

Discussion Paper: Conversations about Vertical Schools in Australia

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What conversations are evident in research and commentary about Vertical Schools?



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We respectfully acknowledge the First Nations owners of the lands and waterways where QUT, and our research partners and schools now stand. We recognise that these lands have always been places of teaching, research and learning.



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The literature review and research for this discussion paper was led by Dr Linda Carroli, Research Fellow in the Thriving in Vertical Schools ARC Linkage project.



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About Thriving in Vertical Schools

This discussion paper is a product from the team involved in the Thriving in Vertical Schools project that is researching the 'Impact of urban vertical schools on students' capability and wellbeing' (2021 – 2023). The project is funded by the Australian Research Council (ARC) Linkage Scheme.

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The project benefits from contributions from the 12 partner-collaborators:

- Fortitude Valley State Secondary College
- Adelaide Botanic High School
- Prahran High School in Melbourne
- Australian Secondary Principals' Association
- Cox Architecture
- Gray Puksand
- ThomsonAdsett
- BFX Furniture
- Hutchinson Builders
- Sound Off for Schools
- Queensland University of Technology
- Simon Fraser University, Canada.



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The Thriving in Vertical Schools project research aims:

1. To evaluate the impact of urban, vertical schools in a collaborative process that connects designers, educators and students.
2. To understand what young people and teachers identify in UV physical, digital and social spaces as impacting capability and wellbeing, and whether these spaces are experienced similarly by all students, including those in priority equity groups.
3. To identify how conversion factors in urban vertical physical, digital and social spaces impact on student capability and wellbeing.
4. To establish knowledge sharing processes for educators and designers in ways that will maximise the educational opportunities of urban vertical schools and the value of infrastructure spending.

Follow project updates on the website: <https://research.qut.edu.au/tvs/>

1 Introduction

As has been the case in many countries around the world, in Australia more medium to high-rise schools on compact urban blocks of land are being built. Despite a substantial history internationally and a growing presence locally, there is very little evidence-based research about these ‘vertical schools’. In contrast, and perhaps because of the lack of scholarly literature, there is quite a substantial level of commentary about vertical schools in educational, architectural, government, and general media. In some cases, the commentary is disparaging of vertical schools highlighting as an example concerns for the wellbeing of students due to the disconnection from nature and opportunities for physical activity. Other commentary promotes these schools as leading the way for educational reform or as being a necessary response to urban densification.

The aim of this initial discussion paper is to engage with current commentary on vertical schools as a basis for provoking further thought and conversation around the distinctive possibilities afforded architecturally and educationally by the ‘verticalness’ of vertical schools. These conversations are hosted by the *Thriving in Vertical Schools*, Australian Research Council Linkage grant project that pays specific attention to the relationship between vertical schools and student capability and wellbeing. Together with partners in the project, this discussion paper proposes questions worth investigating, to inform and extend evidence-based design and educational leadership in vertical schools.

Some of the big ideas that inform this conversation

- Vertical schools are recognised in this discussion paper as multi-storey schools, necessitating specific and unusual design responses, situated in an urban setting. That is, vertical schools are not just defined by their height, rather verticality has an influence on many aspects of schooling.
- Some schools have evolved to become vertical over time, however more recently purpose-built vertical schools are designed to capture a new vision for education and offer innovative learning environments.
- Experiences of educational leaders and students in vertical schools must inform initial and ongoing design, including accessibility, and connections to community.
- Vertical schools are also in relationship with their urban context/urban environment.
- Vertical schools are a co-evolving typology informed by popular as well as academic discourse. There are multiple sources of expertise that contribute to new knowledge about vertical schools, including education, architecture, furniture design, builders, and urban planning.
- Academic research can help to articulate and share new knowledge about vertical schools through interrogating reliable evidence and creating a shared language for learning.

The TVS project is committed to collaborative knowledge creation and invited project partners to participate in a Roundtable Discussion to respond to the first iteration of this document. Based on these discussions, additional notes, insights and questions are included in Section 8.

2 Why have a conversation about vertical schools?



More vertical schools are being built.

Australian State educational authorities have identified a need to build more schools in urban and suburban areas due to population growth resulting from urbanisation. In order to provide access to schools located near residential communities, vertical designs respond to urban morphologies and optimise land use. Vertical schools are also proposed for greenfield developments.



Vertical schools are an emergent typology.

Increasingly in literature and conversation we see and hear vertical schools in Australia referred to as ‘an emerging typology’. But what does this mean? While not as prevalent as overseas, schools of more than one storey do exist in Australia. Historically, these are referred to as mid-rise or high-rise. What differentiates these schools from those labelled as ‘vertical schools’? And more to the point, what might be gained by further exploring the notion of the vertical school as an emerging typology?



Multiple stakeholders inform the design and day to day operations of vertical schools. School leaders, teachers, parents and students share an interest in these schools alongside their neighbours, commuters, and occupants of nearby businesses. Urban planners, architects, builders, engineers, furniture designers, emergency services, transport operators and other stakeholders have an interest in vertical schools. We need to come together to raise questions, share perspectives, and create new possibilities.



Opportunity for a shared vision and language across disciplines. With new buildings come opportunities to reimagine education and urban communities. The partners in the Thriving in Vertical Schools ARC Linkage project believe in the power of collaboration, developing shared language to enable a sharing of knowledge. This discussion paper is a contribution to that vision.

2.1 More Vertical Schools are being built

Vertical schools are relatively new in Australian cities with such schools being built in and planned for communities in Australia's capitals (Cook, 2016a; Swinburn, 2017; Truong, Singh, Reid, Gray, & Ward, 2018). Urbanisation, densification and sustainable development are identified as drivers behind the development of urban vertical schools (Gartry, 2015; Swinburn, 2017). Revitalised and more compact urban environments have been advocated by planning authorities for decades to manage urban sprawl and consolidate and optimise land use and urban form. This has resulted in more multi-dwelling and mixed-use development in urban environments that enable population growth and access to services in areas that had experienced population stagnation. To appropriately service urban communities, new schools and other social infrastructures are in demand for growing and diverse populations.

In some areas, population growth has outstripped existing school capacity with many of those schools experiencing overcrowding (Chalkley-Rhoden, 2017; Stevenson, 2018). Some commentaries claim that governments have failed to appropriately plan for education and the changing demographics of inner urban communities by selling disused inner urban school land and neglecting to reserve land for education (Goss, 2016; O'Sullivan & Gorrey, 2021).

Australian State Governments have made commitments to school building programs to ensure that growing populations have access to schools including those in inner city localities. For example, the Victorian State Government committed to building 100 new schools between 2019 and 2026 and the Queensland State Government committed to opening 16 new schools between 2022 and 2026. Land for low-rise traditional schools in urban areas is not available intensity of development and cost of land. In response, state governments are committing to vertical schools to address demand ("What's happening and where," 2016). In Australia, vertical schools are integrated into some masterplanned precincts and communities, notably Adelaide Botanic High School in South Australia (Sutton, 2019), Springfield in Queensland (Ratnam, 2020), East Bentleigh in Victoria (Heaney, 2019a) and Docklands Primary School in Victoria (Carey, 2019).

A denser urban morphology invites an alternative approach to incorporating social infrastructures in mixed use urban precincts and residential neighbourhoods. For schools, issues such as potential overshadowing and risks to student protection are raised (Johanson, 2014, 2017; Lucas, 2017). In Taylor and Wright (2020b), drawing on UK case studies and research, the high-rise school is one of four typologies for dense urban environments. The other three being: the dispersed school, the mixed use school and the repurposed school. Vertical schools have been established in repurposed office buildings in Australia. Dudzinski's (2019) study of recently built vertical schools in New York examines how they support human scale, afford protection and integrate into or complement the urban environment. However, in addressing the limitations of site and client brief, amenity was compromised.

