Safer Schools
to protect our future

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Index

Executive summary

Like many businesses and administrations worldwide, schools, colleges and universities have been deeply affected by the rapid spread of Coronavirus and in many countries, educational institutions were forced to either close, operate at reduced capacity and/or move online when possible.

Schools not only transmit knowledge and academics skills to children; they also permit socialization and the transmission of cultural norms and values to new generations. As a result, schools can be seen as a social hub where children, teachers and parents meet however the additional level of required close interaction means that virus transmission need to be considered.

Thanks to recent global and coordinated efforts from the medical and scientific communities, it is now possible to adopt local strategies that allow school reopening in a controlled manner whilst adhering to local or national government guidance.

The solutions put forward in this paper allow for the creation of additional spaces and corridors within the existing building footprint by adopting temporary and easy to install partitioning technology. Existing evidence demonstrates that available space can be re-allocated in a cost-effective way enabling and increase in social distancing, reduction in close interactions and efficient management of flow of people in and around the infrastructure.

In addition, a proactive approach by adults and children to adopting the use of personal protective equipment (PPE) and good hygiene practices will undoubtedly further reduce the transmission risk. The wide range of PPE now available makes it easier to accommodate young children and adults while considering specific requirements such as lip reading.

Introduction

While we do not yet have enough evidence to measure the effect of school closures on the risk of disease transmission, the adverse effects of school closures on children's safety, mental and physical well-being and learning are well documented. Long term interrupted educational delivery is also likely to have long-term consequences for economies and societies such as increased inequality, poorer health outcomes and reduced social cohesion.

In many countries, data on virus prevalence is incomplete and decision makers will need to make their best assessments against a backdrop of incomplete information and uncertainty.

Know the latest facts and stay informed about COVID-19 through reputable sources

National governments and partners must simultaneously work to promote and safeguard every child's right to education, health and safety, as set out in the Convention on the Rights of the Child. The best interest of the child must be paramount.[1]

Schools play a critical role in the wellbeing of communities[2]

Global principles

It is important to consider community transmission risk as schools reopen. Evidence from schools internationally suggests that school re-openings are safe in communities with low SARS-CoV-2 transmission rates. Computer generated simulations created in Europe have suggested that school re-openings may further increase transmission risk in communities where transmission is already high.[3]

For school activities, even in the presence of specific context, the guiding principles remain valid such as:[4,5]

1. Social distancing (maintaining an interpersonal distance of not less than 2 meters), staff maintaining distance from pupils and other staff as much as possible.

2. Group children together, avoid contact between groups.

3. Rigorous hand, personal and room hygiene.

4. The control and response capacity of the local and national health services.

1 Framework for reopening schools, UNESCO (United Nations Educational Scientific and Cultural Organisation) - https://en.unesco.org/

2 Preparing K-12 School Administrators for a Safe Return to School in Fall 2020, CDC (Centers for Disease Control and Prevention) - https://www.cdc.gov/

3 The Importance of Reopening America's Schools this Fall, CDC (Centers for Disease Control and Prevention) - https://www.cdc.gov/

4 Piano scuola 2020-2021, MIUR (Ministero dell'università e della ricerca) - https://www.miur.gov.it/

5 Guidance for full opening: schools - https://www.gov.uk/
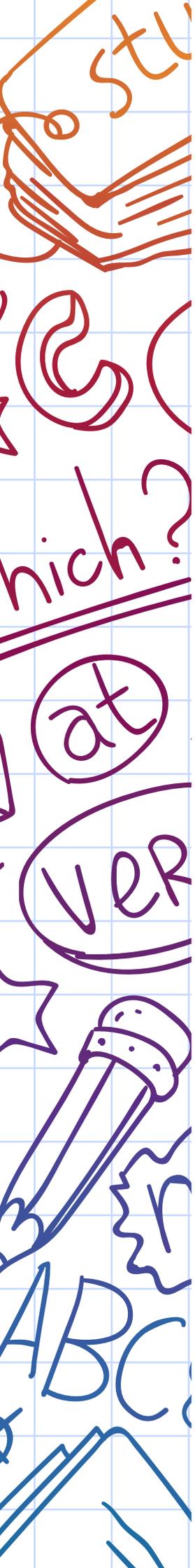
Geographical and social differences

Reopening schools safely is a complex challenge requiring careful evaluation contextualised against a number of factors including but not limited to the school order (users, educational programs, organisational-didactic methods), school and surrounding infrastructures, geographical location, social differences, etc.

