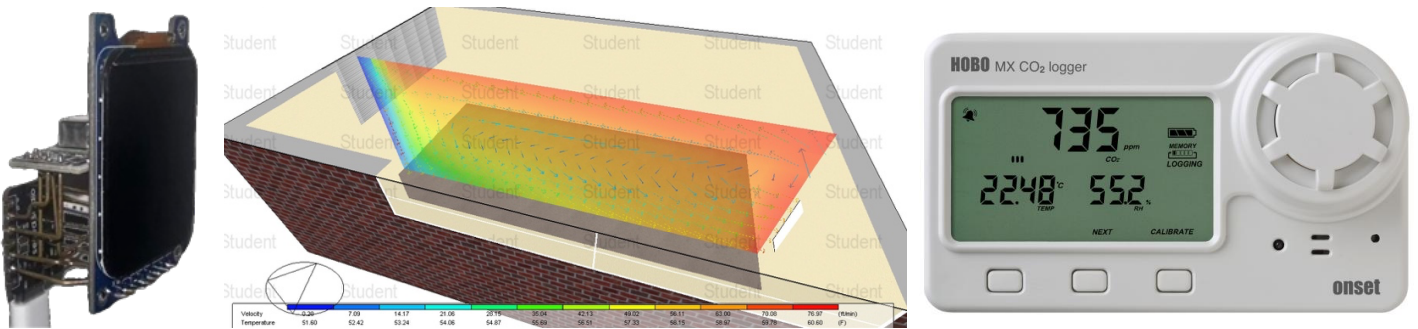# CHARACTERIZING INDOOR ENVIRONMENTAL QUALITY FOR UNIVERSITY CLASSROOMS

A Master's Thesis Defense in Mechanical Engineering

California Polytechnic State University, San Luis Obispo

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Indoor air quality (IAQ) significantly affects cognitive performance, yet many older buildings at Cal Poly, such as Building 20, struggle to maintain healthy indoor environments due to outdated ventilation systems. This thesis aims to identify issues and provide suggestions on how we can improve the learning environment to improve student success within Building 20. Temperature, relative humidity, and carbon dioxide (CO_2) concentration inside Building 20 were measured from January to April 2025. To determine the effects of different ventilation strategies, a model of Building 20, room 128, was developed and validated using DesignBuilder. Additionally, ventilation rates were measured and compared to a non-linear regression model that was developed. We found that CO_2 levels routinely exceeded 1000 ppm — a concentration that hinders cognitive functions. Temperature and relative humidity levels varied considerably and were not in the comfort zone for 85.7% of the time. This shows that students routinely face inconsistent conditions that hindering their learning. Analysis concludes that Building 20 does not have adequate ventilation to support learning. Ventilation within Building 20 needs to be increased to support continued learning at Cal Poly.

Wednesday June 11th, 10:00 AM, Building 13 Room 124b