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Rethinking the Concept of School Design: A Proposed Case Study in Upper Egypt

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ABSTRACT

Given the fact that Covid is still around, along with other airborne viruses, and the ever-growing population, public health became a priority in architectural design. As the COVID-19 pandemic upended the 2019–2020 school year, education systems scrambled to meet the needs of students and families with little available data on how schools' closures may impact learning. With poor economic conditions and infrastructure, the crisis was greater in the rural areas. Therefore, this paper aims to highlight the role that architecture can play during the epidemics, serving poor societies and rural communities. This paper also attempts to provide a typology for designing educational buildings, in the rural places of Egypt, that it can afford a safe environment for children, during and after pandemics. This typology will be concluded from the illustration of two schools' case studies; the first is a design example for the impoverished societies, and the second is a retrofit example during the pandemic. This paper also will illustrate a design example for a school proposal that targeted a poor society during pandemics. This suggested design, in Ezbit El safeh in Beni-Suef governate, entitled: Scaffold Educational Hub, is the 1st prize winner at Cairo Construction Hub sponsored by the prime minister of Egypt (2020). The design aimed to overcome the problem of school closure and the inability to access the internet. The concept of the suggested design depends on changing the routes of the educational buildings and create an educational building can stand and keep children safe.

1. Introduction

COVID-19 is a major experience of a generation that is likely to be repeated. Throughout history, many pandemics hit the world similar to what we have experienced with Covid-19; tuberculosis and the six cholera pandemics in the 19th century, and the Spanish flu pandemic of the early 20th century. These recurring waves of pandemics affected many lives in some way or another, and resulted in new priorities and new realities to face the new "normal" [1].

The 'new normal' as an expression has been coined since the economic crisis of 2008 to refer to the precarious economic socio-cultural unrest causing both communal and individual lifestyles [1]. Throughout the COVID-19 pandemic, this 'new normal' expression has been revived to illustrate the transformation of human life characteristics. Indeed, "the aftermath of the pandemic will irrevocably change the design of the built environment" [2].

During times of crisis, theorists highlight that there is an interaction between culture, individual feelings (powerlessness), and data understanding (conspiracy theories) [3]. However, it is up to us to adjust to the encounters of present transformations in pandemics and

parallel crises, and our response can consequently affect individual and social life.

Given the fact that the Covid pandemic is still around, along with other airborne viruses, and the ever-growing population, public health became a priority in architectural design. Health-oriented strategies and new standards emerged to be set. The "new normal" acted as catalyst of rethinking design and materials to face the challenges of the current situation. Concepts of modular design, prefabricated components, flexible partitions, and lightweight structures resulting in new design forms. Therefore, this paper will highlight, through case studies, the new design forms and architectural solutions that evolved in order to adapt to the "new normal". An amplified prominence is given to sustainability to enhance wellbeing, therefore biophilia and green architecture concepts are likely to be "the mainstream" [4].

Worldwide, one of the most critical life challenges during the epidemics was the education and learning system. Schools' closure caused many complications for students, teachers, and parents, especially in Egypt. With a population of 107.8 million as of July 2022, with approximately 31% of school age, Egypt's education sector faced a great challenge. Egypt has the largest student population in the MENA region, estimated at 24 million K-12 students in 2022, with Greater Cairo accounting for 20% (4.6 million) of the total number [5]. This huge number made the education sector one of the most affected sectors by the pandemic. In order to reduce physical contact between children and students, the Egyptian Government undertook a number of strict arrangements and promoted online learning. Given the fact that in the educational context, students' performance is enhanced through the inspiration of students and the incorporation of emotional, cognitive, and behavioral engagement [6].

2. Problem statement

As the schools' design were not prepared to cope with Covid situation. The sudden need of internet during the schools' closure period caused the failure of the unprepared infrastructure to meet such challenging over usage. The expenses needed for such infrastructure is challenging for developing countries. The magnitude of this challenge is clearly evident with regard to the digital divide between cities and rural areas in Egypt. Only 11% of learners in the slums have a family computer and only 18% have household internet. This is compared to the 50% of learners, in developed countries, who have computers in the home and the 57% who have access to internet. Inequalities exacerbating by the hit of this pandemic highlights the need for the professional intervention to serve the impoverished communities. Therefore, architecture statement here is to create an educational building that can stand and keep children safe, during and after Covid pandemic.

Since the Covid infection takes place through the small respiratory particles with direct and indirect routes. Thus, if the ventilation of buildings is reconsidered, as a significant factor in reducing the viral transmission, school children can resume their learning routine. Especially that children under the age of 16 years represent only about 8.5% of reported cases, with relatively few deaths compared to other age groups and usually mild disease [7].

Consequently, redesigning schools can promote normal educational life and overcomes the poor infrastructure conditions in rural areas. This will necessitate the deployment of the designers' creativity to exploit the minimal resources available in such communities.

