The physical school environment

Educational facilities

The brief explores how physical education facilities - that is, land, buildings, and furniture for education - can affect learning processes and what measures can be undertaken to create the optimal conditions for learners and teachers’ achievement and well-being.

Target 4.a of the Sustainable Development Goal 4 on inclusive and equitable quality education calls for the international community to ‘build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all’. Proposed indicators include water, sanitation, and hygiene (WASH), electricity, and ICT access, as well as access to adapted infrastructure and materials for learners with disabilities (UNESCO, 2016). Spaces that are safe and healthy have been found to positively affect pupil’s academic outcomes (Barrett et al., 2019). Given the sizeable budget allocated to physical facilities, around 10–25 per cent of educational expenditures, it is crucial that funds are well spent and that school locations and facilities support access to education and an environment conducive to learning (Beynon, 1997). The COVID-19 pandemic showed that poor-quality infrastructure (e.g. lack of ventilation) can exacerbate COVID-19 transmission in a school setting (USAID, 2020). School infrastructure is, therefore, high on the agenda as governments prepare for school reopening.

What we know

School location

Schools are an integral part of a community and are best located close to the learners they serve. The need to travel long distances to school can have a negative impact on enrolment and retention (especially among girls and disabled children), as well as attendance and performance. For example, studies have found that students living less than 1 km from their school perform statistically better than those who walk further (Theunynck, 2009).

School size
Evidence on the impact of school size on learning is mixed. Studies from the USA suggest that smaller schools may contribute to better student outcomes as learners, teachers, and parents see themselves as part of a community (Barrett et al., 2019), while in India small schools with fewer facilities and a lack of specialist teachers may be resulting in lower outcomes (Rolleston and Moore, 2018). Data from Senegal showed that school size had no effect on student performance in the early grades, but that attending a large school had adverse effects on student performance by the fourth grade. This may be due to the fact that fourth graders have spent more time in the education system whereas, at the start of the learning process, schools have not yet left their mark on younger learners, whose learning is shaped more by family environment (Koussihouede, 2020). Barrett et al. (2019) also point to the drawbacks of large schools, citing higher transportation costs, higher administrative overheads, lower graduation rates, higher absenteeism, higher rates of vandalism, and lower teacher satisfaction.

**School premises**

An ‘inviting physical environment that ensures the safety and health of learners’ helps to enhance the quality of learning (UIS, 2012: 38). Learning assessment data from Latin America shows a clear relationship between school infrastructure and learning even after controlling the socioeconomic level of the families. The two categories that are most clearly associated with learning outcomes are pedagogical and academic spaces, and connection to services (electricity, telephone, and Internet) (UNESCO Santiago Office and IDB, 2017).

The quality of infrastructure affects enrolment and completion rates, and it is an important aspect in parents’ satisfaction with and perception of school quality (Gershberg, 2014). There is evidence to suggest that school construction projects can help raise motivation among students and teachers and improve parental engagement, which subsequently leads to improved academic achievement (Neilson and Zimmerman, 2011). Well-designed schools can increase the productivity of school staff and cut financial waste on unnecessary services and maintenance (RIBA, 2016).

Although the literature does not show a strong relationship between students’ exam results and their satisfaction with the condition of school facilities, some studies have demonstrated convincing links between student outcomes and specific aspects of classroom infrastructure in OECD countries (Barrett et al., 2019). Table 1 summarizes the evidence gathered from the literature.
Table 1. Classroom characteristics that increase pupils’ ability to learn.