It is a priority for each school to carry out a mapping of the spaces intended for all educational activities in relation to the number of pupils
and staff in order to ensure as much as possible the teaching in presence albeit with possible changes / hourly reductions.[6]

The following guidelines must be adjusted locally by evaluating the opportunities and the risks for each territory and applied to the specific needs of each school autonomy.

The lack or abundance of space a school can utilise also depends on the scope for varying the load capacity of students over time. The concepts proposed suggest adaptations for when a school's space is under-utilised or when a school is running at maximum capacity.

Social distancing

In the general organisational measures of the school, the principle of physical distancing represents an aspect of importance and of great complexity.

All possible organisational arrangements should be considered in order to differentiate the entry and exit of students both through staggering scheduling and by making all the access routes available in order to differentiate and reduce the load and the risk of crowding.

The physical distance remains a primary point of importance to prevent virus spreading...

Every organisational measure aimed at preventing gatherings of people, whether they be students, school staff or parents, must be implemented in common school spaces (corridors, common areas, bathrooms, teachers' room, etc.).

6 Fare spazio, Fondazione Agnelli & Future Urban Legacy Lab del Politecnico di Torino - https://www.fondazioneagnelli.it/

The right distance

The origin of the 1-2 metre / 6 feet social distancing rule for communicable disease significantly predates COVID-19. The research "What is the evidence to support the 2-metre social distancing rule to reduce COVID-19 transmission?"[7] report that the 2-metre social distancing rule assumes that the dominant routes of transmission of SARS-CoV-2 are via respiratory large droplets falling on others or surfaces however, safe transmission mitigation measures depend on multiple factors related to both the individual and the environment including viral load, duration of exposure, number of individuals, indoor versus outdoor settings, level of ventilation and whether face coverings are worn. Some medical experts say that the two-metre social distancing rule is based on 'outdated science'.[8]

In this whitepaper we will refer to 2 meters distancing rule but is important that social distancing should be adapted considering different factors

The distancing rule should be updated as the knowledge of the Sars-CoV-2 transmission improves. A recent study has isolated viable virus from air samples collected 2 to 4.8m away from COVID-19 patients. The paper highlights that patients with respiratory manifestations of COVID-19 produce aerosols that are smaller than simple droplets and these aerosols may serve as a source of transmission of the virus.[9]

Another research letter demonstrates that the ventilation system can increase the distance where those aerosols and droplets can travel.[10]

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7 What is the evidence to support the 2-metre social distancing rule to reduce COVID-19 transmission? - https://www.cebm.net/

8 "Coronavirus: Two-metre social distancing rule based on 'outdated science,' medical experts say", Vincent Wood - https://www.independent.co.uk/

9 Viable SARS-CoV-2 in the air of a hospital room with COVID-19 patients, MedRxiv.org (the preprint server for Health Sciences https://www.medrxiv.org/

10 Lu J, Gu J, Li K, Xu C, Su W, Lai Z, et al. COVID-19 Outbreak Associated with Air Conditioning in Restaurant, Guangzhou, China, 2020. Emerg Infect Dis. 2020;26(7):1628-1631. https://dx.doi.org/
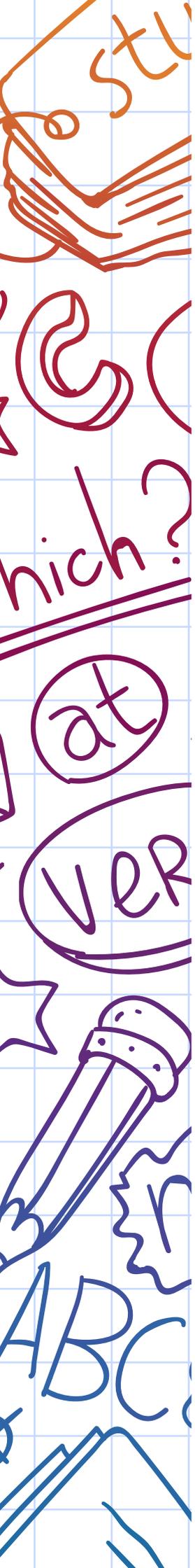
Social distancing applied to schools

In many cases, the classroom layout may need to be revised with a remodelling of the desks, seats and school furnishings, in order to ensure interpersonal distancing, also in consideration of the space of movement and the environment. International social distancing rules differ from country to country but various key points remain.