3. Aim of the paper

Reaching a methodology for the design of the educational buildings, so it can provide safe environment for children, during and after Covid pandemic, specially at the most affected and impoverished places from the last closure. This aim will be reflected in different design elements as following:

- ***The "Master Plan"***
  - Creating interactive spaces, that promotes students' engagement without exposing to danger.
  - Rehabilitation of the building's entrances and exits in a way that helps avoid infection.
- ***The Interior***
  - Rethinking indoor spaces that handle the air buildings' ventilation systems to support students' interaction and normally resume their education activities in a safe place.
- ***The "Façades"***
  - Creating façades that promote natural ventilation to avoid infection.
  - Ensuring the distribution of fresh air throughout the different spaces to ensure all occupants' experience similar air quality.
- ***The "Ceiling"***

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- Creating a ceiling that conducive the process of ventilation and natural light, which reduces the possibility of spreading the infection.
- The shape of roofs approaches the shape and materials of the surrounding environment of the project site.

4. Review of literature

The literature review of this paper will be divided into two main sections: firstly, the studies that covered architectural intervention in rural and impoverished communities; and secondly, the studies that highlighted the role of architecture in lessening the effects of pandemics. This paper complements the current literature by providing a manifestation of the pragmatic resilient design solution that serves the impoverished to face the health hazardous pandemics.

4.1 Architecture in Rural Egypt

Architects throughout history strove to make different initiatives in rural Egypt. One of the most significant initiatives is the case of New Gourna by Hassan Fathy. Fathy aimed to design a whole village giving priority to affordability, climatic conditions and air quality [8]. Fathy's case was analyzed by many recent studies such as, Salama and El-Ashmouni (2021), and Salma Samar Damluji, Viola Bertini (2018). The first volume compared Fathy with other international initiatives that sought to achieve excellence in architecture. The latter focused mainly about Fathy's work through personal interviews conducted by the author, photographs, and drawings from the Hassan Fathy archives, and Fathy's own writings on the subject, many of which are published for the first time. While Fathy revived and utilized mud-brick architecture in a "contemporary way" [9], he faced many problems. Most significant problem was the villagers' rejection of such "contemporaneity" offered by Fathy [10].

Designing for the impoverished societies was studied by many scholars. An edited volume by Ismail Serageldein entitled: Architecture of Empowerment (1997) is about challenging architects to rethink the premises of the process of building for the poor through the empowerment of the poor [11]. Informal societies, in various countries all over the world, was the main theme of many studies such as, David Gouverneur's Planning and Design for Future Informal Settlements (2015) [12]; and Suhartini and Jones' study entitled: Urban Governance and Informal Settlements (2019) [13]. Also, the classical study entitled: Introduction to Social Housing, by Paul Reeves (1996) [14]. Most recent, a study by Nicolopoulou, et al (2021) about unplanned areas of Egypt concluded that "Social innovation can promote agile processes to prototyping services" [15].

There are also many cases that was supported by the foundation of the Aga Khan Trust for Culture, which upgraded the Darb El-Ahmar district in Cairo. The Aga Khan Trust also awarded the design of many schools in impoverished societies, such as Gando Primary School, Burkina Faso (2004), Rudrapur School, Bangladesh (2007), and Makoko Floating School, Nigeria (shortlisted 2014–2016). However, there is still lack of design examples and studies that focused on the Egyptian impoverished and rural places.

Therefore, this paper is significant as it looks at how various architectural approaches can be used to serve the impoverished in marginalized communities, especially during the pandemics.

4.2 Architecture and pandemics'

There are several studies that strove to highlight how architecture can intervene to reduce the risk of pandemics. For example, Salama (2020) parallelly discussed the dialectics of socio-spatial implications on urban space/ urban life and environmental psychology. He affirmed the necessity of a "needed synergy between architectural and urban education, research, and practice" [16]. Earlier, Rice (2019) called for an integration between architecture as a profession and the public health [17]. Many studies studied the impact of indoor environment on health generally, such as Jonathan M. Samet and John D. Spengler (2003) [18]. The health conditions of rural places were the subject of many other studies such as Matz, C.J., Stieb, D.M. & Brion, O. (2015) [19].

None of these studies focused on the Post Covid conditions in rural places of Egypt, specifically schools' design. Schools are a vulnerable environment because of the nature of its group activities that allows the dispersal of pandemics. Moreover, schools in the rural areas differs from that of the cities due to variations in lifestyle between city and countryside residents [20]. Rural places in Egypt was affected by Covid pandemic on many fields, mainly the educational field. Poverty conditions challenges the adaptation to the pandemic's new restrictions. The poverty and poor infrastructure made online education impossible, and exacerbated school education environment. Therefore, while this paper attempts to come up with pandemics' considerations in local impoverished societies, it will demonstrate the pandemics' considerations in the Us to rethink locally specific considerations:

4.3 Pandemics' Considerations

For reopening schools during pandemics, the American Institute of Architects (AIA) collected multi-disciplinary crew of architects, public health experts, engineers, and facility managers to evaluate and reformulate the built environment. This initiative was devoted to conclude "considerations and standards" of schools' design, some of these considerations are [21]:

- **Entrances and circulation spaces**

For security issues, school students typically allowed to move through a sole entry that is closely supervised by teachers and/or security staff.

Surrounding gates that are away from the sight are devoted for emergency situations only. Entrances and foyers challenge the ability of physical distance [20]. This can cause extended lines at schools' entrances, extending the entering time, and results in congested corridors. Schools should take into consideration checking all users for any signs of illness at the school's entrance. To reduce the spread of illness, regulations and strategies can be followed at the entries and in movement spaces [22], such as:

- Different schedules for each group.
- Different entrances for staff and students.
- Making line up zones at a building's entrance with signage illustrating least six-foot distancing.
- Building temporary infrastructure, to support queuing to overcome weather challenges.
- Creating an administered isolation area for symptomatic students.

