**Standards Alignment**

TOPS Biology labs are designed for students to learn that “scientific progress is made by asking meaningful questions and conducting careful investigation” as specified by the California State Science Standards. The TOPS experiments are designed to integrate into a teacher’s current curriculum, and employ a biochemical focus to enhance and bridge the biology and chemistry curricula. The experiments utilize modern technology including computer driven instruments of the type used in local industrial laboratories as well as commercially available data analysis software.

**Amylase lab:**
Testing of the ability of amylase to release maltose from starch under different conditions of temperature and pH. Spectrophotometry to study reaction rate. Uses Water baths, Micropipettors, Diode Array Scanning Spectrophotometer

Standards 1b*, 1h, 9f

Investigation and Experimentation Standards: 1 a, b*, c, d, e, j, l


**Assessment of TOPS Biology Labs for 2009-2011**

Direct assessment using release questions drawn largely from the California Standards Test (CST Biology 2005 & 2009) shows the following effect on student conceptual understanding of topics associated with the hands-on activity:

Topic: Enzyme Kinetics, Amylase
Number of participating students: 412
Change in score: 10.2% increase (post-pre)
Analysis of variance shows this change is highly statistically significant (F(1,411) = 51.5, p < 0.001, η² = 0.112) with a medium/large effect size of the activity on student scores.