

**(I-CAN) Improving Mathematics and Test Performance:  
A New Approach to Math and Test Anxiety**

Topic area: Cross-disciplinary (Mathematics and Psychology): Curriculum, Research and Development & Student Learning

Keywords: Math & Test Anxiety, Test Performance, Mathematics Performance, Emotional Management

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## **Abstract**

It has long been speculated that anxiety negatively affects mathematics performance, and that it is the anxiety reaction, which is causing the problem, not some deep-seated math deficiency. Research indicates that both math courses and math tests can lead to anxiety, and this anxiety, in turn, impedes students' performance. A major source of anxiety for students is the standardized test.

Standardized tests are used at all levels of our society to measure a person's abilities. These "high stakes tests" determine a person's future, their options, and career choices. One such "high stakes test" is the COMPASS/ESL Mathematics Placement Test by the American College Testing Corporation (ACT). Many institutions of higher learning use this instrument to place students into the appropriate mathematics course. At UC Clermont, 92% of the students taking the COMPASS Mathematics Placement Test perform at a level that preempts them from enrolling in a college math course. UC Clermont's statistics are in line with National data compiled by ACT. According to ACT, 83% of the 81,415 students from two-year colleges nation-wide fail to meet the minimum standards recommended for a student to have a 50% chance of receiving a grade of C or higher in a College Algebra course.

Given the magnitude of this problem, a pilot study was conducted to investigate the combined effect of emotional management training and mathematics tutoring on mathematics performance. We chose an emotional management technique that integrates cutting edge research on both neuropsychological and neurophysiological dimensions of anxiety and other negative emotions. It is known as the Freeze-Frame technique developed by the Institute of HeartMath. We used the Brief Symptom Inventory (BSI) to measure changes in psychological dimensions such as anxiety, hostility, and depression. The COMPASS Placement Mathematics Test (pretest and post-test) was administered to measure mathematics performance.

The pilot project involved 7 Tech Prep students, high school juniors, and required daily attendance for three hours (9:00 AM to 12:00 PM), five days a week for three weeks. This forty-five hour program included eighty minutes of emotional management training and eighty minutes of mathematics tutoring each day. The participants took the COMPASS Mathematics Placement Test on the first day and then This Project was supported by the Greater Cincinnati Tech Prep Consortium (GCTPC)

as a post-test on the last day. The BSI was administered three times: the first day, the end of the second week, and on the last day.

While we are aware that the results from this pilot study cannot be generalized, nor can any cause-effect relationships be determined, we did find some very promising outcomes in math gains and psychological well-being.

From these findings, our funding source, the Greater Cincinnati Tech Prep Consortium (GCTPC) has strongly encouraged us with more funding to move forward with a rigorous scientific investigation.

#### Mathematics Performance:

The average percent increase in percentile ranking\* on the COMPASS Mathematics Test was a 30.7% over the eighteen day project. This average was calculated using only 5 of the 7 available scores. This was because of the ceiling effect for two students, whose pre-intervention rankings were the 96<sup>th</sup> and 98<sup>th</sup> percentiles. The smallest percent increase in percentile ranking was 10% and the largest was 77%.

#### Psychological Indicators:

Students showed beneficial gain in the dimensions of Depression, Anxiety, and Hostility. These results varied quite a bit from individual to individual in this small group. We are in the process of analyzing the results of the BSI together with the pre and post intervention interviews.

\*Percentile ranking was calculated using the COMPASS/ESL Composite Report for Two-Year Colleges Fall 1999. There were 81,415 participants taking the COMPASS Algebra Test.