



# CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

<b>Name(s)</b> Catherine K. Takata	<b>Project Number</b> <b>J1133</b>
<b>Project Title</b> <b>Classroom Air Quality: An Investigation of CO(2) and Ventilation in a Classroom</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> Is the carbon dioxide concentration in a St. Anne School classroom consistent with optimum interior air standards? CO<sub>2</sub> is the best measurable indicator of interior air quality and performance of the ventilation system. Standards for interior air specify that CO<sub>2</sub> not exceed 1000 ppm. Academic performance of students is optimized at CO<sub>2</sub> levels less than 1000 ppm. (Shaughnessy, 2010) Hypothesis: I predict that the carbon dioxide concentration will increase in a St. Anne Middle School classroom from the lowest concentration in Period 1, at the start of the day, to the highest in Period 7, at the end of the day.</p> <p><b>Methods/Materials</b> Vernier CO<sub>2</sub> sensor set at low range: 0 to 10,000 ppm CO<sub>2</sub>; Go!Link cable; Logger Pro 3.5 Computer Software (2007), <a href="http://www.vernier.com">www.vernier.com</a>; Dell netbook 10" - Latitude 2100, Intel Atom processor, St. Anne School server, <a href="http://www.dell.com">www.dell.com</a>; Classroom B213, Mrs. Michelle Brooks, mathematics (grades 6-8), St. Anne School; Wall thermostat for temperature readings; functioning HVAC system, room B213; School bell - to signal time of data gathering per class period; Students enrolled (per class period) present in classroom; Pencil &amp; notebook for recording.</p> <p><b>Results</b> 62 out of 80 class periods, or 77.5%, recorded averages greater than 1000 ppm CO<sub>2</sub>. The average % increase of CO<sub>2</sub> per day among all the trials was 900.17 ppm or 155.5%. CO<sub>2</sub> was lower after the teacher's prep period in each trial because Mrs. Brooks turned the thermostat down two degrees, which activated the HVAC system. She turned the thermostat back to its original temperature when her next period started. This is her prep period routine.</p> <p><b>Conclusions/Discussion</b> CO<sub>2</sub> increased from the start of the day to the end of the day in each trial by an average of 900.17 ppm or 155.5%, which supported the hypothesis that CO<sub>2</sub> would increase through the day in a St. Anne Middle School classroom. Two classes benefited from optimum indoor air quality, less than 1000 ppm, the start of the day Period 1 (7th grade students) and Period 5 (6th grade students) who each day followed Mrs. Brooks's prep period. The remaining class periods had poor classroom air quality, greater than 1000 ppm.</p>	
<b>Summary Statement</b> Academic performance of students is optimized at CO(2) levels less than 1000 ppm (Shaughnessy, 2010) and Mrs. Brook's period 1 and period 5 are the only periods with optimum CO(2) levels.	
<b>Help Received</b> Thank you, Mrs. Brooks for the use of her classroom and to my mom and dad and Mrs. Rivero, my science teacher, for their support.	