In the Australian context, the vertical school is represented as a necessity which is new and innovative and responds to urban constraints (Bleby, 2016; Evans, 2018; Squires, 2019; Stevenson, 2018). Former NSW Premier Gladys Berejiklian commended a "very different, vertical" education precinct in Parramatta, Sydney and the suitability of vertical schools for denser urban environments where students live in apartments (Vella, 2020). Queensland Education Minister Grace Grace described Fortitude Valley State Secondary College, Brisbane as a game-changer that supports urban renewal: "The new secondary school will completely revitalise this area of Fortitude Valley, with a

contemporary new vertical building and the refurbishment of the old school building” (Martyn-Jones, 2018). Such commentary indicates that vertical schools are consistent with urban living and lived experience of place.

School building programs are strongly informed by policy, with Wood (2020) arguing that new school buildings ‘do policy’. This means that vertical schools operationalise policy at various scales and that “buildings play more active roles as policy instruments, not just as settings for education” (Wood, 2020, p. 265). Wood draws on Monahan’s idea of ‘built pedagogy’ through which educational ideals are embodied in architecture to propose ‘built policy’. The materiality and physicality of the building reflect policy because the building, pedagogy and policy are inextricably connected. School building is not only directed by education policy, but also urban planning and policy. Built policy refers to “the urban planning, construction, design, use and coordination of buildings and their spatial organization” (Wood, 2020, p. 466). As Wood explains, “built policy helps to see how the meanings, constraints and opportunities of the built environment are shaped and when, by whom and with what resources” (Wood, 2020, p. 480). The introduction of vertical schools indicates “how the spatial form of schooling changes with high land costs and/or poor, long-term planning” (Wood, 2020, p. 478). Other issues in relation to risk and safety are also raised as well as a tendency to swap space with space-saving technology in vertical schools. While several reports have also argued that urban vertical schools are the product of poor long-term planning, given the prevalence of urbanist agendas in Australian cities, urban vertical schools can also be understood as a type of built policy that enacts urban priorities, and discursively and materially triggers a transformation of ‘school-building’. This is further evinced by acknowledgement of vertical schools in supporting real estate markets and urban renewal (Cummins, 2014; O’Malley, 2022; Ratnam, 2019). With more vertical schools being constructed, more research is needed to understand the drivers of vertical schools, the impact on urban neighbourhoods, and the influence of policy and on policy.

2.2 Emerging typology

If the vertical school is an emerging typology, we might ask: what do we mean by ‘typology’? In Architecture, the term has a long history originally used to classify buildings according to their function and/or form. So, for example, we have school buildings, office buildings, residential buildings, and so on which convey how these buildings are used and, in part, how they are to be designed. While buildings can be of the same functional type, they can also vary in their form or morphology. The term ‘vertical school’ is an example of the use of a morphological term to differentiate this type of school from one that is more horizontal. But is it as simple as this? Because, as previously pointed out, mid-rise and high-rise schools are also vertical.

At present research and conversations about vertical schools only succeed in adding to the confusion especially when the terms vertical, mid-rise, and high-rise are used interchangeably. Research papers and reports offer definitions of vertical schools based on whether they are mid-rise and high-rise. For example, Newton (2019) identifies two types of vertical schools in Australia; mid-rise of four and seven storeys; or high-rise reaching 17 storeys. Taylor (2020b, p. 57) proposes that schools which are 6 storeys or higher are considered as high-rise. Understanding a vertical school typology based on the number of storeys is limited as mid-rise or high-rise schools have existed for decades. What is emerging in some literature is an extension of the morphological description that recognises a relationship between height, spatial configuration, and use. Height has significant implications for managing movement and circulation and in schools. This is particularly important in relation to many

aspects of school activity such as timetabling and avoiding congestion at peak times (Swinburn, 2017; H. Taylor, 2020b). Further to this is an understanding of a vertical school as informed by relations to its urban context and associated with this urban densification.

In Australia, the vertical school is regarded as an innovation in school design that intentionally caters to urban students and communities and where many live in high-rise apartments (Swinburn, 2017; Vella, 2020). Vertical schools are presented in government documents as a design approach that complements existing development or lifestyles in a precinct or locality, or as the only option to meet demand and address land constraints. In *The Building Future Schools Project Report* (The Coordinator-General, 2018, p. 6) the development of Fortitude Valley State Secondary College was described as “the first inner Brisbane school to be built in over 50 years and will adopt a vertical design solution to reflect its inner urban setting” (Department of Education, 2022b). Community consultation material for a vertical primary school to be developed in Toowong, Brisbane includes rationale for vertical design with statements such as “a vertical design to maximise available land” and “[v]ertical school designs take advantage of limited space” (Department of Education, 2022b). The vertical school is presented as a solution to problems triggered by urbanisation such as land availability and population growth.

The recognition of limited and expensive urban space has also provoked rethinking of urban social infrastructures as relational. Matthews et al (2020) and Aminpour (2020) examine vertical schools as ‘community hubs’. These studies find relational benefits for vertical schools and their neighbouring communities due to proximity and access by developing an infrastructural relationship beyond the school. Such a relationship extends the social life and purpose of the school through multiple inhabitations and uses.

The use of the term ‘vertical school’ brings together two aspects of typology: a building’s morphology or form (‘verticalness’); and its activity (schooling).

At the heart of the vertical school is student learning. In the emerging vertical school as it appears to be evolving, we see expectations and opportunities for envisioning and enacting pedagogical innovation. Individual case studies highlight the importance of new pedagogy and innovative and flexible learning as integral to school design and development. In canvassing how vertical schools impact teaching and learning spaces, Newton (2019) highlights how they are also changing the way “education is delivered”. What appears to be happening is that vertical schools are altering through their urban context and ‘verticalness’ spatial and social relationships involving community and school, student and teacher, pedagogy and space, including as Truong et al (2018) propose, indoor and outdoor learning. What we don’t know however is how the vertical school as an emerging typology is inhabited and experienced including by its most important stakeholders – the students; and the implications of this for the future design of ‘vertical schools’.

2.3 Multi-stakeholder interest and issues

Media reports included a wide range of voices commenting on vertical school developments, including students, elected representatives, school staff, local authorities, union officers, local residents and designers (see Table 11). This highlights that vertical school developments are relevant or of interest to diverse stakeholders and agendas. However, this multi-stakeholder context may not be represented in the design and construction process of vertical schools, with community consultation often only occurring as part of the public notification requirement of development

applications. The media reports represent an important, although incomplete representation of stakeholder perspectives.

2.3.1 School Community

Samples of student, principal, teacher and parent responses to and experiences of vertical schools are recorded in media articles. Students of Parramatta Public School, Sydney said their school was amazing and fun, that they loved the big playground and liked the rooftop and saving energy with solar panels. For a student at St George's Grammar School, Perth, "[c]oming into the city everyday for school [is] quite a shift. It was quite confronting to begin with, all of a sudden being thrust into this environment where there are hundreds of people around you all the time" (Gartry, 2015). The principal of Prahran High School said that, in a small footprint, the four storey school included outdoor space on every level as well as a rooftop garden and gym. The principal also said "part of our commitment is to show what modern schooling in Melbourne can be" (Hore, 2019). A parent of Prahran High School student described how the opening of the school provided local access to quality schooling (Francis, 2017). The NSW Teachers Federation stressed the need to consult with teachers about classroom and school design because "you can't limit how teachers will teach by the way you build a room" (Martin, 2017).

