

# Exam over, knowledge gone? Retention of conceptual and procedural knowledge in genetics

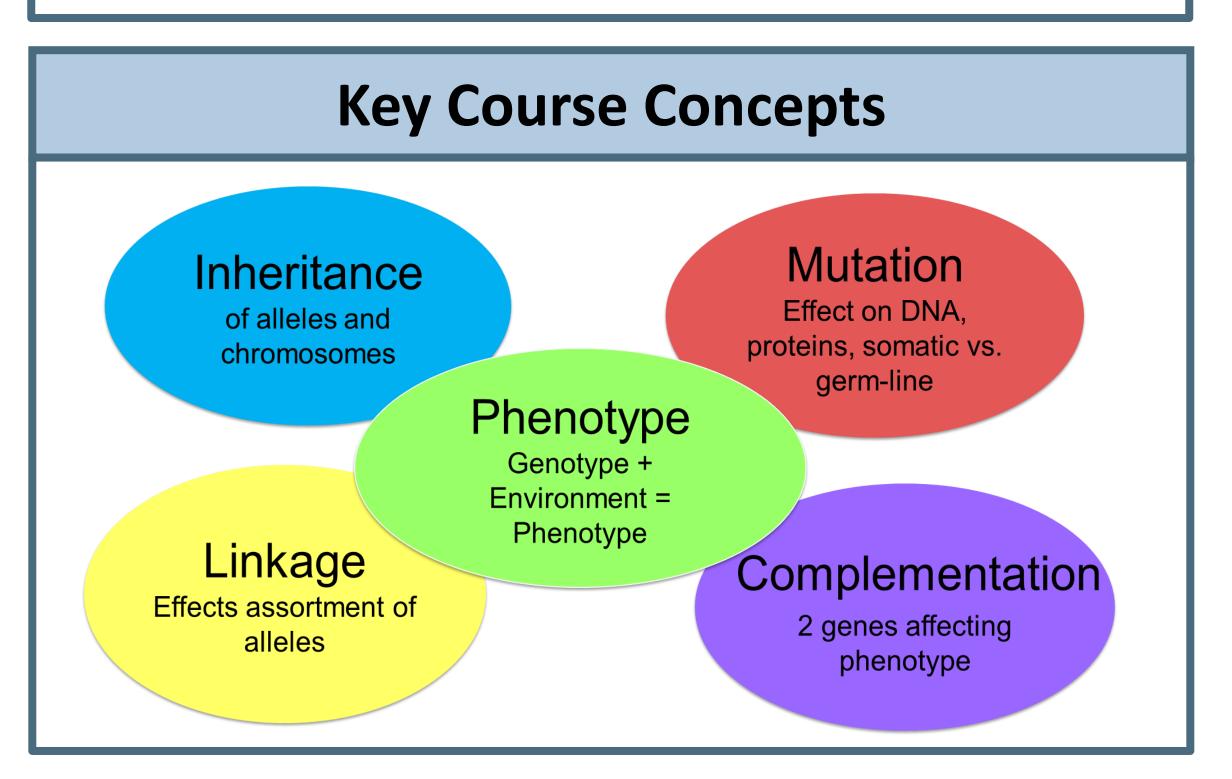




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#### Goal

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



### Do students understand & retain the concepts?

CI Test: 14 multiplechoice questions from validated conceptual inventory tests<sup>1,2</sup>