<table>
<thead>
<tr>
<th>DESIGN PRINCIPLE</th>
<th>DESIGN PARAMETER</th>
<th>SPECIFIC CLASSROOM FEATURES THAT IMPROVE ACADEMIC OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naturalness</td>
<td>Light</td>
<td>Abundant daylight but a low risk of glare, either through orientation or shading. Also, good-quality electric lighting.</td>
</tr>
<tr>
<td></td>
<td>Temperature</td>
<td>Control of heating and cooling in each classroom. The ability to avoid heat from the sun, either through orientation or adequate external shading.</td>
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<td></td>
<td>Air quality</td>
<td>Big window opening sizes at different heights to provide good ventilation in varying conditions. Larger classrooms to dissipate poor air. Air conditioning where necessary.</td>
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<td></td>
<td>Acoustics</td>
<td>Carpeted floors and the absence of adjacent external sources of noise.</td>
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<td></td>
<td>Links to nature</td>
<td>Views outside and, if possible, direct access to and use of outdoor learning spaces. Natural materials in the classroom such as furniture coverings and plants.</td>
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<tr>
<td>Individualization</td>
<td>Ownership</td>
<td>Distinct design characteristics, personalized displays, and high-quality chairs and desks to foster a sense of ownership among students.</td>
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<td></td>
<td>Flexibility</td>
<td>Larger, simple areas for older children, but more varied layouts for younger pupils. Easy access to attached break-out spaces and widened corridors for pupils’ storage. Well-defined learning zones that facilitate age-appropriate learning options, plus a big wall area for display.</td>
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<tr>
<td></td>
<td>Connection</td>
<td>Wide corridors with external views where possible, plus distinctive, orientating features, especially in relation to the doorways of particular classrooms. Circulation spaces large enough to use for educational activities, such as ‘corridor libraries’.</td>
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<tr>
<td>Stimulation</td>
<td>Visual complexity</td>
<td>Visual variety in the room layout, ceiling, and display in balance with the use of displays to create interest but with a degree of order.</td>
</tr>
<tr>
<td></td>
<td>Colour</td>
<td>Light walls generally, but with a feature wall or areas highlighted with brighter colour to produce an optimal level of stimulation. Bright colour on furniture and in displays as accents to the overall environment.</td>
</tr>
</tbody>
</table>

a. Classroom features that are strongly related to their use. Source: Barrett et al., 2019: 28.

Outside of the classroom, learners need access to adequate outdoor space for organized physical education and sports, as well as for play during break times (UIS, 2012). Physical activity and recreation have a significant impact on child development and the physical and mental health of learners (Barrett et al., 2019).

WASH facilities
Schools are one of the most successful and cost-effective resources for targeting children and communities with key health and hygiene interventions (WHO, 2004). Basic services such as water, sanitation, waste disposal, electricity, and communications also help ensure that children and teachers attend school and remain healthy there (Barrett et al., 2019). Inadequate WASH facilities affect boys and girls in different ways, and this may contribute to unequal learning opportunities. Specifically, lack of sanitary facilities may mean that female students but also female teachers are absent from school during menstruation (WHO, 2009; Gershberg, 2014).

**Equity and inclusion**

Equity issues are an important factor in the relationship among school location, facilities, premises, and student outcomes. The following findings emerged from the literature:

- Schools located in areas with good quality-of-life factors (e.g. higher pay, educated population) may attract and retain more qualified and motivated teachers (Gagnon, 2015).
- In general, older school buildings and those in poor condition are located in the poorest areas (Barrett et al., 2019).
- Overcrowded school buildings and heat exposure have been found to have a negative impact on student performance, especially for students from minority and financially disadvantaged backgrounds (Earthman, 2002; Park et al., 2020).
- The effects of small schools (better attendance, higher graduation rates, greater engagement in extracurricular activities) may be more beneficial to children from disadvantaged backgrounds (Barrett et al., 2019).
- Accessibility to school (transportation, well-maintained pavements) and in school (wide doors and corridors, adjusted toilets) is still a challenge worldwide (Education International Research, 2018). The ‘physical “place” of the classroom’ can be improved to support learners with disabilities through the provision of clearly written texts, facilitating the use of assistive devices and adaptive learning resources. Space can be re-organized by moving learners with visual and physical disabilities to the front of the classroom so they can see and hear the teacher (Miles, Westbrook, and Croft, 2018: 79). Flexible, age-appropriate learning spaces have the potential to improve academic outcomes for all learners (Barrett et al., 2019).
Challenges

Condition of school infrastructure

In Africa, the rapid expansion in access to education has surpassed the growth trend in primary school classrooms, often resulting in overcrowded classrooms (Theunynck, 2009). This is further aggravated by the general poor quality, durability, and functionality of the existing infrastructure that requires renovation. However, poor learning conditions do not only affect developing countries. Environmental conditions in elementary schools (in terms of thermal and air quality) are often inadequate in developed countries (Wargocki and Wyon, 2013 in Barrett et al., 2019).