2.3.2 Public Interest and Resident Action

Urban development can be a source of controversy. For vertical schools these controversies relate to both prevailing social expectations for children and the schools' urban context. In media articles, public commentary raised concerns about:

- Impact on children's mental and physical health (Gartry, 2015; Lamb, 2018)
- Safety (Ferri, 2020; H. Taylor & Wright, 2020b)
- Internal movement (Martin, 2017)
- Lack of open or green space (A. Taylor, 2022)
- Environmental and planning impacts (Cartwright, 2019; Ferri, 2020; O'Flaherty, 2021; A. Taylor, 2022)
- Administrative matters such as catchments (Cameron, 2020; Horswill, 2019)
- Exacerbating congestion and parking issues (Lehman, 2019; "School at town centre backed after challenge," 2020; Williams, 2016)
- Unisex toilets (Marszalek, 2020a, 2020b)

Councils and residents have opposed development proposals for vertical schools including Hills Shire Council, NSW opposing the development of a Catholic college in the north-west growth area of Sydney ("School at town centre backed after challenge," 2020). The NSW Independent Planning Commission determined that design and management provisions were required, and that the proposal met broad public interest.

The public articulation of these issues highlights that vertical schools are significant social buildings. In the academic literature multi-stakeholder engagement is recommended for its potential to address these kinds of concerns or conflicts through school design. For example, suggestions to address the lack of access to green space include biophilic design or consideration of "what nature means" in vertical schools (O'Malley, 2022; Truong et al., 2018). However school design may not resolve all conflicting expectations. For example in vertical schools, outdoor spaces have been provided including terrace learning spaces and recreational areas (Newton, 2019), but these may not reflect community expectations of children and education. Vertical schools have staggered start and

end times, which has attracted criticism from parents, as well as promoted active transport to address local congestion (Bennett, 2019a, 2019b; Lehman, 2019; “Letters,” 2019).

With limited availability of research examining vertical schools (see Section 4) the range of media-based commentaries and observations have been influential. The media commentary may not provide sufficient evidence to inform ongoing practices of the design and development of vertical schools. However, these commentaries do provide insight into the everyday narratives that produce urban and infrastructural lives. As with other infrastructures, social infrastructures like schools both make urban lives possible and shape them. There is a clear need for more research as policy making and planning need to be informed by evidence to ensure that vertical schools are providing value for money, quality education and other resources that are suitable, safe and accessible for students and communities in urban contexts.

2.3.3 Risk and Safety

A commonly expressed concern is child safety and wellbeing with concerns reflecting physical, moral and emotional safety. Risk and safety issues have specific implications in a vertical or high-rise schools resulting from their verticality. Due to the COVID-19 pandemic, use of outdoor space for teaching potentially mitigates disease risk and can result in schools remaining open (Malone, 2021). Safety needs, such as evacuation and escape, are community concerns and can dominate and drive design to ensure inclusive and accessible escape for large student populations with mixed abilities and mobilities. As Taylor (2020a, p. 113) states, “[f]ire safety, means of escape, refuges, compartmentation, sprinklers, evacuation strategies, muster points and firefighting access may drive the design solution and must remain key drivers from inception to completion and into operation”.

Concern about access to green and open space has been raised by planning and education experts who observe impacts on children’s health and wellbeing, lack of benchmarks and transparency in vertical school design (Hyndman, Sears, & Cruickshank, 2022; Lamb, 2018; A. Taylor, 2022). These concerns reflect historic precedents in Australian schools in which consideration of light, space and physical activity became vital aspects of school design and promoting children’s health (Willis, 2014). Lamb (2018, p. 23) identifies a trade-off resulting from poor planning that compromises children’s “outdoor school space to such an extent that it profoundly affects their opportunity for unstructured physical play”. The lack of green and outdoor space is argued to risk children’s physical activity and health as well as the role of play in learning and development (Lamb, 2018).

2.3.4 Political Debate

The media also reported policy conflicts with political actors debating the merits of vertical schools including industrial action, construction delays and cost overruns (Bleby, 2021a, 2021b; Goss, 2016; O’Sullivan & Gorrey, 2021). In 2019, the former NSW Planning Minister Rob Stokes said that the vertical schools were too costly, inflexible and complex, with significant cost overruns in vertical school projects (Baker, 2019). Opposition political actors described vertical schools as a “failed experiment” and expressed concern about the lack of green space and playgrounds. In relation to vertical school developments in Parramatta, Sydney, a NSW Education Department officer said “multi-storey schools are land efficient, provide an innovative way to achieve educational outcomes and can be located in areas of high demand” (A. Taylor, 2022). The rationales of critics and advocates for vertical schools reflect priorities noted in other conversations and publications.

2.4 Opportunity for vision across disciplines

To achieve both education and community aspirations, collaboration between design, planning, education, school community and policy stakeholders is needed. High-rise schools can challenge assumptions about educational delivery and invite school leaders to examine options for school operation and pedagogy. Long and Wright (2020) stress the need for educators and architects to work together to create well designed schools that meet educational aspirations. Collaboration with architects has been noted in the research literature to support school leaders to “develop and test new ways of working [and] it allows them to innovate in curriculum delivery and school organisation to make new spaces work for their community of learners” (Long & Wright, 2020, p. 21).

Collaboration benefits are also envisioned between schools and communities. In examining vertical schools as community hubs, Aminpour (2020, p. 50) states that “[a]s vertical schools and their communities become reliant on the use of shared spatial resources, their interdependencies should be considered at different stages of planning, design and management of the schools”. School facilities such as kitchens, sports courts and multipurpose rooms are open to community use and the grounds remain open and accessible. While these examinations consider the design of vertical schools, they also propose a need to examine these schools in a broader urban and social frame. This points to a multi-purpose infrastructural role that vertical schools can play that also optimises assets and land use.

2.4.1 Vision within State Government School Design Guidelines

An educational vision for vertical schools is evident in the State government school design guidelines (Table 1) (Department of Education, 2021, 2022a; Victorian School Building Authority, 2022). These guidelines inform the development of design and construction briefs and link education and design vision. For example, in the Victorian guidelines (Victorian School Building Authority, 2022, p. 22): “Successful school design effectively translates a school’s educational vision and philosophy into a set of integrated learning environments and support facilities”. School design documents indicate that design should be led by educational vision and respond to specific site conditions and local community needs. Yet the guidelines for school design and development in three states provide limited advice about vertical schools. In South Australia, advice is provided about the placement of roof-top solar arrays (Department of Education, 2022a). Victoria’s design guidelines (Victorian School Building Authority, 2022) address the special factors of higher-than-normal buildings and the guidelines provide advice about anticipated costs associated with these buildings as well as movement, disability access, outdoor spaces and safety.

2.4.2. Vision and the Design Process

Linkages between and integration of design and educational vision have been explored during the design process. For example, Thomson’s (2021) examination of Fortitude Valley State Secondary College (FVSCC) provides insight into the development of the school, as the first inner urban school built for over 50 years. It involved a strategic partnership between State Government and QUT and included masterplanning, land acquisition and construction. The design process featured an Enquiry by Design which engaged stakeholders from government, the school leadership, QUT and the design team to develop a reference design that considered the physical attributes of the site and the educational opportunities (Thomson, 2021). The school sought an innovative curriculum approach based on “the city as the campus, employing students’ direct experiences of the surrounding context as triggers for learning” (Thomson, 2021, p. 50). This integration of curriculum with community is reported in news articles, where the school draws on the resources and accessibility of the city to

support teaching and learning (Gartry, 2015; Martin, 2017). FVSSC aims to provide access to facilities to the neighbouring community, which is consistent with thinking about vertical schools as community hubs (Aminpour, 2020; Matthews et al., 2020). In these conversations the new learning environment is seen to support a vision for a transformative and integrated school community, curriculum and learning activities.

