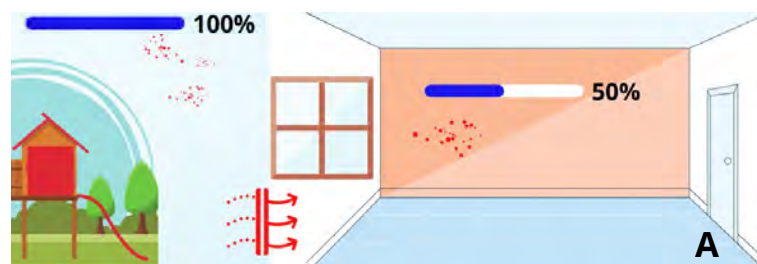


### Executive summary

Ultrafine air pollution particles from road and aircraft traffic infiltrate schools around Seattle-Tacoma International Airport, with potential negative effects on health and student academic performance, but using HEPA air purifiers significantly improved classroom air quality, according to a 2021 University of Washington study.

The findings come from the Healthy Air, Healthy Schools Study funded by the Washington State Legislature and five cities near Sea-Tac Airport. The study was led by the UW Department of Environmental & Occupational Health Sciences and the Department of Civil and Environmental Engineering.

The study found that about one-half of all outdoor ultrafine pollution was measured inside classrooms in five schools near the airport before HEPA air purifiers were installed. Measurements after the HEPA units were deployed found that ultrafine pollution in classrooms dropped to about one-tenth of outdoor levels.



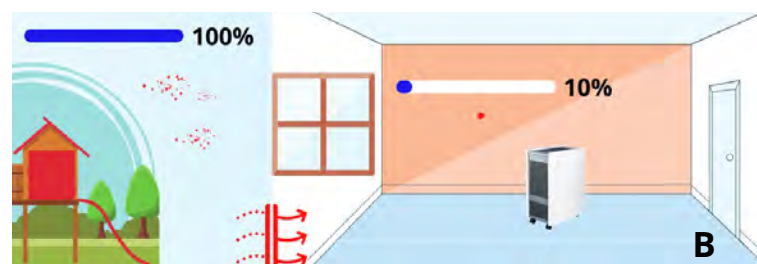
The primary sources of ultrafine particles at the schools came from general roadway traffic, aircraft traffic and heavy-duty trucks, in that order.

The study also found a significant increase in outdoor particles attributable to aircraft traffic when aircraft were landing overhead.

**The portable HEPA filter units removed an estimated:**

- 83% of total ultrafine particles.
- 67% of aircraft particles.
- 73% of heavy-duty truck particles.

Overall, using portable HEPA filter units could reduce classroom concentrations of ultrafine particles by approximately 70%, depending on the age of the school building and other characteristics, according to the study's models.



Visualizing the impact of outdoor air pollution on A) classrooms under standard ventilation conditions and B) classrooms with a HEPA filter intervention.

### Conclusions

This study is unique in focusing on ultrafine particle pollution in school settings and demonstrating that the ultrafine pollution measured in classrooms is primarily of outdoor origin.

- Schools that are near high-traffic roadways, aircraft flight paths and truck routes are at higher risk of indoor air pollution.
- Jets landing at Sea-Tac Airport contribute significantly to indoor and outdoor ultrafine pollution concentrations in nearby schools.

- Portable HEPA filter units can be effectively used in the short term to decrease air pollution in classrooms by removing particles.
- Additional investigation is needed to evaluate long-term portable HEPA filter usage in classrooms to address concerns related to energy efficiency and noise levels.
- Ventilation changes and building-level remediations such as sealing gaps and managing doorways should also be investigated as another approach to reduce infiltration of outdoor particles indoors.

## Next steps

With new funding from the Washington State Legislature and the US Environmental Protection Agency (EPA), the UW research team has launched phase 2 of the Healthy Air, Healthy Schools Study to further investigate the longer-term impacts of improving air quality in classrooms.

Phase 2 is a two-year study in 30 schools in both urban and rural settings in Washington. UW researchers will deploy HEPA air cleaners in classrooms in 20 schools near Sea-Tac Airport to measure the difference in air quality in classrooms with and without the filters over the course of a year with funding from the State of Washington. Researchers will also compare student academic performance during the year in classrooms with and without the filters. Research suggests that air pollution exposure is associated with lower student test scores.

With EPA funding, the team will expand its work beyond airport communities to measure the impact of HEPA air cleaners on air quality in 10 elementary schools around King County, Yakima County and the Yakama Nation, particularly during wildfire smoke events.

The phase 2 study will allow researchers to investigate the effectiveness and optimal usage of HEPA filter units and explore alternate interventions, including building upgrades. They will also examine the health, well-being and academic benefits of reducing concentrations of ultrafine particle pollution in classrooms. These findings will inform future recommendations to improve air quality in schools and other public buildings in Washington.



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## More information

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- Read the full report: [https://deohs.washington.edu/healthy\\_schools](https://deohs.washington.edu/healthy_schools)