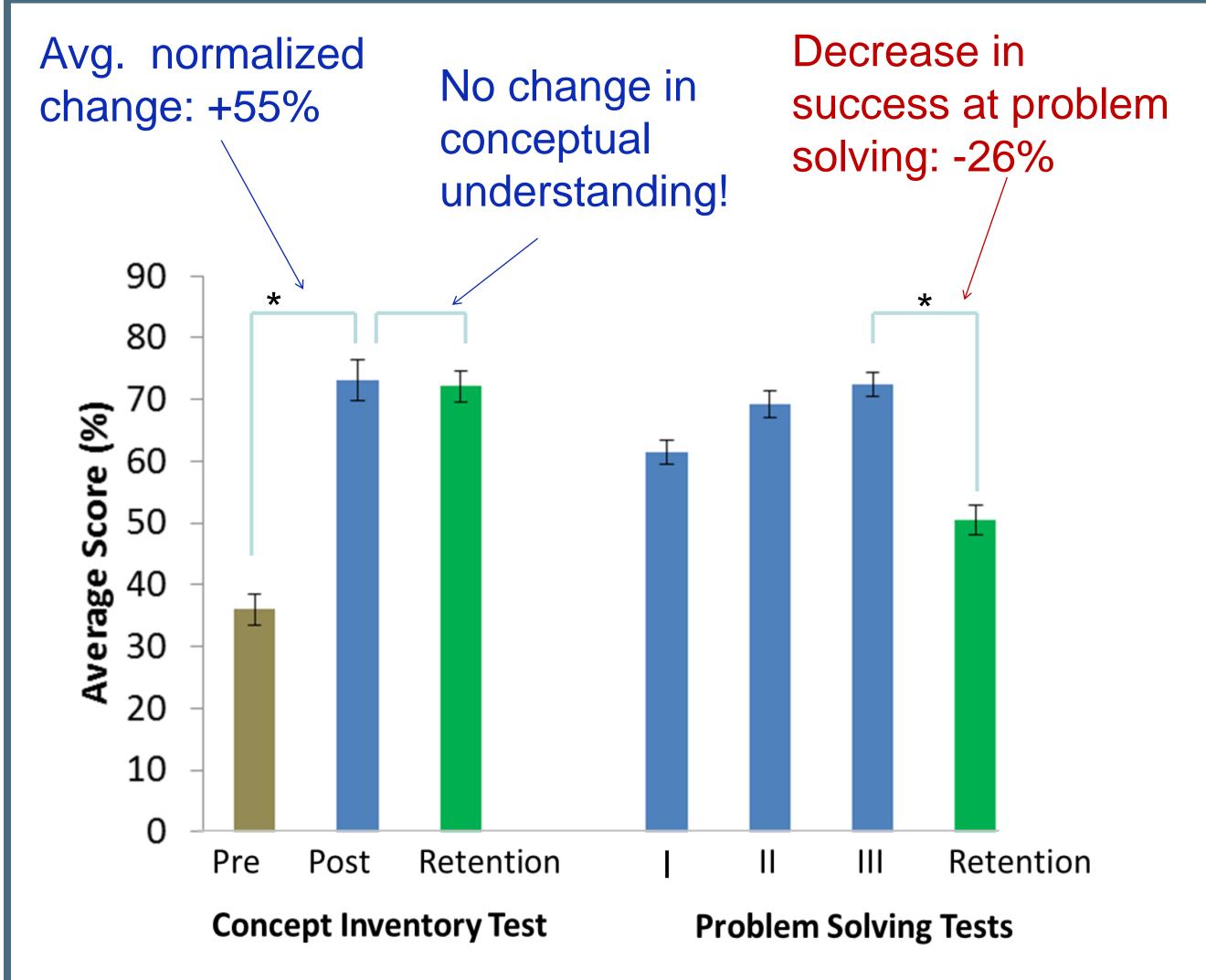
Average end of term score (n=441): **70%** 

## Can students apply understanding to solve a problem?

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

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

### **Measuring Retention** Sept CI Pre-Test first day of class 2012 Entire PS Test: Midterm 1 Class PS Test: Midterm 2 (n=441)CI Post-Test, last day of class Dec **PS Test:** Final Exam Sub-set of **Retention Testing:** students CI Test 2013 (n=44)PS Test Qs isomorphic to midterm & final exam

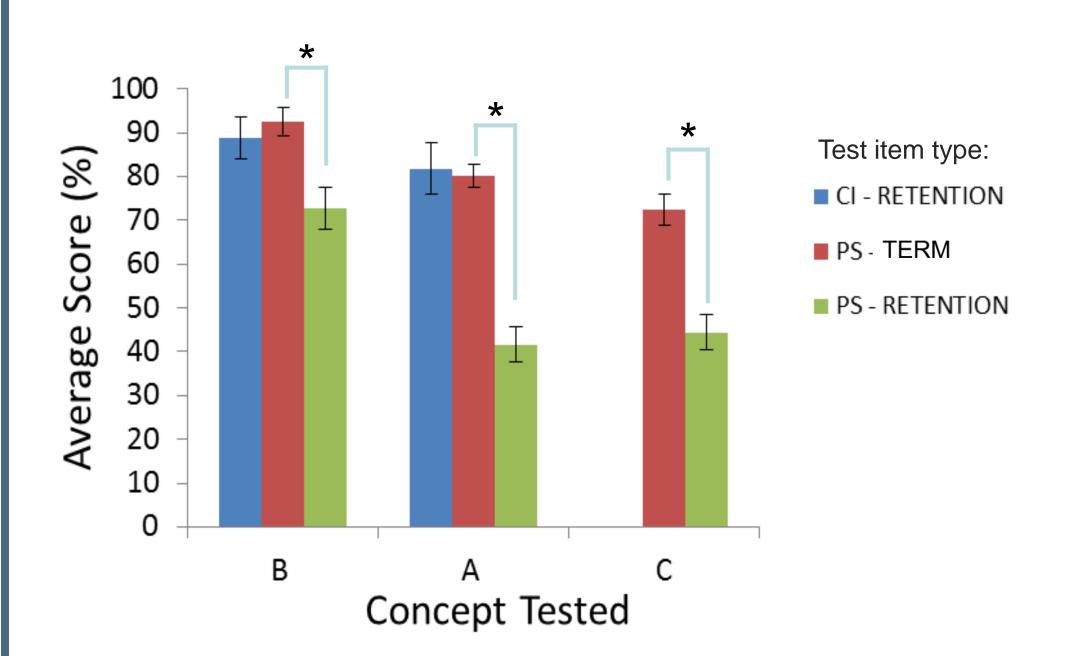


**Figure 1.** Student performance on concept inventory (CI) and the Problem Solving Tests [midterms (I, II), final exam (III)], +/- standard error. N=44. \* t-test, p<0.01.

### 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.

	PS Item	
CI 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.</p>
- 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.



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