Lack of facilities

Many schools lack the basic services necessary to guarantee a safe and healthy environment for learning. In Africa and Latin America, a high proportion of students attend schools with inadequate facilities (e.g. no potable water, lack of working sanitary facilities, broken or missing school furniture) (Theunynck, 2009; UIS, 2012b; UNESCO Santiago Office and IDB, 2017). For instance, in Latin America, only one-quarter of third graders attend schools that met the infrastructure sufficiency criteria of the study (UNESCO Santiago Office and IDB, 2017).

Inadequate resource allocation

Beyond budget constraints, ‘the problems of poor infrastructure are often exacerbated by an inefficient and inequitable distribution of construction resource’ (Theunynck, 2009: 10). In some countries, overcrowded classrooms coexist with underutilized spaces (Theunynck, 2009; Barrett et al., 2019). This can be partly explained by the high centralization of infrastructure planning, which cannot always accurately assess the actual needs at the local level (Theunynck, 2009; Gershberg, 2014).

Policy and planning

School design

In areas that are prone to natural disasters, schools should develop disaster preparedness plans that are reviewed on a regular basis (UIS, 2012a). Other
physical factors to consider for creating an optimal teaching and learning environment include: learner-to-classroom ratios, appropriate furniture for learner comfort, noise levels, heating and ventilation, sex-segregated toilets or latrines, and adequate lighting (Beynon, 1997; Neilson and Zimmerman, 2011; UIS, 2012a; UNESCO et al., 2020). The COVID-19 pandemic has emphasized the need for adequate WASH facilities and classroom arrangements that facilitate social distancing (UNESCO et al., 2020; Furlani and Tibério Cardoso, 2021).

It is also important to go beyond health and safety minimum standards and create spaces conducive to participatory learning methodologies. Although its impact on learning remains to be documented, school design can help build a connection between schools and the wider community if conceived in accordance with local climatic and cultural environments (UIS, 2012a; Barrett et al., 2019).

**Infrastructure planning**

In areas facing budget constraints, cost-effectiveness analysis can help guide decisions regarding the construction or renovation of classrooms depending on their impact on the quality of learning (Jenkins and Zeinali, 2015). Steps to create quality learning environments include an audit of the current state of affairs in schools, the development of a plan with specific baseline standards and indicators for reaching them, and a cost evaluation (Theunynck, 2009; UIS, 2012a). Using up-to-date information on the condition of school infrastructure and adopting a participatory approach (involving parents and communities) are critical elements for successful infrastructure planning (UIS, 2012a; UNESCO Santiago Office and IDB, 2017).

**Access to school places**

Maintaining reasonable travel distances implies increasing the number of schools and reducing their size rather than fewer and larger schools (Theunynck, 2009; Barrett et al., 2019). This means that smaller schools should be locally distributed according to the density of demand (Barrett et al., 2019).

**Improving equity in access**

Simple solutions exist when working towards better inclusion of children with physical disabilities, provided that they are incorporated in the school design and planning process (Theunynck, 2009). These include building ramps, widening door openings, minimizing stairs, attention to topography, etc.
Maintenance of buildings

Consistently maintaining and bringing the necessary improvements to the existing infrastructure can result in a good-quality educational environment in buildings of any age. Additionally, attention to infrastructure sustainability can help accommodate future demographic or pedagogic changes (Barrett et al., 2019). In this regard, Gershberg (2014) suggests that in developing countries, the decentralization of the education infrastructure can ensure more efficient maintenance.

Plans and policies

- Lao PDR: School construction guidelines (2009)
- Togo: Stratégie nationale du MEPSA en matière de constructions scolaires du primaire (2009)

Tools


References and sources


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