Modified layout

- Space seating / desk at least 2 metres apart when feasible.

- Turn desks to face in the same direction (rather than facing each other), or have students sit on only one side of tables, spaced apart.

- Create distance between children on school buses and public transport.

Physical barriers and guides

- Where it is difficult to maintain distancing, if possible, install physical barriers, such as sneeze guards and partitions (e.g reception desks, hallways).

- Provide physical guides, such as tape on floors or sidewalksand signs on walls, to ensure that staff and children remain at least 2 metres apart in lines and at other times (e.g. guides for creating "one-way routers" in hallways).

Communal Spaces

- Close communal use shared spaces such as dining halls and playgrounds with shared playground equipment if possible; otherwise, stagger use and clean and disinfect between use.

- Add physical barriers, such as plastic flexible screens, between bathroom sinks especially when they cannot be at least 2 metres apart or limit the number of users of washrooms at any given time.

Where to find the space?

Where to find the space for social distancing and correct space between the seating is a challenge for some structures. A study of recurring dimensions and types in Italian school buildings helps to identify spaces – indoors and outdoors - which can be an asset to host educational activities even on a temporary basis.[11]

Indoor

Within the school building the Italian research identified different space resources which almost doubled the available area to accommodate educational activities.

Classrooms 28%	Other (teachers' room, caretaker accommodation, clinic, etc .. 14%	Gyms and sports facilities 9%
11% (> 50 sqm)	Toilet 6%	Workshops 6%
corridors, lobbies, stairs 20%	Technical rooms 6% / Canteen 4% / Offices 3%	Classrooms music, art, etc. 3% / Large stairs 1% / Library 1%
4%		
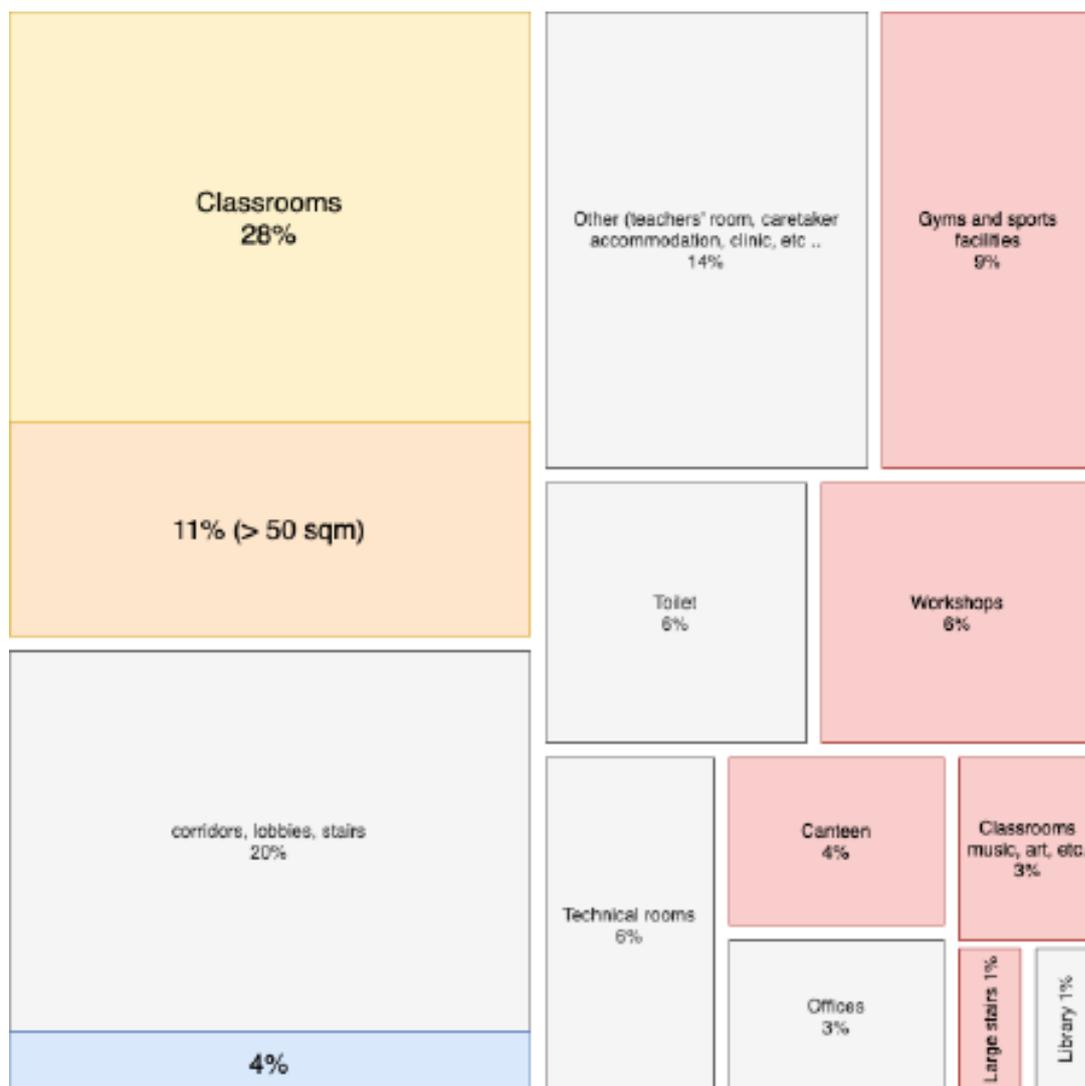
11 Rapporto sull'edilizia scolastica, Laterza, 2020, Fondazione Giovanni Agnelli,
   EAN: 9788858139622

