

HVAC AND THE CLASSROOM

By Laura M. Totten, BS



The October 2006 issue of ASHRAE Journal (vol.48) contains an article, entitled: "Research Report on Effects of HVAC on Student Performance and Classroom Habitat". This study, by Pawel Wargocki, Ph.D. and David P. Wyon, Ph.D., shows that the ventilation and temperature of a classroom impacts performance.

Previous research has shown that an office work environment with poor indoor air quality and high indoor temperature negatively affects performance. Other studies have attempted to establish a similar relationship in school performance.

In the subject study, Wargocki and Wyon performed five separate experiments at an elementary school in Denmark. Two alternating classrooms and their students were used as control and experimental arms, changing each week. The students ranged between ten and twelve years old. The studies were done in late summer and again in winter. Various tasks in reading and mathematics were measured. The rooms were mechanically ventilated in a way that air flow rates and temperature could be altered. An interesting part of the study was that the windows were allowed to be opened at will, even though the ventilation was determined by continuous CO₂ measurements during class periods.

Their findings showed that increasing the air supply rate and eliminating high temperatures greatly improved a student's achievement in terms of speed and efficiency in the various tasks ($P < .05$). According to the article, "...doubling outdoor air supply rate would improve the performance of school work in terms of speed by 14%, while reducing classroom air temperature by 1.8°F would improve performance in terms of speed by 4%". Interestingly, there was no correlation between the air flow and temperature in the room and the percentage of errors made in the students' tasks. These results held between 2 to 10 liters per second air flow and between the temperatures of 68 to 77°F.

The results could be generalized when both indoor and outdoor environments are similar to Denmark, but environments with a warmer climate and higher humidity would require more study. The authors postulate lowering pollutants by different methods or improving architectural design might also yield positive classroom effects.

To fully understand the data and resulting conclusions, review of the original article is recommended. A copy of the original article can be obtained at www.ashrae.org or by contacting Chastain-Skillman's Tampa office.

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