- **Classrooms**

Twenty-students is the average classroom capacity in a typical US public school. Depending on state's standards and student age groups, classrooms' minimum space is about 700 sq. ft and can reach 1,300 sq. ft. Interactive programs are promoted in education science; therefore, students work in groups while fronting each other in the classroom for learning activities. The current contact threshold between students for periods longer than 15 minutes. The spread of germs increases through frequent surface touch [23]. To reduce the spread of illness, some regulations and strategies can be followed in classrooms that include, see Figure 1:

- Decreasing number of students, desks, and worktables in classrooms.
- Expanding space for students by eliminating additional furniture.
- Turning desks to face the same direction and fixing casters to prevent furniture movement.
- Mapping floors to outline one-way walking pathways and furniture locations.

- **Cafeterias and food services**

Cafeterias and food service zones can present risk due to the high number of interactive actions. Additionally, cafeterias typically accommodate large groups, which is challenging for controlling the standards of physical distances and could necessitate waiting lines while selecting food. Therefore, the cafeterias' spaces should be turned into learning spaces—to meet educational spatial needs. Various tactics for food amenity while cafeterias are shut include:

- Enquiring all the users to depend on their personal flasks and food.
- Offering meal delivery options indoor or outdoor on different schedules for each classroom.
- Offering hand sanitizing posts in schoolrooms with suitable and touchless waste containers.

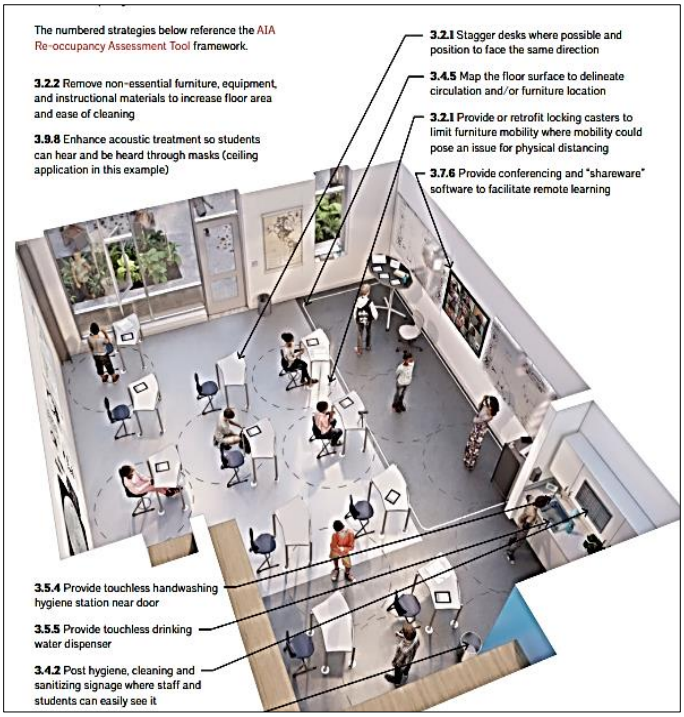


Figure 1. Single classroom (800 sq. ft.), Courtesy of AIA Report.

- **Public bathrooms and staff areas**

Restrooms and staff office spaces, are common across multiple building types, and are very hazardous spaces. School locker rooms will have hazards and strategies similar to restrooms. AIA report Reopening buildings provided many risk mitigation strategies for both of these spaces:

- Installing automated toiled lids that close directly before flushing.
- Installing touchless bathroom fixtures, such as faucets, flushes, and soap dispensers, and automated doors.
- Restrict access number of students to lavatories to ensure physical distance.
- Locker rooms should be open spaces for more ventilation, see Figure 2.

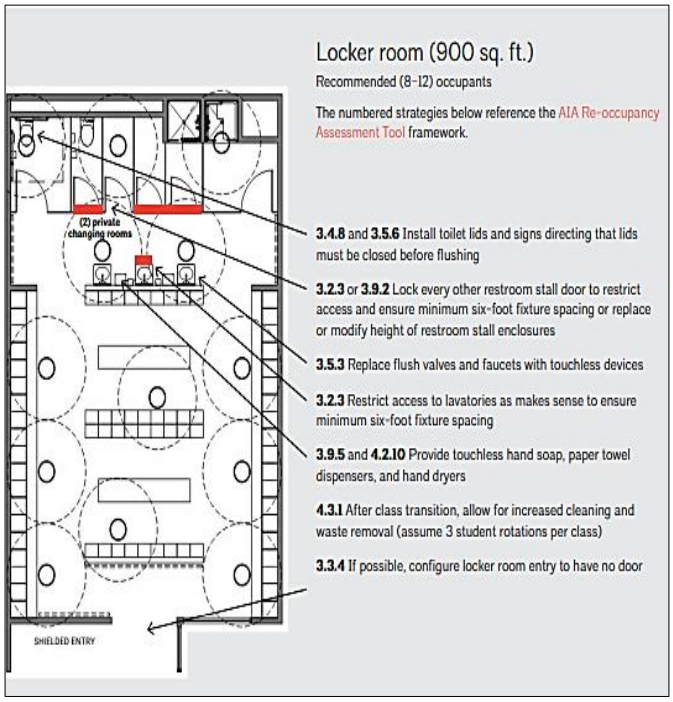


Figure 2. Example illustrating Locker room (900 sq. ft.), Courtesy of AIA Report.