Table 1: State government education vision and design principles

	Victoria	Queensland	South Australia
Education vision from Education Department School Design guidelines	Together we give every Victorian the best learning and development experience, making our state a smarter, fairer and more prosperous place.	A great future for every Queenslanders.	Provide world-class education that achieves growth for every child and student in every preschool and school.
Education Principles	Learners and learning are central Schools are community hubs Diversity is celebrated A welcoming environment	Learners Learning Access and inclusion Diversity Wellbeing community	Expert teaching Quality leadership Engaged parents and communities Stronger services Resourcing and investment Accountability and support (DoE Strategic Plan levers)
Design Principles	Local schools are accessible to all Recognise Aboriginal culture in all new buildings and significant upgrades to Victorian government schools Integrate facilities for students with disabilities Building for early childhood learning Design facilities that can adapt for changing purposes	Responsiveness Collaboration Informed risk-taking Harness technology Reconfigurability	Community and context Site analysis Heritage places Disaster resilience Design for participation and learning Diversity and choice Durability and adaptability Indoor/outdoor learning Environment and sustainability

2.4.3 Vision for Design enabling Pedagogy

While not specific to vertical schools, Wood (2020, p. 473) proposes that “[a]rchitecture operationalizes policy in spatial form”. He notes a shift in labelling and discourse in contemporary schools where classrooms are increasingly referred to as *learning spaces*: for example, “spaces sounds freer” and shifts the building approach from enclosure (as in a traditional classroom) to

flexibility, availability and connectivity. The spaces of a school are organised by diverse actors including students and teachers in their engagement with and use of space.

Individual case studies of vertical schools highlight the importance of new pedagogy and innovative and flexible learning as integral to their design and development (Newton, 2019; H. Taylor, 2020b; Thomson, 2021). In canvassing how vertical schools impact teaching and learning spaces, Newton (2019) found that they are also changing the way “education is delivered”. Truong et al (2018) propose that vertical schools may develop in ways that alter spatial relations between community and school, and indoor and outdoor learning. They project that:

Schools will no longer have the land for green space playgrounds as they move to high-rise buildings. These replacement educational structures will be multi-storey schools that will require innovative design and pedagogical approaches to ensure direct contact with nature and open green spaces is available to staff and students (Truong et al., 2018, p. 181).

They also observe that the innovative pedagogical shift implicit in vertical schools is untested despite its potential for changing the educational landscape.

Media reports also link design and pedagogy in vertical schools including the introduction of ‘new models of education’ that are expressed in spatial or physical forms. Adelaide Botanic High School features collaborative learning spaces and flexible use staircases that can be used as theatres for group projects. The principal also said:

There's a lot of visibility, a lot of glass, and it's really de-privatised the practice of teachers. It also means our students are very well connected, so instead of traversing a long distance horizontally to go from one space to another, they can actually move, under supervision, to different spaces and work within a learning precinct on a particular floor (Sutton, 2019).

At South Melbourne Primary School, a design principle was to “put learning on display” in well lit specialist and flexible learning spaces (Edwards, 2017). These comments indicate a higher level of permeability and openness in vertical schools through which traditional boundaries and enclosures are being challenged. The principal of Eynesbury Senior College reported that the narrow building contributed to safety and an intimate supportive environment as well as integration into the urban surroundings (Williams & Squires, 2019). These conversations indicate an expectation that vertical schools are a locus of educational innovation.

A call for ongoing exploration of these linkages and opportunities is evident in Truong et al’s (2018) study. ‘Vertical schooling’ is addressed as the integration of vertical built forms and student and staff understanding of and relationship to nature. As vertical schools may diminish the relationship to nature, the authors propose a need for “innovative design and pedagogical approaches to ensure direct contact with nature and open green spaces is available to staff and students” (Truong et al., 2018, p. 181). Truong et al stress the benefits of outdoor learning and engagement with nature in schools as well as leveraging the curriculum to “let nature in”. Swinburn’s (2017, p. 101) study of vertical schools concludes that:

vertical school architecture that has been strategically designed to provide quality outdoor spaces suitable for recreational activities, visual and physical connections between floors to foster school community, and a secured school zone above publicly accessible shared facilities have the greatest potential of providing a positive school experience and meaningful civic infrastructure for the greater city.

Yet, the perceived lack of a code of principles for schools and open space has resulted in some schools being described as poorly located with students and staff exposed to risks such as noise and pollution (A. Taylor, 2022). Other locational issues have also emerged such as the co-location of the Melbourne Cricket Club and a proposed vertical school which has attracted community criticism (Mier, 2017). State governments provide some guidelines for school site selection and the Queensland Government's advice on infill sites does not set spatial requirements and notes that decisions on site will be made case-by-case as "[l]earnings from new inner-city schools in Brisbane will inform future decisions on new school sites. Site size requirements will also be influenced by potential for co-location and negotiated use of non-school owned sporting and play facilities" (Queensland Government, 2020).

2.4.4 Vision of Universal Design for accessibility and inclusion

The vision for inclusive education, where all students feel welcome and access learning alongside their peers, has been strongly influenced by an architectural vision of Universal Design. Thinking about people of all ages and abilities who are likely to use a space and designing for their needs from the start, is credited to the architect Ronald Mace in 1987 (Pisha & Coyne 2001). The original Universal Design principles of equitable use, flexibility, simple and intuitive use informs current architecturally accessible design for social inclusion (Story et al, 1998, Zallio & Clarkson, 2021). These principles have been adopted into Universal Design for Learning principles with implications for school leadership, curriculum, pedagogy, assessment and school policies (<https://udlguidelines.cast.org/>). Instead of expensive retrospective adjustments for inclusion, vertical schools represent an opportunity to represent new innovations in inclusive architecture and education, from the start. While not addressing vertical schools, Page et al. (2021) propose that innovative learning environments can be designed to be socially inclusive, and attend to light, sound, colour, comfort and flexibility, in ways that unify inclusive design and inclusive pedagogy.

Attending to student rights and inclusion is more than a design vision, it is an educational obligation enshrined within international human rights law. Education is a human right with civil, social, economic, and cultural rights implications. Its provision requires both access and removal of barriers that may constrain or inhibit access – whether these access affordances relate to the content, pedagogy, discrimination, or physical infrastructure – as well as active actions by States parties and those acting on their behalf – such as teachers, civil servants etc – to ensure the full extent of each child's right to education is fulfilled. For children with disabilities, the Convention on the Rights of Persons with Disabilities (2007), and associated General Comment No. 4 on the right to inclusive education, clearly define what does (and does not) constitute inclusion from a human rights perspective. Inclusion "involves a process of systemic reform embodying changes and modifications in content, teaching methods, approaches, structures and strategies in education to overcome barriers with a vision serving to provide all students of the relevant age range with an equitable and participatory learning experience **and environment** that best corresponds to their requirements and preferences. Placing students with disability in regular classes without appropriate structural changes to, for example, organization, curriculum and teaching and learning strategies does not constitute inclusion." (United Nations, 2016, para 11, *emphasis added*). Vertical schools can reflect these accessibility and inclusion priorities in physical and educational design choices.

Inclusion also considers the role of students as agents who can participate in decision making about things that matter, including their school and community. Inclusion in decision-making about *all* matters affecting them and having their views and input taken seriously is another of the human rights for all children (United Nations, 1989). Multiple surveys of young people indicate that they

value places to socialise with friends, in spaces that support inclusion, mental health and engagement with the environment (Mission Australia 2021, Global Youth Wellbeing Index, 2017). When consulted about school designs, young people consistently request spaces with fresh air, access to green and play spaces that are not noisy, crowded or stuffy (Hughes et al, 2019). These preferences are challenging to meet in urban schools that contend with issues of air quality, noise, crowding, limited green or play space (Woolner & Triplady, 2019). Verticality may present challenges for students who experience social and sensory difficulties (Saggers & Ashburner, 2019) and prompt innovative responses for example in the design of furnishings, breakout rooms, acoustic treatments and pedagogic innovations in wellbeing. Vertical school design for wellbeing and academic agency for all students inspired the Thriving in Vertical Schools project.



