Constructing Education: Building for impact

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Table of contents

Introduction 1

The Constructing Education framework 2

Phase 1: Initial planning guided by a shared vision for education 2

Phase 2: Getting ready for the new learning environments 2

Phase 3: Moving into the new building 2

Phase 4: Reflecting and adjusting 2

What we learned about the relevance and feasibility of implementing the Constructing Education framework 3

Phase 1: Architectural brief and initial education planning 3

Phases 2 and 3: Construction and getting ready to move in 6

Phase 4: Post-occupancy evaluation, reflecting and adjusting 9

The costs of implementing the Constructing Education framework 12

Conclusions 13

Annex 1: List of participants 15

FINLAND 15

ITALY 16

Annex 2: School projects 17

Annex 3: Design template 23

About this publication

This publication was prepared by Yael Duthilleul (principal education technical advisor, Council of Europe Development Bank) and Silvia Guallar Artal (education economist, European Investment Bank) in collaboration with a group of experts that supported a three-year study to assess the feasibility of the Constructing Education framework and the costs of using the framework to guide investments in education infrastructure. Experts include Pamela Woolner from the School of Education, Communication and Language Science at Newcastle University in the United Kingdom, Reino Tapaninen, a Finnish architect, Raffaella Carro and Leonardo Tosi from the National Institute for Documentation, Innovation and Educational Research (INDIRE) in Italy. Paula Cardellino, an architect, was also part of the expert group that worked with the municipalities involved in the study.

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Foreword

The Council of Europe Development Bank (CEB) and the European Investment Bank (EIB) are committed to supporting education investments that foster learning and promote social cohesion.

The CEB designed the Constructing Education framework to address the disconnect between the construction process and education aims when planning and building schools or other education infrastructure. This disconnect prevents investments from influencing education outcomes in the desired way. For example, innovative spaces designed to promote collaboration among students and develop problem-solving skills are not always used to their full potential because teachers are not trained in how to exploit them. When a school is designed without involving the teachers, administrators and students that occupy it, the new build or refurbishment risks maintaining the status quo instead of introducing innovative ideas – preventing the full potential of the investment from being realised.

The CEB and the EIB engaged in a three-year joint study to examine the relevance and viability of the Constructing Education framework for its clients. We thank the cities of Järvenpää and Espoo in Finland and the municipality of Milan in Italy for agreeing to participate in the study, and we thank the officials and school principals who helped us test the concepts and tools offered by the framework. Their involvement helps us to refine the framework and better estimate the cost of implementing it.

The discussions with educators and city officials were rich and thought-provoking. They confirmed the framework's potential to promote investment that directly supports learning.

It is essential to help city and regional officials understand the importance of including school principals, teachers, administrators and even students in the investment process. At the same time, educators need to appreciate the key role the learning environment plays in developing new pedagogical approaches, so that they can more effectively tap the potential of new spaces to support learning and inclusion.

We look forward to opportunities to apply the framework to the educational investments our institutions support.

Tanja Faller

Director of the Technical Assessment and Monitoring Directorate

Council of Europe Development Bank

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Head of the Education and Public Research Division

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Introduction

In March 2021, the CEB published Constructing Education: An Opportunity Not to Be Missed.[1] This paper proposes a new approach to financing educational infrastructure investments to ensure that they promote learning. The main idea is to integrate an educational perspective into the construction process. This new approach builds on the CEB's in-depth research into the links between school design and learning outcomes in Espoo (Finland), Seine-Saint-Denis, (France) and Malmö (Sweden), and on the existing body of academic research exploring the relationship between physical spaces in schools, such as classrooms and common areas, and student learning.

From 2021 to 2023, the CEB and the EIB worked with Finland and Italy, both of which have received significant financial support from the two institutions, on the feasibility of implementing the Constructing Education framework. Two municipalities in Finland – the major city of Espoo and the smaller municipality of Järvenpää – along with the municipality of Milan, Italy, identified two schools per city[2] that were at different stages of construction. Over a three-year period, city officials and school principals engaged with the CEB and the EIB on whether the approaches used in building the new schools were aligned with, or could be enhanced by, practices proposed by the Constructing Education framework. A list of the participants and a brief presentation of the schools participating in the study can be found in Annexes 1 and 2.

