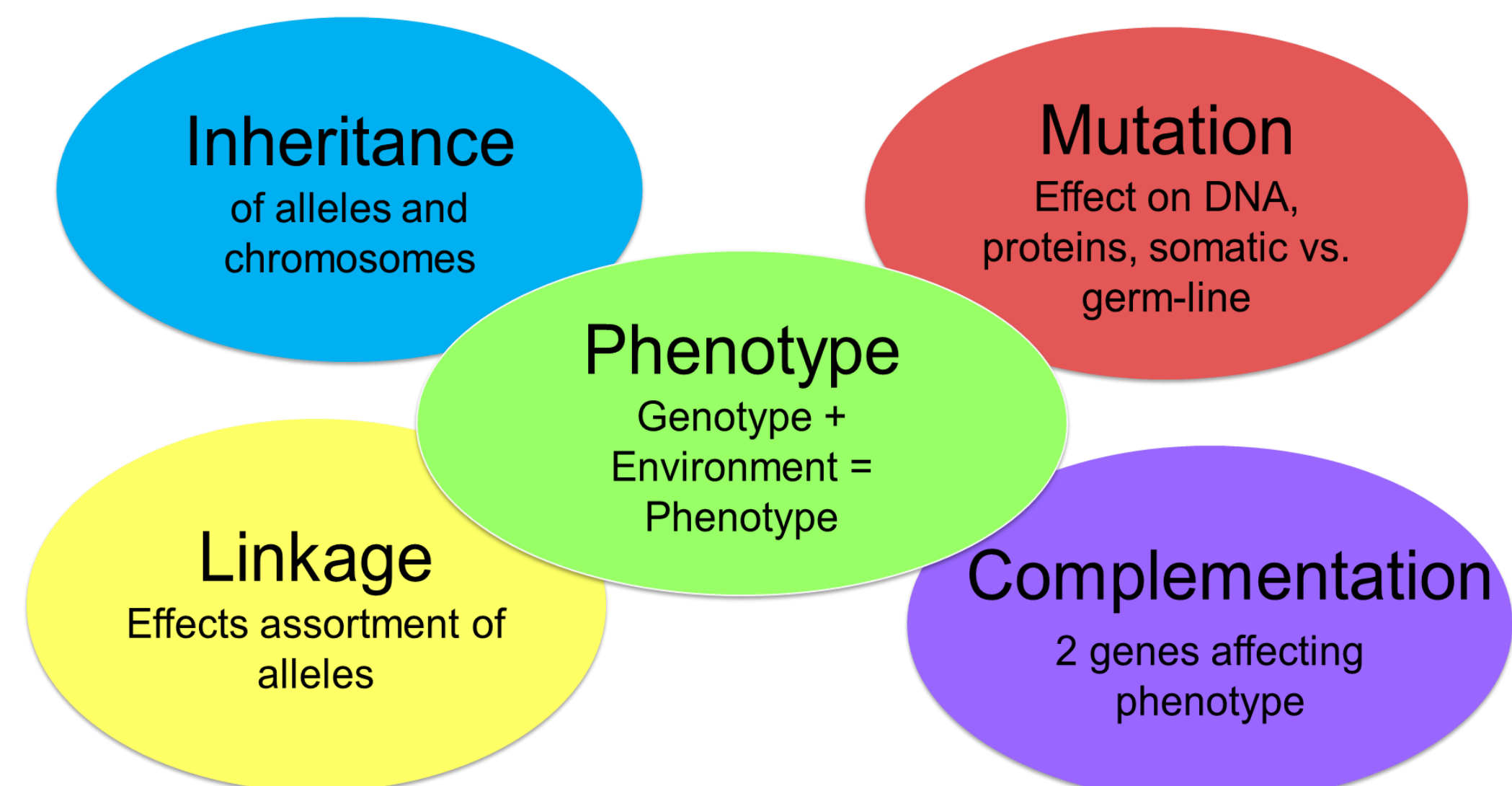
## Retention of conceptual and procedural knowledge in genetics

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### Goal

Measure **retention** of **conceptual understanding** versus **problem solving ability** 2.5 months after students completed the required second year genetics course.