23% of spaces for other activities
The sum of gyms, canteens, laboratories, music or art classrooms, large rooms such as auditoriums, theatres, and lecture halls - normally used on a non-continuous basis.

11% of space > 50m2 classrooms
The classrooms with an area > 50 m^2 are the 29% of the classrooms.

DISTRIBUTION OF ITALIAN CLASSROOMS WITH SURFACES RANGING FROM 15 TO 100 SQUARE METERS
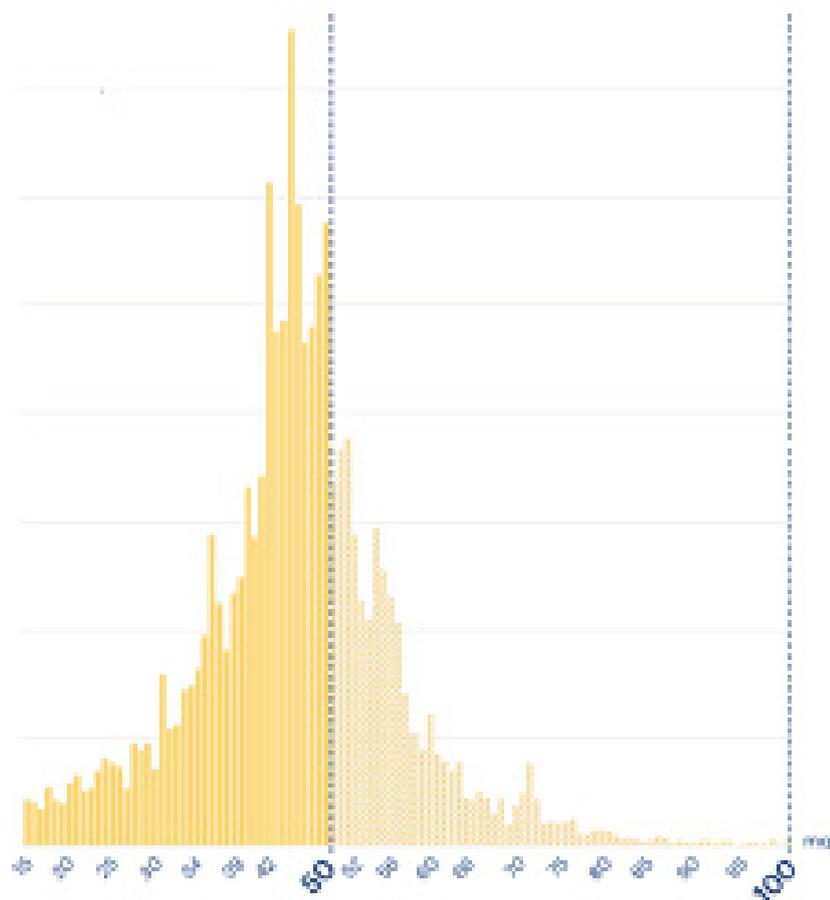
4% of distribution spaces
i.e. the portions of atriums and corridors on the above ground floors not strictly necessary for movement inside the building.