Therefore, this paper will go through two case studies for school designs. First, the Gando Primary School design as an example of school design in impoverished societies. The second is the retrofit principles and actions implemented in the Samuel Randall School in Bronx, New York during the pandemic. Then the paper will illustrate the 1st prize winner proposal presented in Cairo Construction Hub sponsored by the prime minister of Egypt, for school in the impoverished area of Ezbit El safeh, Egypt.

5. School Design Case Studies:

5.1. School Design for the Impoverished

Gando Primary School, designed by the architect Francis Kéré for the impoverished in Gando, Burkina Faso. Kéré's concept relied mainly on a list of parameters including cost, climate, resource availability, and construction feasibility. The clay/mud is the most affordable traditional construction material used for housing in the region. Exploiting the most affordable local material of clay did not prevent the creation of a "structurally robust" building [24]. In order to protect the clay bricks from rain the architect added a large overhanging tin roof, which is a foremost material in Burkina Faso roofs. However, in this project, using the clay walls compensated the absorbed heat of the metal roof. Also, pulling the roof of the Gando Primary School away from the walls prevented the increase of heat in the interior of the learning spaces, see Figure 3 and 4. Therefore, the design is an attempt to achieve optimum results with the nominal accessible resources.

The design also addressed two main complications in schools' design in Burkina Faso: lighting and ventilation. A dry-stacked brick ceiling is presented in between, permitting for optimal ventilation: while cool air comes through the interior windows, hot air exits through perforations in the clay roof. By lessening the need for air-conditioning, the school's ecological print will decrease [25]. The design successfully associates traditional and modern building practices to produce best building solutions while simplifying construction and future maintenance. Moreover, Kéré was also able to involve the local community in the building process [26].

Figure 3. Gando school, illustrating the overhanging tin roof. Courtesy of Architecture Review.

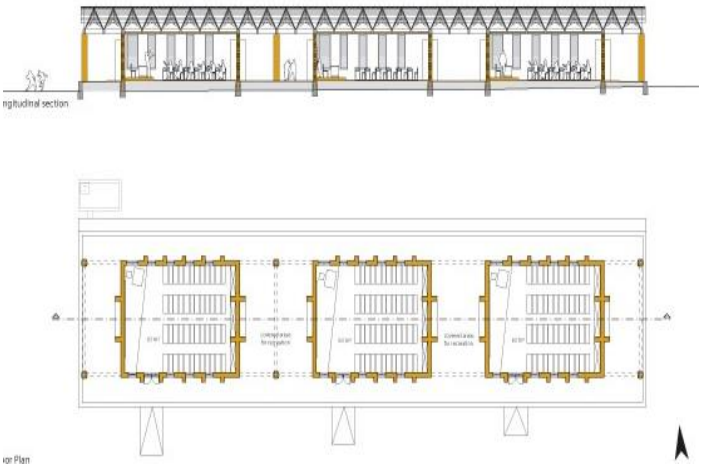


Figure 4. Gando school, illustrating the overhanging tin roof. Courtesy of Architecture in Development Webpage.

5.2. Pandemic Adaptive Schools' Design

5.2.1 Samuel Randall School in Bronx

Safely reopening schools for the academic year, is the most argumentative discussion of all educational parties; administrators, educators, parents, and students. The creation of strategies to exploit the learning spaces through instant act plans, targeted retrofits, and redesigns, is necessary—along with public health directives and reviewed curriculums [27]. Schools' organizations are reviewed by school administrators, designers, building specialists, and teachers— to face the hazards of the epidemic in the already built school buildings, and how to secure their occupants [28].

But even as school districts outline cautious hybrid learning programs– some informing plans [29] – new resources are coming online to motivate discussions about safe building operations. The Centers for Disease Control and Prevention (CDC) is updating recommendations [30]. The Urbahn Architects developed a guide that is based on the design of a New York City public school. This guide was developed through an extensive analysis of core CDC (Center of Disease Control) recommendations [31] and through studying the reopening strategies implemented in Europe and Asia. It is notable that the changes in design standards charted by Urbahn architects and others increased health services in schools and prepared for an ambiguous future [32]. Therefore, Urbahn Architects presented interventions in various levels that ranges from instant retrofits of current amenities to complete changes for future school designs.

The instant retrofits implemented through techniques of pandemic transmission prevention – forming plentiful stations for hand wash and surfaces' sanitizing, as well as enabling social distancing, use of masks, and retrofitted equipment to avoid aerosol diffusion, see Figure 5. Those techniques were applied in Samuel Randall School in Bronx, NY, represent the most significant gears to prevent the virus spread before the availability of vaccination. This example of Samuel Randall School showcases a practical roadmap that ensures students' and staffs' regular sanitation and safe distances [33] The Urban retrofit plan prepares the school at maximum to seat around six-hundred students – only thirteen less than its original capacity.

