Figure 7 shows data pairs of the average outside temperature compared to the corresponding average CO_2-level. This correlation analysis shows a high dependency of the inside CO_2-level from the outside temperature in window-ventilated classrooms and almost no correlation in mechanically ventilated classrooms. This suggests that the colder it is outside, the less likely it is that occupants will adequately ventilate the classrooms if done by window airing. On the other hand, since most mechanical ventilation systems have heat recovery implemented the outside temperature plays a minor role given such a system. The parameters of the correlation, the regression line, and the root-mean-square deviation are listed in Table 3.

Table 3: Parameters of correlation and the regression line

Case	Ventilation	Interception*	Slope*	Correlation Coeff.	RMS
$PM_{2.5}$ inside / $PM_{2.5}$ outside	Window Airing	0.61 µg/m³	0.55	65.3 %	5.57 µg/m³
	Mechanical Ventilation	1.07 µg/m³	0.25	51.2 %	2.28 µg/m³
CO_2 inside / Temperature outside	Window Airing	2123 ppm	-56.9 ppm/°C	-49.5 %	608 ppm
	Mechanical Ventilation	896 ppm	-4.2 ppm/°C	-7.1%	196 ppm

*regression line in style of $value_{inside} = slope \times value_{outside} + interception$

4 CONCLUSIONS

This work, which is based on the preliminary measurement data of the project DIGIdat, examines various air quality parameters by means of statistical data analysis. The low-cost sensor kits used have been placed in 36 classes so far and measure temperature and humidity, as well as CO_2-levels, fine particulate matter (PM), and volatile organic compounds (here as b-VOC_{eq}). Measurements were carried out at one-minute intervals, although due to problems with the database infrastructure, some classrooms had to temporarily be measured in four-minute intervals. The aim of this study was to find statistical differences between classes with and without mechanical ventilation and to investigate correlations between outdoor air and classroom air. Higher concentrations of CO_2 and $PM_{2.5}$ were found in classes with window airing confirmed by statistical significance. There also was a statistically significant lower level of humidity in mechanically ventilated classrooms. Statistical differences were tested with the Welch t-test and Mann-Whitney-U-test at 5% significance level. The correlation for mechanically ventilated classrooms showed that fine particulate filtering is statistically visible. However, $PM_{2.5}$ concentration is low for all classes with median values well below 10 µg/m³. For window airing, a dependence of the CO_2-levels on the outside temperature can be found. In general, the colder the outside temperature the higher the CO_2 measurements, with CO_2 concentrations above 2000 ppm in several of the window-ventilated classrooms. The preliminary analysis indicates that mechanical ventilation as installed and operated in Austrian schools reduces CO_2 concentration significantly. The goal for further analysis is to expand the data set and generate clean data for further analysis, including temperature and b-VOC_{eq}. Furthermore, the data failures are to be quantified and correlations to underlying conditions in the individual classes, such as class size, window orientation, etc., are to be established.

5 ACKNOWLEDGEMENTS

Project DIGIdat is funded by the Sparkling Science Programme of the Austrian Agency for Education and Internationalisation (OEAD) and the Federal Ministry of Education, Science and Research Austria (BMBWF). The success of the project is also due to the involvement of all the students, teachers, and helpers.