Outdoor

The open spaces belonging to the school, if properly equipped, are another important resource for teaching or for other activities that requires a controlled socially distanced area. Equipping these spaces with light, heat and removable covers (gazebos, tents, inflatable structures) allows them to be used for recreational and sports activities even in winter, thus freeing up internal spaces of the school for didactic activities.

Schools reorganisation guidelines

Once available space has been recognised, proposals and design can be presented for the transformation or repurposing of a schools internal and external spaces.

Redistribute large learning spaces

Some schools have large classrooms, which constitute a potential environment for carrying out parallel activities or for hosting several small groups.

Due to its size, the lecture hall / auditorium / gyms can provide a large amount of space for carrying out educational and recreational activities, especially when it is combined with the possibility of moving sports activities outside.

The use of curtains or dividing panels, can be useful for dividing the space, allowing the carrying out of more types of educational activities within the same room and with the use of a single teacher to supervise the whole class.
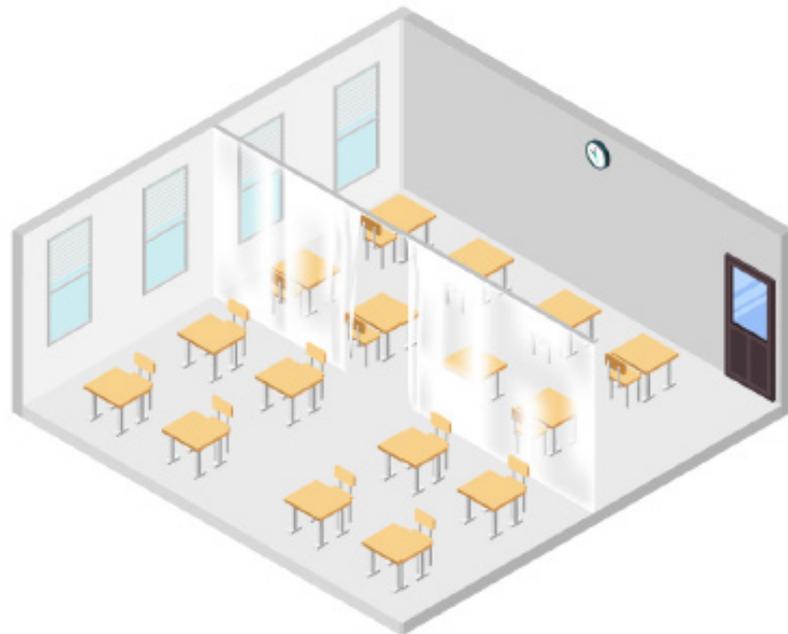
Reorganise non-continuous usage spaces

The canteen spaces are a resource for addressing the problems of organisation of the school space following the health provisions. However, the need to dedicate each teaching space to a fixed group of students could make these spaces unsuitable for meals. Depending on their size, the premises previously used as a canteen, workshop or laboratory could be reorganized to accommodate assembly educational activities (for example, welcoming a class) or for small group or free activities.

Extend to other shared spaces

Corridors, distributions and lobbies, if large, can also be used for all meetings that cannot be held remotely, including meetings with parents, class council meetings and small groups of teachers. Furthermore, with minimal modification, such as floor signs and furniture, it is possible to use these distribution areas for individual study activities or in small groups, ensuring the ability to supervise students if partitions are clear.
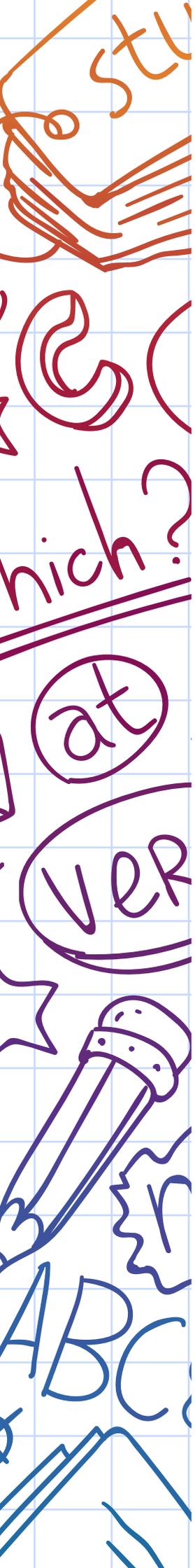
Organise the routes in the school