The purpose of the three-year study was to follow up on the construction process of selected schools and consider the experiences and opinions of the different stakeholders (city officials, school principals and teachers). It sought to identify which practices made the investment more effective, which tools facilitated the process, and how successful the Constructing Education framework could be in increasing the benefit of education investments.

Two experts – one educator and one architect – were assigned to each participating location to act as facilitators. One of the experts was based locally and had an in-depth understanding of the educational context of the relevant country. At least three remote meetings were held every year with the different participants to collect their views and experiences about the challenges encountered while implementing the investment. To arrange school visits and encourage exchanges among the educators, city officials and a larger audience of education experts, two in-person learning events were held in Milan (2022) and Järvenpää (2023).

This report presents the study's conclusions and confirms the relevance of the approach outlined in the Constructing Education framework. The study identifies some of the obstacles encountered in implementing the framework, and calculates the additional cost of the educational and collaborative activities proposed for inclusion in education infrastructure investment.

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1 Duthilleul, Y., Woolner, P. and Whelan, A. (2021) Constructing Education: An Opportunity Not to Be Missed. Thematic Reviews Series Council of Europe Development Bank, Paris.

2 In the Espoo, Karhusuo and Tuomarila Schools; in Järvenpää, Harjula Campus and Järvenpää Comprehensive School; and in Milan, Lower Secondary School Cristoforo Colombo and Scuola Primaria Matilde Viscontini. More information about the schools can be found in Annex 2 and in the following blogs: https://www.eib.org/en/essays/finland-education-school-design and https://www.eib.org/en/essays/education-financing-italy-infrastructure

The Constructing Education framework

The framework proposes embedding an educational perspective into the design of a new school, as opposed to conceiving a school building as a purely architectural product. This means identifying education-related activities that should be carried out simultaneously with planning, design and construction to ensure that principals, teachers and others get the spaces they really need, and know how to make the best use of them when they move in. However, this approach requires funding these additional activities – for example, training teachers to use new spatial configurations, like adjustable modular classrooms. These costs should be included in the total project costs.

The framework sets four critical phases for collaboration in the construction process: (1) the initial planning phase, guided by a shared vision for what education should be; (2) getting ready to move into the new building; (3) moving in; and (4) reflecting on the new spaces and making adjustments for future cooperation. This applies an educational perspective to the conventional architectural phases of building a school: (1) the architectural brief, (2) construction, (3) handover and (4) post-occupancy evaluation. The purpose is to ensure that, once the school is done, educators can use it to its full potential to support quality learning for all.

Phase 1: Initial planning guided by a shared vision for education

The framework is guided by the idea that new or rehabilitated school spaces should reflect and support educators' chosen activities and pedagogical practices. The original design should therefore be informed by educational values and perspectives – specifically, a guiding educational vision for school design should be developed at the relevant level of government. Educators can then add on to this vision for their schools, or use it to provide feedback on building designs proposed by officials. In cities or countries that use standardised designs for schools, educators can still participate in planning how the new spaces will be used. Thus, this process is also an opportunity to develop a vision for what a school should be, and to shape the future of learning. It is essential that it be guided by longer-term thought that reflects the values of the city and country, and is not limited to the perspective of one principal or teacher.

Phase 2: Getting ready for the new learning environments

The time it takes to build a new school is time that teachers, educators and students can use to prepare to move in. Teachers must be able to plan together and try out new furniture and equipment. The construction phase is also the ideal time to begin offering professional development to help teachers exploit the new space's full potential to promote learning, especially if the design includes innovative installations and technology. This development can be continued into phase 3. It is also the time to reflect on which organisational changes will be needed under the new design.

Phase 3: Moving into the new building

Moving into a new school can be frustrating for teachers and students. It takes time to ensure that all the materials and furniture are in the right place, and that new equipment works as intended. And having time to explore is all the more important when transitioning from a conventional classroom to an innovative, open design. Teachers will need support throughout this process to make the space their own. School principals should consult regularly with students and teachers at this stage – to discover how occupants view and use the new space, address any problems that arise and identify necessary alterations. This consultation is also important to show students and teachers that their opinions are valued, which will help create a positive school environment.

Phase 4: Reflecting and adjusting

Once the building is occupied, it will be important to continually evaluate how the new spaces are used so that they can be adapted for needs that develop over time. A monitoring team can be created to collect feedback from users and reflect on future needs. It is also useful to exchange with other schools or research teams. From an investment point of view, the importance of post-occupancy evaluation is well established, even if it is not

often used as a tool to guide future investments. Different post-occupancy tools exist that can lend valuable insight into how a space is being used and what could be done to improve this usage.