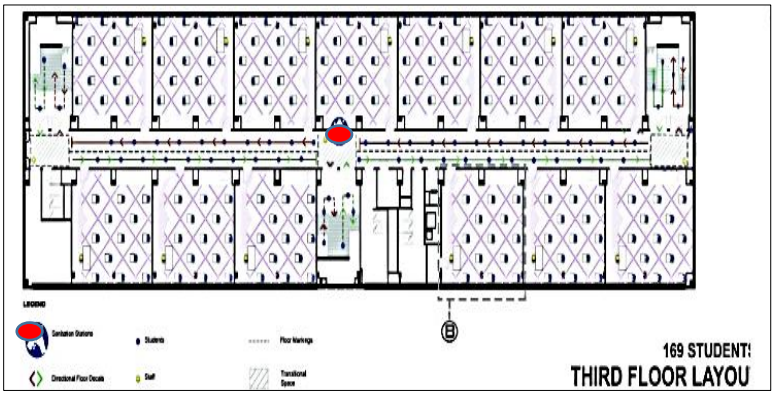


Figure 5. An illustration of a rearranged classroom layout to alter circulation routes to facilitate social distancing. Courtesy of Urbahn Architects

The Urbahn plan focuses on sanitation and isolation across the critical parts of a school rooms, amenities, and entrances, see Figures 6& 7. For instance, the plan is to add prefabricated sanitation posts in the foyer and corridors to facilitate frequent sanitizing. The plan also ensures one-way passage flows in corridors, stairways, and around sanitizing areas. Moreover, the plan examined each of the classrooms' proper social distancing. The plan also examined refunctioning some large rooms, such as the fitness facility and restaurants, and turning them to educational areas, see Figure 8. This comprises rescheduling sessions during the day or across the week between classrooms and separate stations in larger spaces while finishing their school assignments using laptops or tablets or experimenting self-learning strategies. This allows two formats of learning directed by the same teacher to simultaneously take place within the school spaces. Both formats enable instructors to keep students involved both in person and remotely – all under the school's roof. Moreover, the refunctioning of auditoriums allows the usage of offstage precincts as isolation spaces and separated exits – when any infection symptoms appear on students or staff [34].

HAVAC systems are critical in schools and should necessarily be adjusted to prevent stagnant air in schools and improve air circulation [35]. While renewing and reinstalling appropriate filters with higher efficiency is crucial in schools with main HAVAC units, operable windows and fresh air is urgently reconsidered to guarantee an ongoing air exchange. Since HVAC systems partially depend on recirculated air, filtration is crucial. Therefore, New York City design guidelines call for the expansion of filtration and its upgrade to MERV 14, 15, or 16 filters [36]. It also calls for the installation of moveable filtration units and disinfection, or close return obstructions to avoid air recirculation.

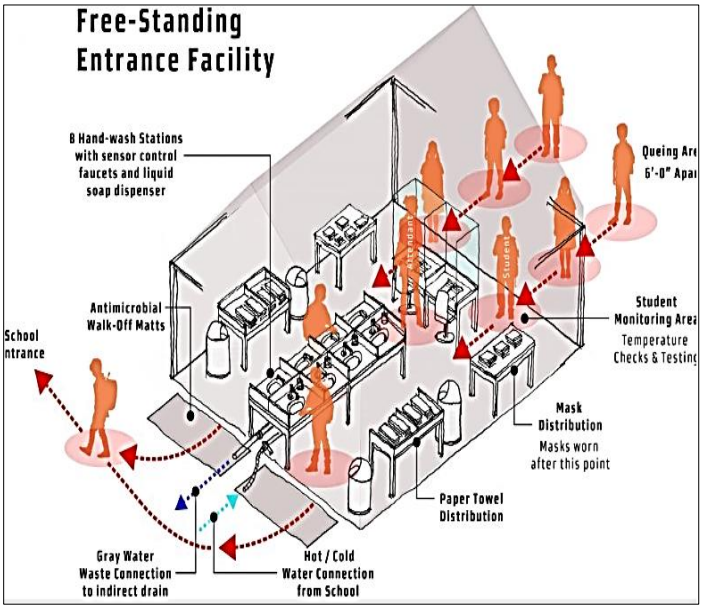


Figure 6. The entrance with appropriate organization of sanitation unites to warrant both proper distancing and shorter queuing time prior to entering their school. Courtesy of Urbahn Architects

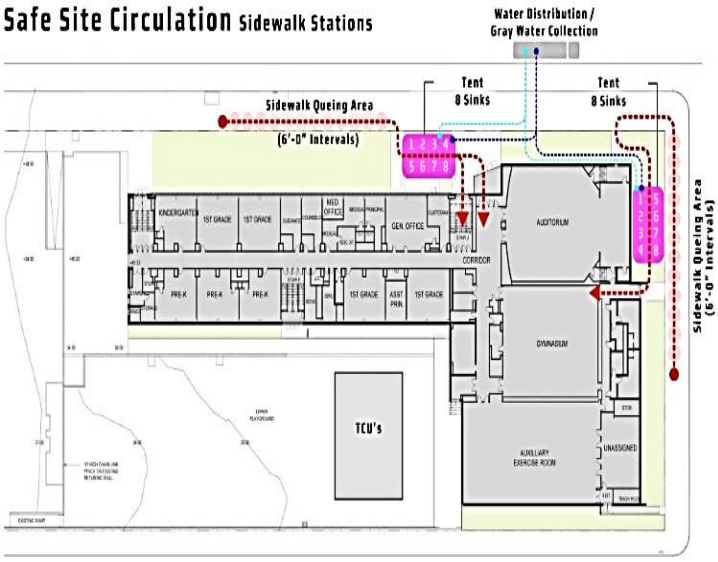


Figure 7. Proper organization of Sidewalk Sanitation units will ensure proper distancing prior to entering their school. Courtesy of Urbahn Architects

