



# CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

<b>Name(s)</b> Sydney S. Gamble	<b>Project Number</b>  34369
<b>Project Title</b> The Truth about Higher-Order Learning vs. Rote Methods	
<b>Objectives/Goals</b> The objective of this experiment was to determine if students retained and recalled more information if they were taught with Higher-Order (Critical Thinking) versus Rote Memorization methods. <b>Abstract</b> <b>Methods/Materials</b> Informed consent was obtained from 80 students (40 fourth graders and 40 fifth graders). The scientist separated 40 fourth grade students into two groups of 20 students. The 40 fifth grade students were separated into two groups of 20 students. The scientist taught A Groups using Higher-Order (Critical Thinking) methods and B Groups using Rote Memorization. The groups were taught separately for 40 minutes each, according to a curriculum formulated after conducting research on both methodologies. One day after each teaching session, the same test was given to all students to evaluate short term memory retention. Two weeks later, a second test was given, this time to evaluate long term learning retention and recollection. <b>Results</b> Results for the first test (conducted one day later) showed Group A student population taught with Critical Thinking methodologies overall scored 8.5% better than Group B student population taught with Rote Memorization. On the second test (conducted two weeks later), Rote Memorization fourth grade students scored 4% below their first test scores and the fifth grade students scored a significant 18.9% below their first test scores. Conversely, the Critical Thinking fourth grade students scored a notable 12% higher on their second test, while the fifth grade students dropped a mere 1% lower on their second test. <b>Conclusions/Discussion</b> Students taught using Rote Memorization scored lower than Critical Thinking students on a test given one day after the teaching session. When the students were required to recall information two weeks after the teaching session, Rote Memorization test results were significantly lower. Students taught using Critical Thinking achieved both immediate recall of information similar or better than rote students and could also recall, analyze and apply the concepts taught after a full two week duration had passed. The scientist also attributes these findings to the physiology of the human brain, where the process of consolidation on the cognitive level is far more likely to occur effectively when the brain is actively participating in the learning (Critical Thinking) versus passively absorbing information (Rote Memorization).	
<b>Summary Statement</b> The focus of this project was to determine which teaching methodology, Higher-Order (Critical Thinking) or Rote Memorization is most effective, notably relative to brain memory consolidation so as to benefit our education system and society	
<b>Help Received</b> Fourth and fifth grade teachers assisted in scheduling the teaching and testing sessions.	