The possibility of increasing access points to the school building constitutes an important potential to avoid crowding at the time of entering and leaving the school. The addition of access points allows students and staff to reach the teaching spaces without crowding atriums and corridors. Inside, the identification of directions and the installations of long curtains, in particularly narrow corridors and spaces can help maintain social distancing and reduce risk factors.
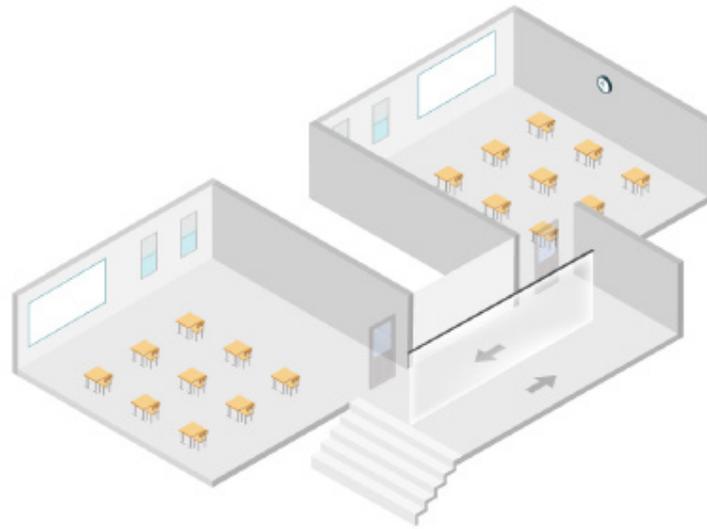
Create waiting spaces for entry / exit management

The management of flows during entry and exit times can be facilitated by the installation of simple structures in open spaces, also useful for managing forms of staggering. Signage on the ground is useful for identifying waiting areas. If longer waits are foreseen, the installation of lightweight roofs or tensile structures can provide shelter from rain and sun for pupils, families and staff.

Prepare and cover open spaces between buildings

Schools with open spaces between buildings can use them for educational and recreational activities. This type of set-up is helped by the presence of windowless walls of the building, useful for projecting films and images or for setting up sports equipment. Furthermore, the internal courtyards, if covered, can provide a useful expansion space for hosting outdoor recreational activities.
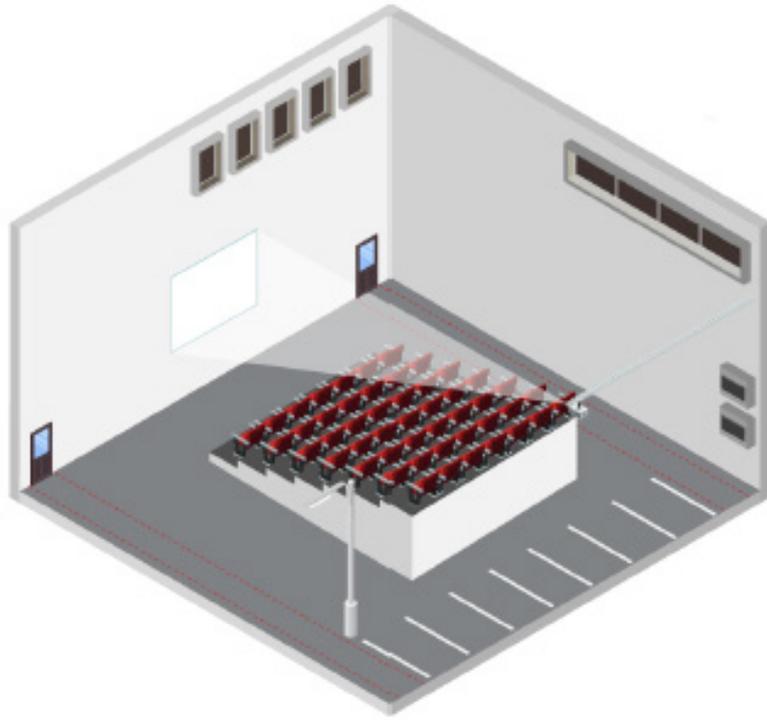
Source control

Source control is a term used to describe measures intended to prevent infected individuals from spreading disease.