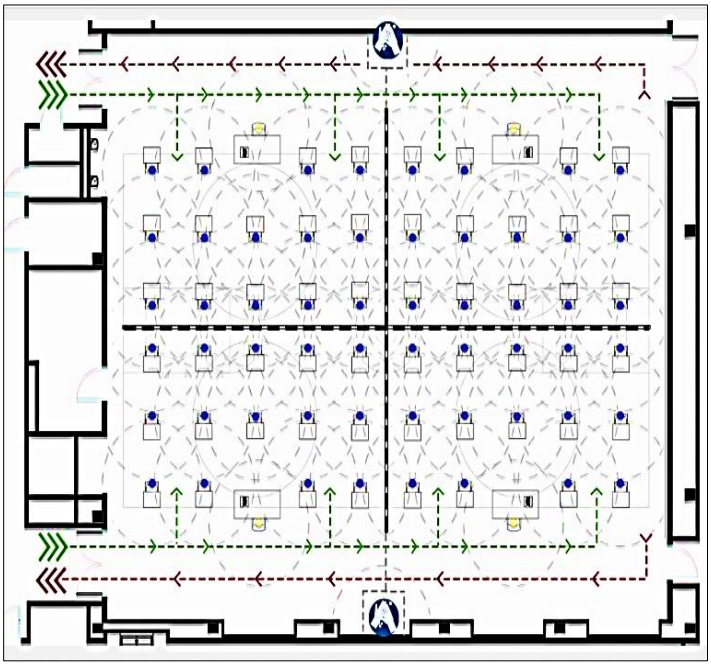


Figure 8. The plan of students' desks and partitions in a gymnasium to increase students' distancing. Courtesy of Urbahn Architects

These interventions are low-cost initiatives that almost all schools can easily implement. However, over the next year, the retrofit of existing services and amenities, as well as longer-term permanent changes to future school designs, should be reconsidered. Upgrading projects could focus on adjustments of foyers and passages to alter ventilation circulation and mount permanent sanitizing stations [37]. Future schools would allow swift adjustment actions with nominal fluctuations to the school design in case of any future pandemics to adapt new strategies [38].

Moreover, long-term tactics should be implemented in schools' classrooms to be adapted to imperative pandemics. It may be desirable for standard classrooms to be larger size. In this way, social distancing will be easily applied to combat any future airborne disease. Classrooms should be designed to accommodate less number of children to reduce the strain on the teaching staff and evades the need for splitting up classes and lessons [39]. Also providing sanitizing stations and toilets in the school rooms will reduce the frequent trips to the main toilet. Recess can be indoors and students stay in their classes during a pandemic, to stop cross-contamination of other classes [40].

5.3. Design Proposal in Upper Egypt: Scaffold Educational Hub

This project is the 1st prize winner proposal presented in Cairo Construction Hub sponsored by the prime minister of Egypt, for school in the impoverished area of Ezbit El safeh, Egypt. The winners were selected between ninety entries from forty Egyptians universities and private design studios from Egypt. The project's team consists of four young

designers: Alhussein Ben Aly Sakr - Alaa Hamed - Alaa Hassan Al Ghannam - Hager G. Abdelhady who decided to take the challenge of designing an educational building that harmonizes with its surrounding. The design challenge is to find design solution for a small sustainable ecological space, that was affected by the pandemic "COVID-19" to achieve maximum health safety for users. The education is one of the slums' most challenging issues. This design can be used as typology that serves similar impoverished communities in Egypt, given that many of them have similar characteristics.

5.3.1 Location Analysis and Concept

. Ezbit El safeh is a slum area in Beni-Suef province in Egypt, see Figure 9 & 10. About 3000 families living in only 40 acers, Ezbit El afeh is considered one of the most dense and poorest places in Beni-Suef City, besides the lake of social services. Ezbit El safeh which called the tinplate manor, this name is gained from the rise of tinplate houses that created the place, see Figure 11. Ezbit El safeh is a typical recurring example of the Egyptian slums. The buildings of the area are mostly in poor conditions and with average height of two to three floors.

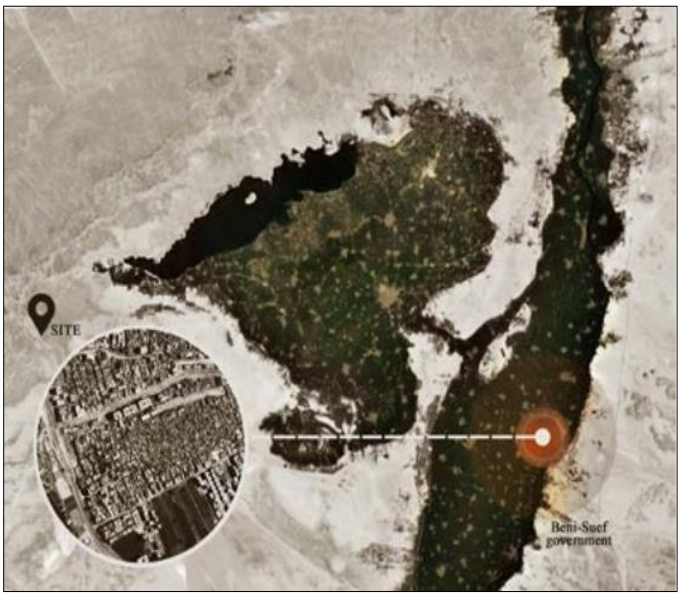


Figure 9. Project location in Egypt. Courtesy Google maps.