Extend the conversation

- What educational visions are associated with vertical schools and what is the source?
- What other drivers do you see for the increased interest in vertical schools?
- Architecture historian Julie Willis describes a new school as a ‘symbol of hope’ – what hopes does a vertical school symbolise?

3 How new are vertical schools?

In the *Thriving in Vertical Schools Project*, the three partner schools are all government schools opened in the last four years: Fortitude Valley State Secondary College in Brisbane, Prahran High School in Melbourne, and Adelaide Botanic High School. Alongside other new vertical schools being built by both government and non-government sectors, it may seem that vertical schools are a new typology in Australia. Yet one of the earliest vertical schools in Australia is St Andrew’s Cathedral School in Sydney, built in 1976. It is acknowledged vertical schools are not new in UK and European urban environments (Matthews et al., 2020; Newton, 2019; Swinburn, 2017; H. Taylor & Wright, 2020a). The reviewed literature, media reports and other documents note many vertical schools located in primarily European, English, Australian and American cities with three vertical schools in Singapore and Hong Kong identified (Table 2).

Table 2: Vertical schools identified in reviewed literature. Australian schools are highlighted.

Examples of Vertical Schools	References in literature	State/Country	Open
Adelaide Botanic High School	(Black, 2018; Cartwright, 2019; Edwards, 2017; Newton, 2019; Schlesinger, 2016; “South Australia’s first vertical school opens in Adelaide parkland,” 2019; Squires, 2019; Squires & Williams, 2019; Sutton, 2019; Tomlinson, 2018; Williams, 2016; Williams & Squires, 2019)	South Australia	2019

Albert Park College	(Cook, 2016b; Eddie, 2021a, 2021b; Mills Turbet, Carey, & Eddie, 2021)	Victoria	2010
Arthur Phillip High School (redevelopment)	(Baker, 2019; Cummins, 2014; Martin, 2017; O'Sullivan & Gorrey, 2021; Schlesinger, 2016; Squires, 2019; Squires & Williams, 2019; A. Taylor, 2022; Vella, 2020; Williams & Squires, 2019)	NSW	2020
Avenues: The World School, New York	(Swinburn, 2017; H. Taylor & Wright, 2020b)	USA	2012
Barkarby School, Stockholm	(Matthews et al., 2020; Newton, 2019)	Sweden	2017
Belham Primary School, Southwark (Extension)	(H. Taylor & Wright, 2020b)	UK	2018
Bobby Moore Academy, East London	(H. Taylor & Wright, 2020b)	UK	2018
Bridge Academy, London	(Swinburn, 2017)	UK	2007
Inner South State Secondary College, Brisbane	(Cartwright, 2019; Horswill, 2019; Martyn-Jones, 2018)	Queensland	2022
Cardinal Pole Catholic School, Hackney	(H. Taylor & Wright, 2020b)	UK	2013
Chelsea Academy, London	(Swinburn, 2017)	UK	2009
Copenhagen International School, Nordhavn	(Matthews et al., 2020; Newton, 2019)	Denmark	2017
Docklands Primary School, Melbourne	(Carey, 2019; Cook, 2016b; Goss, 2016; Green, 2013)	Victoria	2021
The Early Learning Village, Singapore	(H. Taylor & Wright, 2020b)	Singapore	2017
East Village, Bentleigh (Proposed)	(Heaney, 2019a)	Victoria	
Eynesbury Senior College, Melbourne	(Squires & Williams, 2019; Williams & Squires, 2019)	South Australia	1991; closed 2021
Fitzroy High School/Warun Senior Campus, Melbourne	(Bleby, 2021a, 2021b; Priess, 2018)	Victoria	2022
Fortitude Valley State Secondary College, Brisbane	(Bennett, 2019a, 2019b; Cameron, 2020; Cartwright, 2019; "Letters," 2019; Marszalek, 2020a, 2020b; Martyn-Jones, 2018; Martyn-Jones & Vogler, 2018; McKay, 2018; O'Flaherty, 2020a, 2020b; O'Malley, 2022; O'Sullivan & Gorrey, 2021; Ratnam, 2019; Scott, 2019; Squires,	Queensland	2020

	2019; Stevenson, 2018; Thomson, 2021)		
GEMS Academy, Chicago	(Swinburn, 2017)	USA	2014
Haileybury City Campus, Melbourne	(Bleby, 2016; Cartwright, 2019; Egan & David, 2019; Johanson, 2017; Johanson & Heffernan, 2020; Lucas, 2017; Schlesinger, 2016; Squires, 2019; Squires & Williams, 2019; Stevenson, 2018; Williams & Squires, 2019)	Victoria	2017
Harris Westminster School, Sixth Form Academy, London	(H. Taylor & Wright, 2020b)	UK	2014
Hellerup School, Hellerup	(Matthews et al., 2020)	Denmark	2002
Inner Sydney High School, Sydney	(Baker, 2019; O'Sullivan & Gorrey, 2021)	NSW	2020
International Baccalaureate School, Springfield (Proposed)	(Ratnam, 2020)	Queensland	
Livity School, Streatham	(H. Taylor & Wright, 2020b)	UK	2013
Marist College, Rosalie (Proposed)	(Houghton, 2019)	Queensland	
Montessori College East, Amsterdam	(Swinburn, 2017)	Netherlands	2000
North Melbourne Primary School, Melbourne	(Carey, 2019; Cook, 2016b)	Victoria	2023
Notre Dame High School, London (Extension)	(H. Taylor & Wright, 2020b)	UK	2013
Ørestad College, Copenhagen	(Matthews et al., 2020; Newton, 2019; Swinburn, 2017)	Denmark	2007
Parramatta Public School, Sydney	(Baker, 2019; O'Sullivan & Gorrey, 2021; A. Taylor, 2022; Vella, 2020)	NSW	2019
Port Melbourne Secondary College, Melbourne	(Carey, 2017; Goss, 2016; Johanson, 2014)	Victoria	2022
Prahran High School, Melbourne	(Akerman, 2017; Carey, 2019; Cook, 2017b, 2019; Francis, 2017; Hore, 2019; Newton, 2019; Schlesinger, 2016; Squires, 2019; Squires & Williams, 2019; "What's happening and where," 2016)	Victoria	2019
PS244Q The Active Learning Elementary School	(Dudzinski, 2019)	New York, USA	2008
PS273Q	(Dudzinski, 2019)	New York, USA	
Regent High School, London	(H. Taylor & Wright, 2020b)	UK	2014

Richmond High School, Melbourne	(Carey, 2019; Cook, 2017a; Heaney, 2019b; Newton, 2019; Squires & Williams, 2019)	Victoria	2018
Santa Sophia Catholic College, Sydney	(Ferri, 2020)	NSW	2022
Saunalahti School, Espoo	(Newton, 2019)	Finland	2012
St Andrews Cathedral School, Sydney	(Martin, 2017; Swinburn, 2017)	NSW	1976
St Georges Anglican School, Perth	(Gartry, 2015; Swinburn, 2017)	Western Australia	2015
St Patrick's Cathedral College, Sydney	(Cartwright, 2019)	NSW	2020
School of the Arts, Singapore	(Swinburn, 2017; H. Taylor & Wright, 2020b)	Singapore	2008
SHaW Futures Academy, Bromley	(H. Taylor & Wright, 2020b)	UK	Not open
Singapore International School, Hong Kong	(Swinburn, 2017)	Hong Kong	1991
South Melbourne Primary School, Melbourne	(Bleby, 2016; Carey, 2019; Cook, 2016a, 2017b; Edwards, 2017; Goss, 2016; Newton, 2019; Schlesinger, 2016; Squires, 2019; Squires & Williams, 2019; "What's happening and where," 2016)	Victoria	2018
Sydhavnen School, Copenhagen	(Matthews et al., 2020)	Denmark	2015
Toowong Primary School (Proposed)	(Bennett, 2021; O'Flaherty, 2021)	Queensland	
Westmead Catholic Campus, Sydney	(A. Taylor, 2022)	NSW	2024
William Jones College Preparatory, Chicago (Redevelopment)	(Swinburn, 2017; H. Taylor & Wright, 2020b)	USA	Redevelopment opened 2013
Xavier High School, New York (Expansion)	(Swinburn, 2017)	USA	Expansion opened 2017

In Australia, vertical schools are currently not operating in Tasmania, ACT or Northern Territory. However, since 2018 the ACT Council of Parents and Citizens Associations in Canberra has called on the territory government to consider building a vertical school on the light rail corridor to address overcrowding in schools (Evans, 2018; Lansdown, 2021; Lindell, 2021; Livadeas & Groch, 2018). Media reports also describe proposed high density developments that include vertical schools in South Yarra (Masananauskas, 2021; Sakkal, 2021) and Alphington (Lenaghan, 2018), Victoria, and Gold Coast, Queensland (Stolz, 2007) as part of developer-led or 'unsolicited urbanism' proposals (Rogers and Gibson, 2021).