### Key Course Concepts



### Do students understand & retain the concepts?

**CI Test:** 14 multiple-choice questions from validated conceptual inventory tests<sup>1,2</sup>

Average end of term score (n=441) : **70%**

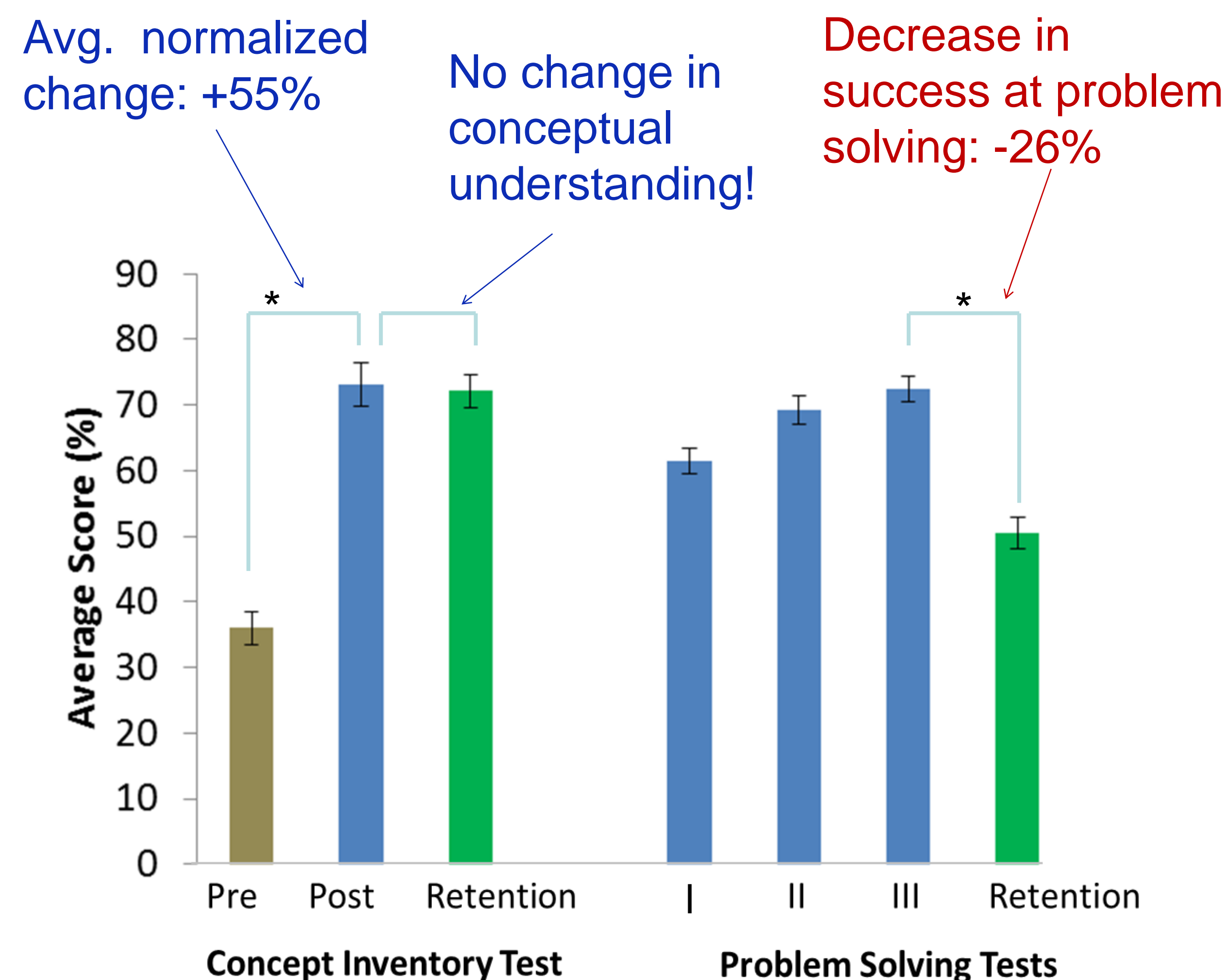
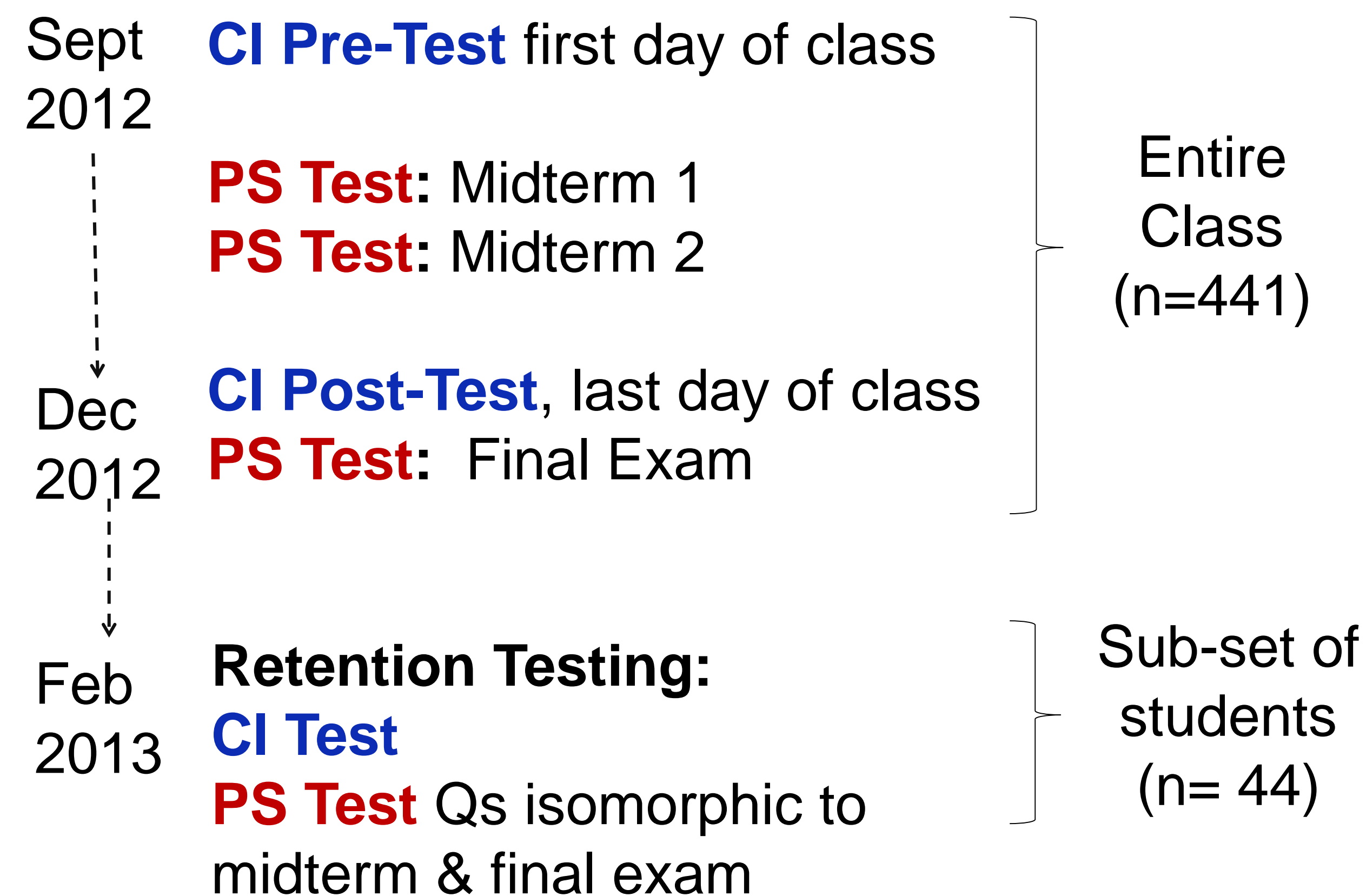
### Can students apply understanding to solve a problem?