Figure 10. Project's Location Analysis. Courtesy of Researchers.

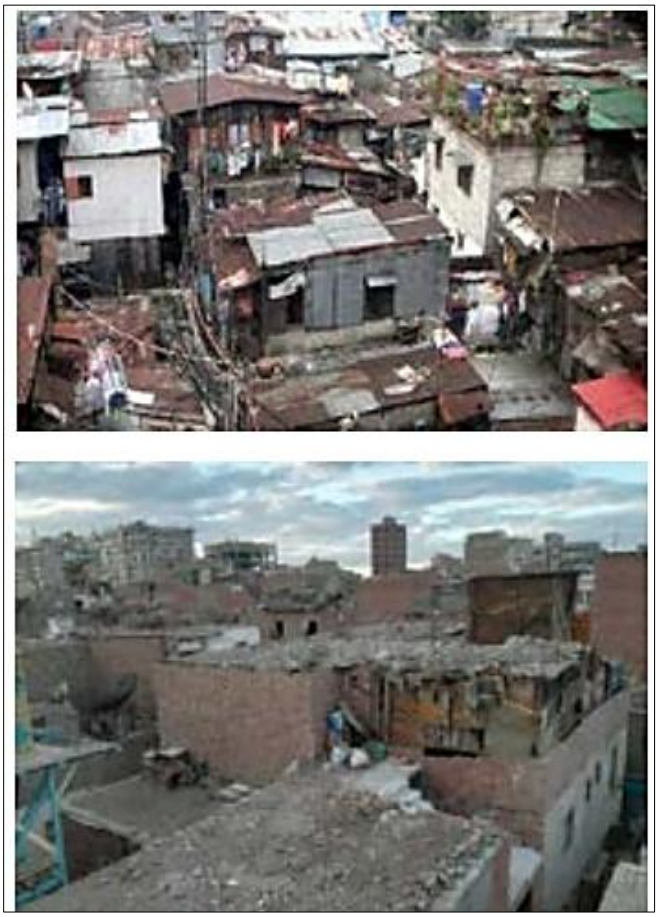


Figure 11. Houses in Ezbit El Safeh, Beni-Suef, Egypt. Courtesy of Researchers.

Covid 19 imposed drastic adjustments to people's lives, the coronavirus has introduced a new "normal", changing our perceptions and altering our priorities. Driven towards

questioning and evaluating our environment, we are constantly reacting and anticipating an unknown future. The new restrictions placed on society have been a catalyst to rethink much of what we take for granted in the built environment.

Therefore, the main theme of the school is the 'scaffolding', also called scaffold or staging, which is a temporary structure used to support a work crew during the construction process. Scaffolds are widely used on site to get access to heights and areas that would be otherwise hard to get to. Moreover, scaffolding, as an educational strategy, is defined as a process in which a knowledgeable individual supports an apprentice to resolve a problem or carry out a mission [41]. This scaffolding strategy positively affect students' emotional and cognitive abilities. Therefore, the concept of this design proposal relied on the scaffold as an architecture system to provide an affordable light material and a rapid solution for the problem of education during Covid era, see Figure 12 &13.

Figure 12. Main shot of the project. Courtesy of Researchers.

Figure 13. Main shot of the project. Courtesy of Researchers.

- **Interior studies**

The design relied on the instructions of the AIA standards and the principles applied in Bronx School of the physical distancing.

Also, based on Gando's primary school concept of affordable light material, the designers proposed using movable partitions, made from light wood as an affordable material, to separate different classes and activities. The design also exploited walls to install interactive playing staging boards to allow individual activities and reduce interaction during recess time, which should be scheduled in a staggering manner, see Figure 14& 15.

Figure 14. Movable wooden partitions and spaces between children. Courtesy of Researchers.

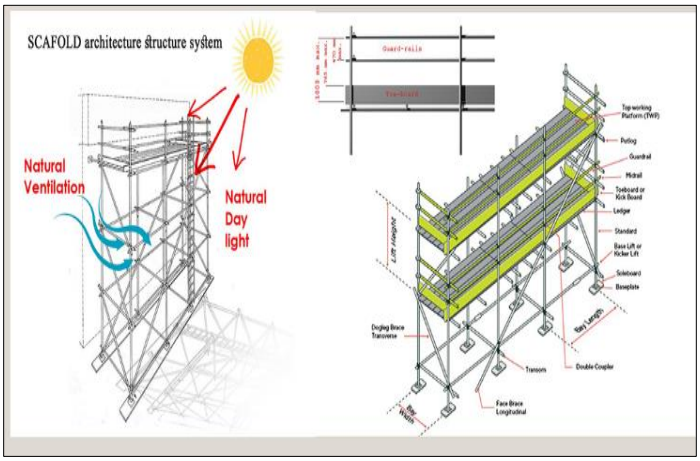
Figure 15. Playground staggering activities for individual open-air activities. Courtesy of Researchers.