In several case studies existing multi-storey buildings have been refurbished as schools. For example, Harris Westminster School, Sixth Form Academy in London is located in a renovated 8 storey building (Buchanan, 2020). In Australia, Adelaide Botanic High School is located in a converted 1960's University of South Australia building and St George's Grammar School, Perth is located in a refurbished office building (Gartry, 2015). With reference to continuing high-rise urban development and the need for mixed use, Taylor (2020b, p. 57) asks "maybe all buildings above 30 storeys high should integrate educational provision?" In the expansion of Xavier High School in New York, the school partnered with a property developer to secure 6 storeys of a residential development for school facilities (Xavier High School, 2017). In Canada, public-private partnerships in education include the development of a school in a condominium development in downtown Toronto (Winton, 2022). Several strategies for developing vertical schools are evident, including adaptive re-use and public-private partnerships, and contribute to urban planning outcomes such as service provision, density and mixed use.



Extend the conversation Vertical schools are not that new, so why is there not more research about them? Are there other vertical schools in Australia that can be added to this list, and what is the source?

4 There has been very little academic research about vertical schools

Even though vertical schools have been built for some years around the world and can be seen as an emerging typology in Australia, there is scant academic research that has been conducted. A robust search of the peer-reviewed academic literature found only five research publications addressing our search criteria.



As presented in Table 3, the literature focuses on the description and function of vertical schools within the urban environment.

Table 3: Peer reviewed literature

Reference	Description	Type
Dudzinski, A. (2019)	Discusses recently completed multi-storey school projects in New York as examples of schools in a dense urban environment.	Research article
Lehman, R. (2019)	Refers to vertical school as a transport destination in an urban environment that may potentially cause congestion and addresses transport issues.	Research article
Taylor, H., & Wright, S. (2020)	The book examines the development, design and challenges of urban schools in dense environments. Case studies present the challenges and opportunities associated with schools in dense urban environments. Two chapters specifically examine high-rise schools as a type of urban school.	Book with chapters including case studies
Wood, A. (2020)	Progresses the idea of 'Built Policy' through which the school built environment operationalises policy; that is, the buildings 'do policy'. The article refers to vertical schools.	Theoretical and research article
Truong, Singh, Reid, Gray & Ward (2018)	Presents an overview of vertical schools in Australia and examines 'vertical schooling' as a response to urbanisation and densification that has implications for outdoor access and learning.	Research article



These papers and book chapters are early explorations around the evidence of vertical schools mainly through case studies. They focus more on design than educational experience.

What other issues and types of evidence could inform and influence future directions?

5 How did we find what literature was (or was not) there?

The literature review that informs this paper examined research and commentary about vertical schools. The literature review responds to the research question, 'What conversations are evident in research, policy and media about Vertical Schools?'

A scoping review method was used, as outlined by Arksey and O'Malley (2005). Its primary purpose is to rapidly identify conversations and to provide indications of how this conversation is developing. This aligns with Arksey and O'Malley's (2005, p 21) description of a type of scoping study that "examine[s] the extent, range and nature of research activity". The literature review began with a search for peer reviewed articles in academic databases and expanded to include other search engines (Google Scholar and Factiva) and grey literature (government documents and conference papers). Selective searching was also undertaken to address gaps in the database searches. For example, Factiva does not include articles from ABC News, *The Guardian* and *The Conversation*.

Initially, searches were undertaken of two education databases, one architecture database and one comprehensive database: ERIC, A+Education, Art and Architecture Complete and Scopus. Each search was limited to peer reviewed publications, English language and the time period of 1995 to 2022 to focus on the most recent literature about innovative school learning environments. The search was undertaken in two stages. First, searches used "vertical school" and the related terms "high-rise school" and "tall school". The search results for these terms were similar and resulted in **one** eligible article. Second, a subsequent search used the following search terms: "urban school" AND architecture; "school architecture" AND design; and "school architecture" AND urban.

Search results were screened for inclusion based on relevance to the research question in terms of whether the article specifically commented on vertical or high-rise schools and contributed to understanding of vertical or high-rise schools (Table 4).

Table 4: Literature review inclusion and exclusion criteria

What conversations are evident in research and public commentary about Vertical Schools?	Inclusion criteria	Exclusion criteria
Type of study or article	The publication or study examines or includes: <ul style="list-style-type: none"> commentary about vertical or high-rise schools and/or descriptions of vertical or high-rise schools contribution to understanding of vertical schools 	Excluding technical building and construction studies
Type of conversation	The publication or study is research, policy, professional or media commentary about vertical schools.	Excluding social media and blogs

The search resulted in 1 article and the search results and screening are distilled in Table 5.

Table 5: Database search results

Search Term	A+ Education	ERIC	Art and Architecture Complete	Scopus
Limiters: peer reviewed				
Year: 1995 to present				
"vertical school"	0 identified	3 identified 0 eligible	155 identified 0 eligible	4 identified 1 eligible
"high-rise school"	0 identified	2 identified 0 eligible	1 identified 0 eligible	0 identified
"tall school"	0 identified	1 identified 0 eligible	0 identified	1 identified 0 eligible
Total eligible				1 eligible

The expanded search for peer reviewed articles using additional search terms. The same filtering exercise was undertaken to establish relevance and resulted in three publications including a book (Table 6). Several chapters of this book examine high-rise schools.

The search identified **four** peer reviewed publications specifically addressing vertical schools. Of the articles, two address the urban context of the school, and one makes note of a vertical school in relation to policy. The book examines schools in dense urban environments and includes chapters examining 'high-rise schools' as one type of school in urban density. An additional peer reviewed article was located in follow up searches of grey literature, to bring the total to 5 articles. Because so few articles were found to be eligible, they are all included in this study.

Table 6: Expanded database search results

Search Term	A+ Education	ERIC	Art and Architecture Complete	Scopus
Limiters: peer reviewed				
Year: 1995 to present				
"urban school" AND architecture	0 identified	7 identified 0 eligible	4 identified 0 eligible	9 identified 0 eligible
"school architecture" AND design	4 identified 0 eligible	345 identified 1 eligible	158 identified 0 suitable	102 identified 0 eligible
"school architecture" AND urban	0	76 identified 0 suitable	20 identified 0 eligible	22 identified 2 eligible
Total eligible	0	1	0	2 eligible

We acknowledge that there may be other literature that has not shown up in these searches and screening process, however the difficulty in locating the literature speaks to the need for more research to be conducted and for a common language to distil the findings.



Conversation starter

What other terms are used in your field to describe vertical schools?