Face masks

Surgical masks and face coverings are recommended as a simple barrier to help prevent respiratory droplets from traveling into the air and onto other people when the person wearing the mask coughs, sneezes, talks or raises their voice. This recommendation is based on what we know about the role respiratory droplets play in the spread of the virus that causes COVID-19, paired with emerging evidence from clinical and laboratory studies that shows masks reduce the spray of droplets when worn over the nose and mouth. COVID-19 spreads mainly among people who are in close contact with one another (within about 2 metres), so the use of masks is particularly important in settings where people are close to each other or where social distancing is difficult to maintain.[12]

Medical-grade mask like N95, KN95, FFP2 respirators of FFP3 are not recommended for general public as those are critical supplies that must continue to be reserved for health care workers and other metical first responders.[13]

Face Shields

A face shield is primarily used for eye protection for the person wearing it. According to a research conducted by health workers in Chennai, India, and published in the medical journal Jama Network, face shields reduced the percentage of health workers Infected with Covid-19 from 19% to zero in combination with a face mask.[14] "The face shields may have reduced ocular exposure or contamination of masks or hands or may have diverted movement of air around the face," the researchers suggested in conclusion.

At this time, it is not known what level of protection a face shield provides to people nearby from the spray of respiratory droplets from the wearer. There is currently not enough evidence to support the effectiveness of face shields for source control. Therefore, CDC does not currently recommend use of face shields as a substitute for masks. However, wearing a mask may not be feasible in every situation for some people for example, people who are deaf or hard of hearing or those who care for or interact with a person who is hearing impaired.

Although evidence on face shields is limited, the available data suggest that the following face shields may provide better source control than others:

• Face shields that wrap around the sides of the wearer's face and extend below the chin.

• Hooded face shields.

12 Considerations for Wearing Masks, CDC (Centers for Disease Control and Prevention) - https://www.cdc.gov/

13 N95 Respirators, Surgical Masks, and Face Masks, FDA (U.S. Food & Drug Administration) - https://www.fda.gov/

14 SARS-CoV-2 Infection Among Community Health Workers in India Before and After Use of Face Shields - JAMA. Published online August 17, 2020. doi:10.1001/jama.2020.15586
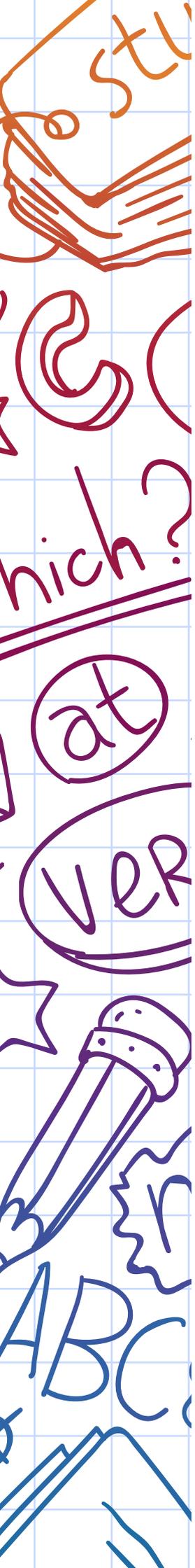
Rigorous hand, personal and room hygiene

Access to basic handwashing facilities is a key condition for schools to be able to operate safely in the midst of the COVID-19 pandemic.[15] The following checklist for school administrator, teachers and staff has been published by WHO and UNICEF:[16]

1. Promote and demonstrate regular hand washing and positive hygiene behaviours and monitor their uptake. Ensure adequate, clean and separate toilets for girls and boys

    a. Ensure soap and safe water is available at age-appropriate hand washing stations

    b. Encourage frequent and thorough washing (at least 20 seconds)

    c. Place hand sanitisers in toilets, classrooms, halls, and near exits where possible

2. Clean and disinfect school buildings, classrooms and especially water and sanitation facilities at least once a day, particularly surfaces that are touched by many people (railings, lunch tables, sports equipment, door and window handles, toys, teaching and learning aids etc.)

    a. Use sodium hypochlorite at 0.5% (equivalent 5000ppm) for disinfecting surfaces and 70% ethyl alcohol for disinfection of small items, and ensure appropriate equipment for cleaning staff