- **Structure studies**

The main skeleton of the proposed project is made of a scaffolding assembly This type of scaffolding is called pipe staging. The basic components of scaffolding are tubes, couplers and boards. The frame is made of metal aluminum or steel tubes, or wooden studs, to create a strong frame. Couplers are little corner pieces that are used to join the ends of metal tubes together, see Figures 16 & 17& 18. A scaffold of various sizes and heights could be assembled easily by a couple of workers.

Figure 16. Scaffolding structure members exposed in the interior. Courtesy of Researchers.

Figure 17. Vertical 3D Section. *Courtesy of Researchers.*



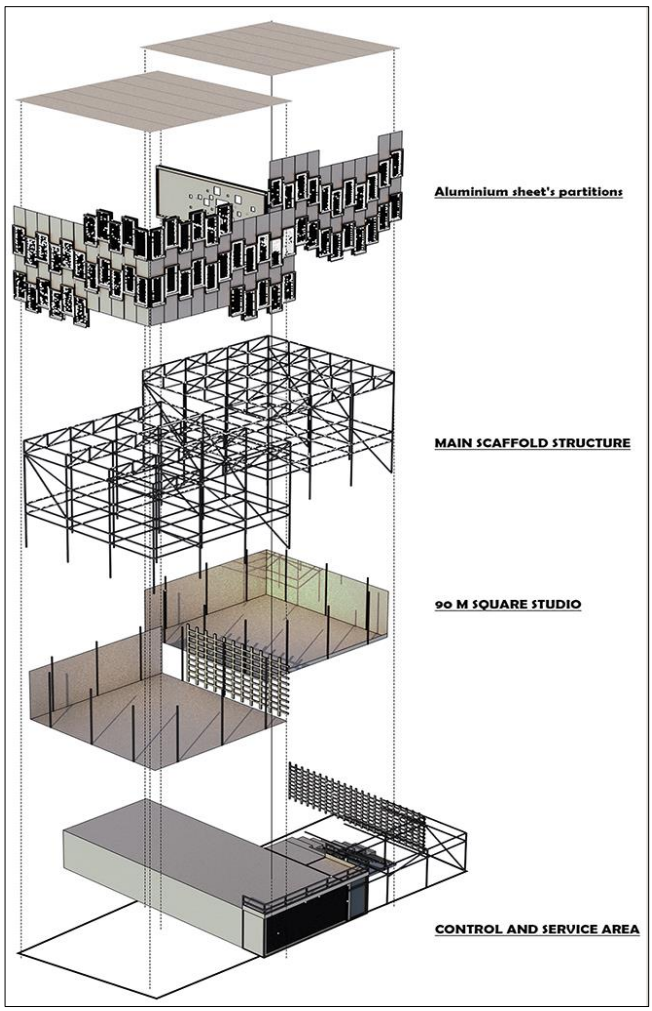


Figure 18. Structure sections and analysis

6 Conclusion

Over the past few decades, school design endeavored to cope with the varying needs of students and has moved away from traditional approaches of learning. Schools became places of transformation—cultivating new knowledge, splendid stories, and visions of children, allowing transformation into young adults. The pandemic raised many worries and inquiries about coping with health protection needs without failing the desires of an entire generation of learners. With the amplified risks of pandemics and the increased poverty, it is a turning point in the architectural profession to proactively contribute to the enhancement of the educational system for generations to come, by refocusing on accessibility, equity, and the innate needs of learners.

Similar to the initiatives made by the AIA during the Covid 19, at a localized level, architects, educators, and students must work together to establish innovative solutions that will provide places that suites the economic conditions of our society. Architects should rethink schools' design to accommodate virtual or in-person— where collaborative, problem-solving, agency-driven, and project-based learning can happen. Online distance learning should not replace our traditional classrooms. As conditions evolve, our learning environments must also evolve in response to community interdependencies and student needs.

Certainly, advanced building envelopes, when economically applicable, can face challenges and hazards of pandemics. However, the 'scaffolding' design proposal, illustrated in this paper, is a practical example that manifest such rethinking of schools' design in impoverished societies to face health hazards. This proposal, inspired by the concept of light affordable materials of the Gando School, reused scaffolding materials to serve impoverished societies. Moreover, the 'Scaffolding school' applied the principles of interior separation, natural ventilation, and Covid distancing limits in the Samuel Randall school. This paper highlighted that "architecture can be a cure not a cause—of communicable illness" by creating "hygienic spaces" that are able to reduce "episodic pathogen transmission" [3].

This research found almost not enough experiments to broaden the use of recycled materials and construction scaffolding in the building sector of poor places in Egypt. This highlights the importance of integrating methods of upgrading and reusing materials in different educational experiments and institutions. The school design comprises multifaceted approaches and fields. Therefore, this research opens the way for continuing studies associated with schools' design adapted to rural social challenges and new health hazards, for researchers from different areas of knowledge. In this way, the emphasis here was on design challenges in the education field in the post-pandemic era, and on the adaptation of the school-built spaces for the return of activities. School design should support community and public agencies in making decisions to create safe, resilient, and child-centered schools. Most important, this paper emphasizes the ability of architecture as a profession to cope with endangered conditions. Indeed, "when you design with a mindfulness of the extremities, you invariably benefit the entire range of the spectrum" [3].

7 References

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