6 There are more conversations in policy and non-peer reviewed literature

Because the database searches resulted in a low number of eligible and included articles, this potentially reveals a peer reviewed research or publication gap or delay. Research completed in the last two years or so may not yet be published. The search results also prompted additional searches including a Google Scholar search and searches of grey literature, such as policy and government documents, conference papers and other non-peer reviewed publications, on the assumption that discussions about vertical schools were occurring in forums other than peer reviewed research.

A further investigation of grey literature and non-peer reviewed literature was undertaken. This review included (a) identifying policy relevant to the development of vertical schools searching state government and department websites for three states and (b) identifying conference papers, PhD theses and professional publications as non-peer reviewed literature using Google Scholar.

Google Scholar searches used “vertical school”, “high-rise school” and “tall school” as the search terms. These are listed in Table 7 and the documents screened for inclusion are listed in Table 8. Of these documents, 8 were PhD theses indicating emerging scholarship about vertical schools. These are not included in the literature. This search also revealed an additional peer reviewed article which was not identified in earlier searches.

Table 7: Google Scholar search results

Search term	Google Scholar identified	After screening for eligibility
“vertical school”	297	14
“high-rise school”	56	1
“tall school”	154	0

Table 8: Non-peer reviewed literature

Document	Type	Description
Aminpour, F. (2020)	Conference paper	Conference paper examines the vertical school as community hub in which facilities are shared with local residents
Lamb, R. (2018)	Professional publication	Article examines the decline of space and green space in vertical schools as a health risk for children
Matthews, T., Newton, C., Guaralda, M. and Mayere, S. (2020)	Conference paper	Conference paper examines the vertical school as community hub and compares several examples from Australia and overseas.
Newton, C. (2019)	Professional publication	Article examines design of Australia and European vertical schools
Swinburn, A. (2017)	Government report	Report from a study tour that examines international and Australian vertical schools
Thomson, S. (2021)	Professional publication	Review of the design of Fortitude Valley State Secondary College

Three state government websites were scanned and searched for policy, reporting and guidelines about vertical schools. The schools which are included in the *Thriving in Vertical Schools* research project are located in Victoria, Queensland and South Australia. In all government websites the term ‘vertical’ or ‘vertical school’ did not provide many results and this search was supplemented with search for “vertical building” and “vertical design”. State Government guidelines for school design were scanned for references to vertical schools. State government commitments to building new schools are documented on websites and these were scanned for references to vertical schools. The results of screened searches are listed in Table 9.

Table 9: Government and policy reports

State Education Department	Type of documents	School design guidelines
Victoria – Victorian School Building Authority	Online documentation of commitment to build 100 new schools with some vertical designs indicated	✓
Queensland	Guidelines, regulations, forum proceedings and funding commitments	✓
South Australia	Profile of Adelaide Botanic High School	✓

6.1 Media Reports

A search of news sources using Factiva was undertaken, searching the term “vertical school” in all years of Australian news sources. This search found 71 news reports to May 2022, including the term “vertical school”, excluding doubles. The articles are sourced from state, national and international media. Additional searches of the websites of *ABC News*, *The Conversation* and *The Guardian* were also undertaken as these are not included in the Factiva search. These searches used the same search term and resulted in 10 articles from these national new sources. These results are included in tables 10 and 11.

Table 10: Media reports about vertical schools

Vic	NSW	Qld	SA	WA	NT	ACT	Tas	State (Total)	National	Inter-national
24	10	19	3	2	-	2	-	60	19	2

Table 11: Media reports by year

2007	2012	2013	2014	2016	2015	2017	2018	2019	2020	2021	To May 2022
1	1	1	2	7	1	11	12	19	10	13	3

The news articles – combined from Factiva search and additional searches - report about school development priorities for various stakeholder groups with some indications of conflict. The articles also highlight the development of vertical schools as a novelty and include descriptions of the schools, their drivers, objections and criticisms, and decision making (Table 12).

Table 12: Themes emerging from media articles

Themes in media reports	Refers to:	Number of articles
Description	physical attributes, type of place, facilities, urban context, student experience, sense of belonging, pedagogy	38
Drivers	reasons provided for the development of vertical schools including population growth and demographic change, innovative learning, developer proposals, urbanisation	42
Objections and criticism	criticisms of and objections to vertical school development and activities	28

Decision Making	decision making about vertical schools including design, planning, political decisions, community expectations, developer proposals	71
Stakeholders	Interviewees in articles include: <ul style="list-style-type: none"> • Catholic Education • State planning departments/authorities • Experts and academics • State government politicians and candidates (government and opposition) • Educators and Principals • State Government Premiers & Ministers • School Council • City Council • City Councillor • Resident group • Teachers Union • Building Union • Professional Associations – principals and librarians • P&C • Parents • Developers • Students • Architects 	

All the eligible literature has been included and referenced in this discussion paper. This literature review is intentionally focused on vertical schools. However, in scanning and screening literature for inclusion in this discussion paper, other bodies of research, including urban planning and historical literature, highlight how schools have developed in Australia over a century or more. In future research and academic commentary it will be important to expand the literature review to include urban, education and historical theory and research to understand broader co-evolutionary and urban dynamics.

7 Roundtable ideas and questions worth asking



Vertical schools represent a range of interests, and an opportunity to identify areas for further knowledge creation and sharing. The aim of the discussion paper is to address some of the gaps in the conversation and raise questions worth asking for further research. This discussion paper was augmented through a roundtable conversation in reflections and questions prompted by this discussion paper were shared.

Conversation starters were interspersed throughout this document as prompts for further discussion and exploration. These are collated below. Roundtable participants were invited to share responses to these questions or other ideas that were prompted by existing research.

- What educational visions are associated with vertical schools and what is the source?
- What other drivers do you see for the increased interest in vertical schools?
- Architecture historian, Julie Willis, describes a new school as a ‘symbol of hope’ – what hopes does a vertical school symbolise?
- Vertical schools are not that new, so why is there not more research about them? Are there other vertical schools in Australia that can be added to the list, and what is the source?
- What other terms are used in your field to describe vertical schools?
- The literature cited in this document are early explorations around the evidence of vertical schools mainly through case studies. They focus on design issues rather than educational experience. What other issues and types of evidence could inform and influence future directions?
- What are the questions that are worth asking as part of an agenda for future research?

8 Roundtable Discussion Summary

The roundtable discussion that was held on 26 October 2022, when the TVS project team elaborated on this collection of evidence from research, reports and media commentary. Together we agreed that what has been written about so far does not capture the full and exciting range of ideas that are associated with vertical schools.

The experiences of people who are intimately involved in the design, development and operations of vertical schools provided a rich, ground truth of ideas worth exploring. Some of the key themes that were evident in the round table discussions are listed below, together with questions which can inform an ongoing research agenda for vertical schools.

8.1 A ‘vertical school’ = $f(x,y,z?)$



A vertical school is surprisingly hard to pin down. What makes a school vertical? This idea needs further discussion as they do represent an emerging typology. Central to the typology is the notion of *verticality*. The discussion referenced other schools which have multi-level buildings but are not labelled as ‘vertical’ schools. While the vertical case schools in this study are urban schools there are other vertical schools that are planned for greenfield communities on small footprints. This suggests that the conceptualisation of a vertical school encompasses but also goes beyond verticality, as the typology has specific political, economic as well as educational agendas. In all, the discussion called into question the centrality of verticality as the defining characteristic while it also affirmed the ‘vertical school’ as a

Research questions worth exploring:

- What are the attributes of the vertical school as a phenomenon?
- How do we build knowledge about these attributes and their interrelationship and in an ongoing and relevant way for multiple stakeholders?
- What are the implications and opportunities architecturally and educationally? For example, how does a specific attribute (in relationship with other attributes) afford wellbeing and learning and how is this translated in an aligned way architecturally and educationally?