**PS Tests:** written, open-ended, problem solving questions.

Average scores during term (n=441): **66%**

<sup>1</sup> Smith et al. 2008. CBE-Life Sci Ed 7(4): 422-430; <sup>2</sup> Kalas et al. 2012. Submitted to Cell Biology Education.

### Measuring Retention

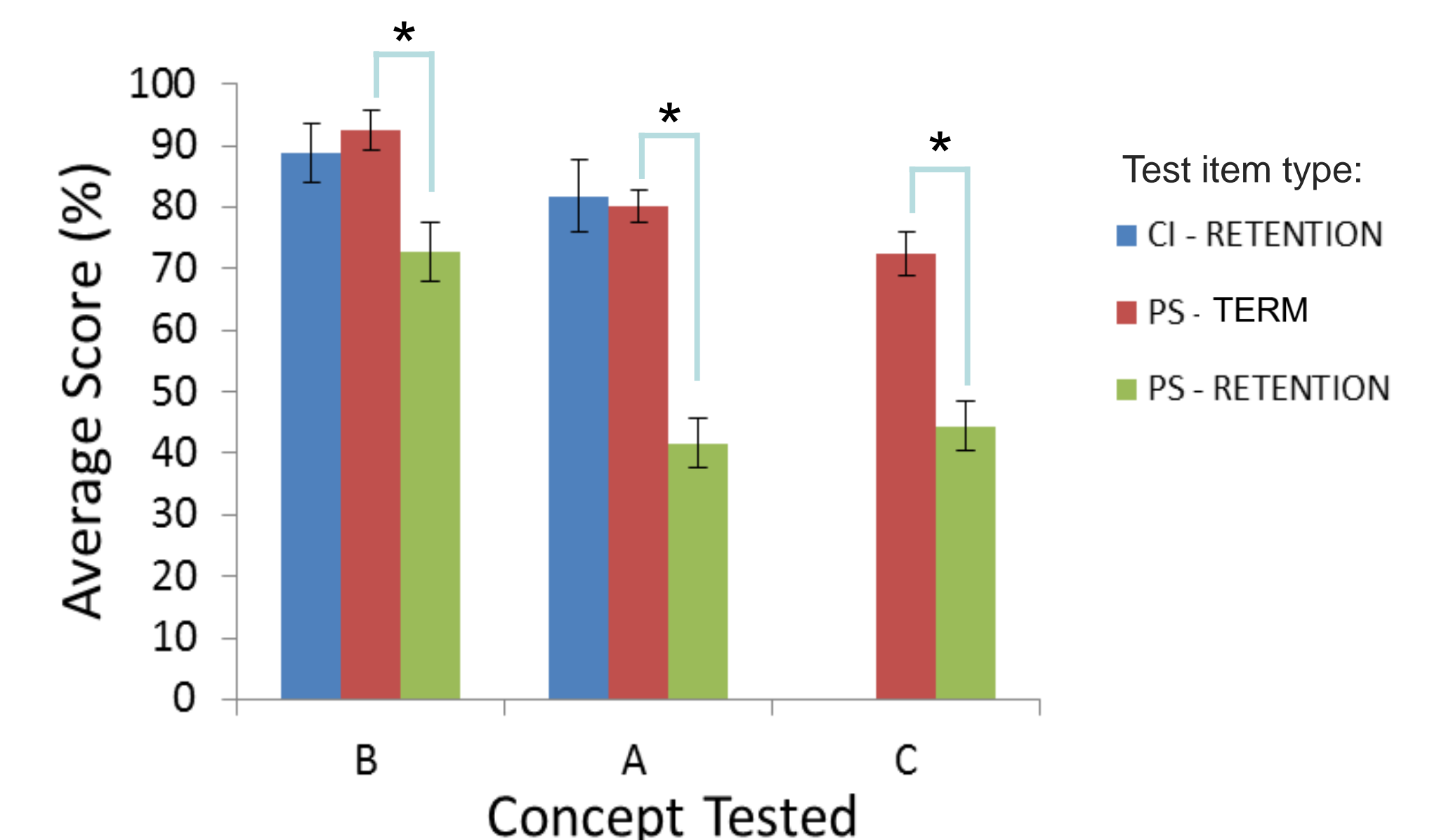


**Figure 1.** Student performance on concept inventory (CI) and the Problem Solving Tests [midterms (I, II), final exam (III)], +/- standard error. N=44. \* t-test, p<0.01.

### Conceptual vs. Problem Solving

Selecting the correct response on the conceptual test (CI) was not correlated with performance on a problem solving (PS) test item that required understanding, application, or integration of that same concept.

CI Item	PS Item Required:	Correlation
Concept A	Apply	-0.19
Concept A	Integrate	0.07
Concept B	Understand	-0.16
Concept B	Apply	-0.14



- Reduced success at solving problems at the time of retention resting, \*t-test p<0.01.
- Items which students rely more on memorized tactics (A, C) have greater losses.
- Conceptual understanding (B, A) not correlated to problem solving ability.

### Knowledge gone?

2.5 months after the course, conceptual understanding retained but ability to apply concepts to solve problems is reduced.