3. Increase air flow and ventilation where climate allows (open windows, use air conditioning where available, etc.)

4. Post signs encouraging good hand and respiratory hygiene practices

5. Ensure trash is removed daily and disposed of safely

15 WHO Weekly Epidemiological Update 1, 17 August 2020 - https://www.who.int/

16 Key Messages and Actions for COVID-19 Prevention and Control in Schools, UNICEF & WHO - https://www.who.int/
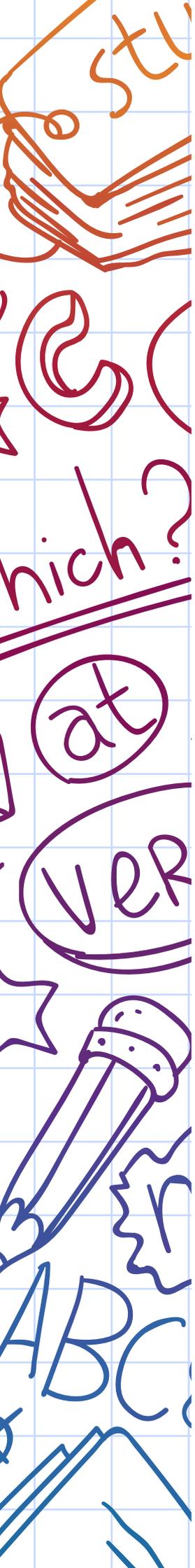
Conclusion

COVID-19 is a disease caused by a new form of coronavirus. It was first reported in December 2019 in Wuhan City in China. The epidemic – now pandemic – of the new coronavirus has advanced at a staggering pace and continues to do so. Fortunately, the scientific studies and evidence on the virus (SARS-CoV-2) and the disease (COVID-19) are also advancing at great speed. It is important that everyone knows the latest facts and use only reputable sources of information.

The best way to prevent illness is to avoid being exposed to this virus by following the good cleaning and social distancing practice. In public spaces such as schools there is a requirement to consider the remodelling of spaces io ensure the best protection for students, staff and parents. There are a number of organisations that can provide solutions to assist with PPE and social distancing measures of a temporary or permanent basis.

It is essential that governmental advice is adhered to and that everyone wears the necessary level of protective equipment correctly and close monitoring of symptoms is essential fever, cough or difficulty breathing balanced alongside testing to avoid infecting others or reducing the spread of the disease.
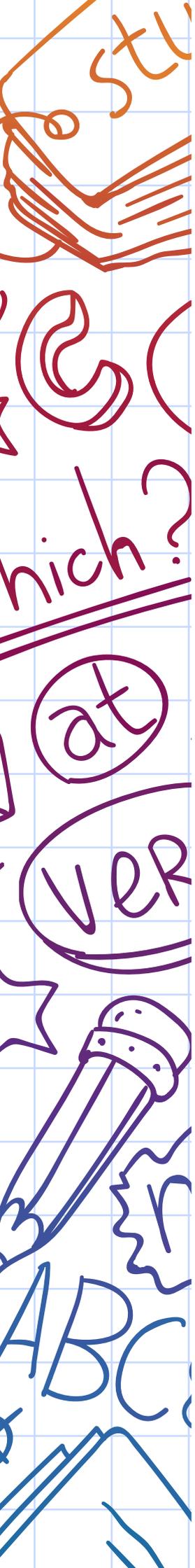
About the authors

Nicolas Chiovini graduated in Computer Science in 2007 from the University of Insubria in Italy and has since contributed to the development of new solutions and products, mainly within the cinema industry. With nearly 15 years of experience in material science, design and software, Nicolas thrives in complex and interdisciplinary situations where his open-minded attitude contributed to the development of an innovative playlist-less Digital Signage software and more recently to new large outdoor projection screens. Since 2016, Nicolas has been working for the industry leader Harkness-Screens in the innovation and cinema group where he now holds the position of Associate Director.

Cody Polla graduated in Industrial and Systems Engineering in 2008 from Virginia Tech and started installing cinema systems in North and South Americas for many leading exhibitors. He later transitioned to technical support and field engineering for a major cinema manufacturing company where he further developed his project and inter-personal management skills. Cody joined Harkness-Screens in 2015 as Technical Sales-America and quickly became Product Manager for Qalif automated calibration tools working with European wpartners to develop new innovative products and features.

Laurent Espitalier was awarded the title of Ingenieur-Maitre in Materials Science after graduating and completing his MSc at the University of Evry (France). He then specialized in advanced coatings and surface engineering at the University of Paris-Sud and completed his industrial thesis on the development of Diamond-Like Carbon coatings. Laurent has contributed greatly to the development of Plasma Enhanced Chemical and Physical Vapor deposition coatings in high-tech industries and is now lecturing at leading Universities in the UK. He recently completed his MBA with distinction from Lord Ashcroft Business School in Cambridge (UK) and gained a fellowship from the Chartered Management Institute.