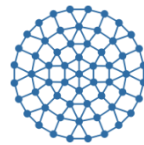
phenomenon; one that is multidimensional – a function (f) of various interrelated attributes, physical and social (x,y,z?). Multiple stakeholder interest in vertical schools, and the small research base confirms the need for further exploration. The Thriving in Vertical Schools research will provide current evidence on how students experience the emerging vertical school typology in Australia to inform design architecturally and educationally.

- What are the implications/opportunities, for example, in procedural terms for design and procurement?

8.2 Designing for Connection

There are complex relationships between the design of a school's buildings, its pedagogy, its leadership team, its context (students, locale, history, etc.), and its vision. The debate around designing urban vertical schools is yet to recognise and respect the nuance of these interdependent relationships. In the roundtable discussion, stories about these connections frequently emerged: about how pedagogical decisions made by school leadership drive the design of the built environment and how the built environment drives pedagogical decisions such as timetabling. Students also respond to the dense connection in the environment with behaviours that may not be as apparent in traditional horizontal schools. For example the transparency of vertical school buildings can contribute to a sense of being observed. A student in a vertical school sees and is seen by more teachers and peers. As urban vertical schools are densely connected spaces, the lines of sight are up, down, out, and in: people see each other more and the school is more seen. Its rising edifices, its inhabitants, its pedagogy, its leaders, its 'vision' as an institution are on display. This combination of connection and visibility of connection, arguably, raises the stakes for those designing such places, and for those leading and learning in vertical spaces.

Urban vertical schools also have the advantage of connections to their context of dense, urban areas; places that are alive with commerce, culture, and diversity. Vertical schools take



Research questions worth exploring:

- How does the visibility and density of connections influence the creation of school culture and community?
- What do teachers and students who have experienced both vertical and horizontal schools identify as differences and similarities?
- How does connection within and beyond vertical schools affect teachers' perceptions of teaching and learning?
- What kinds of connection between a school and its community are possible or desirable?
- What are the boundaries of connection and the possibilities for semi-permeability?
- How does a semi-permeable school challenge norms around curriculum, supervision, and responsibility?
- What are student perceptions of safety and contribution in the urban environment?
- What pedagogical decisions made by school leaders inform vertical learning designs?
- What design elements in vertical schools inform school leaders?

advantage of this connection to their surrounds, emphasising the learning opportunities that are available within proximity of the school. This is a radical conception of what it is to be a school where it is seen as the locus for activity; as semi-permeable and where students and teachers can come and go freely to the mutual enrichment of both school and surrounds. Such opportunities for connections are contextual with opportunities to integrate locational advantages with school learning. Semi-permeable schools also challenge many taken-for-granted norms of supervision, risk, and responsibility. As students move through cities and hangout, they are also changing their communities in unknown ways. Designing for connection also requires more research about the experience of people within current vertical schools.

8.3 Experiences

Experiences within vertical schools can be highly varied. Visibility and proximity within vertical schools can be both exciting and challenging for students and teachers. Students who feel seen can experience belonging, and increased need for privacy. High balconies and views create connection, and increased safety considerations. Students may find integrated curricular topics encourage creativity and flexible use of spaces. Some students with sensory sensitivities, may also find flexibility overwhelming. Accessibility and inclusion need to be evaluated by investigating student experiences. It was noted that students are finding spaces in the school to use in unexpected ways. Also that teachers often take about six months to adapt to teaching in a vertical school, as some of practices that are effective in a horizontal school are not as relevant in a vertical school. School leaders report making new types of decisions, collaborations and problem solving. Much more

- How are our urban vertical schools sharing this valuable design knowledge with one another?
- What new ways of design and leadership knowledge sharing might be possible?
- And what contribution to theory might be made from such understandings?



Research questions worth exploring:

- What do parents and students consider when deciding whether to enrol in a vertical school?
- How does the innovative building influence expectations parents have of urban schools?
- Does student movement through high density urban areas change the community?
- Are there any spaces in the school where no one wants to go, or everyone wants to go?
- In classrooms do teachers and students notice a difference by being up high?
- How do students with disabilities that impact on their mobility, and sensory

research is needed about the possibilities and tensions in the lived experience for students, teachers, leaders and families in vertical schools.

Family-school life experiences are an important area for more research. Vertical schools seem to prompt families to consider new combinations of school, work and family life as more families come to live in the inner city, or students travel from the outer suburbs on the train or bus with parents and carers who work in the city. Discussants spoke about the influence of family members who are unfamiliar with the school creating mixed expectations as vertical schools may not look like a school at all. Students may find their school routines and practices are heavily scrutinised or questioned at family gatherings. Students have developed a language to talk about their schooling. Alongside understanding varied experiences, the importance of communication and vision in vertical schools was clearly a focus for more research.

8.4 Vision

Vertical schools are more than a building. They are also shaped through culture and purpose that reflects a vision for education into the future. Envisioning the opportunities of vertical schools includes the mesh of school and broader communities, pedagogy and design in an urban context. School leaders in vertical schools recognise the importance of vision and values creation as part of positioning a new school to gain the confidence and trust of staff, students and families. The vision and values also reflect the opportunities for teaching and learning availed by the built form, the location and the broader community. These opportunities can include the desire to do things differently, engage in interdisciplinarity, collaboration and searching for new synergies while supporting pedagogical experiments that can inform education more broadly. Located in

differences experience accessibility in vertical schools?

- What are the unique challenges for school leaders in establishing vertical schools and the leadership strengths that are needed?



Research questions worth exploring:

- How are school leaders' visions influenced by the vertical school environment?
- What is the social or stakeholder expectation of student learning and experience in vertical schools?
- How does education vision in/for vertical schools include student voice?
- How do policy makers and school communities understand and capture the full benefits of vertical schools to realise educational vision?

urban precincts, vertical schools also extend their educational vision by providing access to diverse experiences that can engage cultural facilities and nearby businesses.

Visions for vertical schools are also informed by guidelines and policy set by state governments and there is a need to ensure that the design and education briefs enable aspiration, especially for vertical schools in urban settings. However, existing design briefs do not always provide sufficient scope for collaboration between educators and designers. Vertical schools attract high expectations for innovation, and therefore an opportunity to revisit restrictive and redundant requirements. A collaborative briefing process can be an opportunity to capture a vision for schooling in the policy requirements, with roll-on impacts for operations and maintenance budgets. An important design challenge encapsulated in vertical schools includes future proofing through built forms that can be adaptively re-used, recognising that cities and populations can change over the building's life.

- What are the barriers and enablers for vertical schools in complying with state government issued standard design guidelines? How can this be addressed to ensure parity across all state schools?
- How are the differences in operations and maintenance of vertical schools accommodated in policy and budgets?
- What are the alternatives to standardised design guidelines and briefs that can satisfy stakeholder needs and aspirations?
- What advice and evidence do state governments need in relation to designing, building, operating and maintaining vertical schools?
- What lessons should be incorporated into government guidelines and decision-making?

9 Conclusions

Little formal research has been conducted so far with the designers, leaders and learners in vertical schools and more research is needed. More vertical schools are being built, and there are multiple stakeholders whose interests intersect. We need to learn from pioneers to inform the ongoing design and educational work.

Vertical schools are an emerging school typology in Australia that is yet to be clearly defined, however any conceptualisation needs to consider more than the physical height of schools. The vision for vertical schools is associated with innovation and connections to community that can lead to new ideas for education, and for urban communities.

The Thriving in Vertical Schools ARC Linkage project is designed to generate evidence from students, designers, school leaders and teachers about their everyday experiences in vertical schools. The research is being conducted in 2022- 2024. While the evidence from the Thriving in Vertical Schools project will answer some of the questions raised in this discussion paper, there is a need for more research and transdisciplinary dialogue across the architecture, education, urban planning, construction, design and wellbeing communities. The ideas and questions raised in this discussion paper are invitations to talk across disciplines and plan to learn from research together. When we come together to raise questions and share, a sense of what is possible is created.

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