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CASE STUDY:

HOW ARANET4 HELPED TO MITIGATE COVID-19 RISKS IN ISTITUTO IC, A SCHOOL IN MILAN

Air quality monitoring

ISTITUTO IMMACOLATA CONCEZIONE (ISTITUTO IC) is a primary school, a kindergarten and a day-care center in Milan, Italy.

Since the initial lockdown began in March 2020 the school started looking for the most suitable solution to reopen the following September. Many possible safety precautions were examined to allow the school to operate with all students present in classrooms. The parents, the teachers, the school staff and management all joined forces to re-think the organization of the school to minimize COVID-19 risks as much as possible.

It just so happened that one of the students' parents was **Prof. Ciribini** – a research fellow in civil engineering and architecture from the **University of Brescia**. His work during the last years has been focused on possible improvements of educational facilities. He involved a team of researchers from various universities, in order to investigate the case and provide support, advice, and expertise to allow a safe re-opening of the school after the initial lockdown.

One of the key elements in providing a safe return to the school is a good air quality. As one of the main transmission routes of the SARS-CoV-2 virus is via airborne aerosols, it is necessary to ensure good ventilation of indoor spaces. In rooms without air exchange the virus can linger in the air and remain infectious for several hours, so by ensuring sufficient air exchange this contagion risk can be greatly reduced.

> **"We calculated the theoretical air exchange rate per hour depending on the features of each classroom – its geometry, location of the windows etc. Based on the models provided by Prof. Jose-Luis Jimenez – the world-renowned expert on COVID-19 aerosol transmission, and also consulting pediatricians and pulmonologists we decided to install CO_2 monitors in the school."**— explains Prof. Ciribini.

15 **Aranet4** devices were installed in all classrooms and in the canteen to monitor air quality and to provide guidance for regular ventilation of all rooms where the students spend their time during school hours. All of the sensors were connected to the **Aranet PRO base station** which was set up to transmit the data via the MQTT protocol to the university server for a more detailed analysis.

> **Paolo Bellagente** a research fellow University of Brescia who oversaw the technical implementation of the project remarked — **"The installation process was easy – the system was working "out-of-the-box". Because of the MQTT license data extraction was straight forward. The Aranet base station is inside of ICT network of the school and it is connected to our servers in a safe and encrypted way. It is very secure, very fast and easy to set up. We set up the communication part in less than a minute."**

Since the beginning of the academic year until March (when a region wide lockdown was implemented in Lombardy) ISTITUTO IC was working in-person with the regular lesson schedule. They introduced several precautions:

- Coordination of entrance and exit of people, modeled on simulations.
- Measurements of body temperature with an infra-red thermometer.
- Rigid and separated flows of children among classrooms to optimize physical distancing.
- Scheduled use of the canteen with minimal overlap for children from the primary school.
- Children from the daycare and kindergarten have their lunch in their classrooms and not in the canteen.

- Use of surgical and FFP2 masks and facial coverings for teachers and the students of primary school.
- Use of hand sanitizing gel dispenser.
- Separate playground areas for every children's group, even outside.
- Specific protocols for cleaning and sanitizing of rooms according to the guidelines.
- Specific protocols for management of suspected and confirmed infection cases of Covid-19, according to the guidelines.
- Aranet4 for air quality monitoring in classrooms and in the canteen.

> **"I think that Aranet4 is very useful and I would advise its use in any school since it can be considered a necessary tool to monitor indoor air quality. It can timely inform about the need of ventilation to avoid the spread of the virus. Especially in the winter, when it is impossible to keep the windows constantly open, it is very useful to have a target indicator for the need for air change, thus helping to keep a balance between indoor temperature and air quality."** — says Cristina Racchi, the school head teacher.

Before the start of the new semester all of the school's staff was trained to follow a health and safety protocol with special attention to the basic recommendations – use of masks, social distancing, hand sanitizing, rooms sanitizing, regular ventilation of rooms.

When Aranet4 devices were installed, all teachers and staff were instructed on how to use the information provided by the devices. When the measured CO_2 concentration level approaches 1000ppm, windows are opened until the level drops below 700ppm.

Especially in the canteen, that is a place at major risk since many children from different classrooms join, Aranet4 reveals to be very useful with its continuous monitoring.

> **"In contrast to other schools, where a single infection has caused a lot of contagion by spreading quickly, in our school we have had only 4 cases (among students, not among teachers or other personnel of the school) and these 4 cases were promptly isolated, without spreading to other students. This is the proof that the prevention protocol adopted by us works properly, and the ARANET4 is part of this success."** — says Cristina.

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