A summary of the four phases set by the Constructing Education framework is presented below.

Table 1: The Constructing Education framework

	Phase 1	Phase 2	Phase 3	Phase 4
ARCHITECTURAL	Brief	Construction	Handover	Post-occupancy evaluation
EDUCATIONAL	Initial planning	Getting ready	Moving in	Reflecting and adjusting

What we learned about the relevance and feasibility of implementing the Constructing Education framework

Two countries that participated in the Constructing Education framework study, Finland and Italy, have very different approaches to managing education.

In Finland, the curriculum is defined at the national level. However, local governments are responsible for the construction, maintenance and operation of schools, the recruitment of teachers and the development of a local curriculum that complements the national one. Thus, while schools must follow the national curriculum, principals and teachers have considerable freedom to determine how it is implemented.

In Italy, the national government sets minimum standards for education, manages school staff and ensures consistent quality throughout the system. Local authorities are responsible for the construction, operation and maintenance of school buildings. Every school handles its own and administration and management, and schools define their curriculum and educational activities, and organise teaching (school hours, use of space, class grouping, technological infrastructure, etc.).

Due to these different approaches, discussions with Finnish officials at the local level involved construction and educational aspects, but consultations with city officials in Milan largely focused on construction issues. School principals and teachers engaged in the discussions and shared their experiences. In Finland, particularly in urban areas, recent projects to build and refurbish schools are driven by population growth, and on fighting mould that affects the air quality of older school buildings. At the same time, new buildings, extensions and refurbishments are designed to respond to a new national curriculum that promotes team teaching, with a fresh focus on the kinds of learning environments required for this. In Italy, investments are driven by the need to rehabilitate and modernise old infrastructure, improve access to education in some areas and promote innovative pedagogical practices.

Phase 1: Architectural brief and initial education planning

The framework proposes that the architectural brief guiding school design be drafted in consultation with principals, teachers and students, under a long-term national/local vision for education informed by the knowledge and experience of educators. This consultation process should be structured, systematic and guided by a facilitator that understands the construction and education aspects of school design, and can foster a forward-looking vision for education. Financial resources should be devoted to ensuring that stakeholders can join in the discussion and take action, such as visiting recently renovated schools and meeting experts and other teachers to further develop their understanding. This proposal is supported by evidence from the Finnish and Milan examples below.

The Finnish case: Espoo and Järvenpää

The Finnish building process involves educators at the earliest stages of school planning and design, which is fully aligned with phase 1 of the Constructing Education framework. In Espoo and Järvenpää, schools are planned and designed by municipal officials and school principals, who have a degree of control over the project. This typically yields cohesive plans for buildings and learning environments.

Initial meetings are held between the municipal officials who plan new schools and the school principal, ensuring the principal's involvement in the design from the outset. Regular, structured consultations take place during the different planning and building phases so that users' wants and needs are considered. This consultation process is supported by financial resources that (at least partly) cover the time the school principal spends on the project. For completely new builds, school principals are appointed six months to a year before construction is completed. Resources are also available for teachers to visit other newly planned or renovated schools that may inspire the design. This provides a comparison, or benchmark, for the project.

In addition, the school – normally in cooperation with the municipality – can hold a "dream school" event that involves teachers and students. The Karhusuo School in Espoo held a full day event with the architect, the teachers and all the students (around 20 members of staff and 200 pupils at the time). The ideas generated at these events are used by the architect and municipal planners to develop the brief.

"Dream school" events help administrators, teachers and students suggest ideas for the curriculum, and how to use and allocate the new spaces. This approach helps to forge a shared vision for the new school. At the Karhusuo School in Espoo and the Harjula School in Järvenpää, the principals used this time to conceptualise how the new premises would be used and what new educational approaches and activities would be put in place. At Harjula, one new approach was to carve out "small schools" – individual units embedded in the larger school – to be reflected in the building design. These "small schools" exist for all grades, and each is led by a deputy principal. This facilitates contact between students and teachers, as students remain in a familiar environment and the same teacher keeps track of them over several years.

However, even in the Finnish system, school communities were able to influence design less (or at least differently) than might be hoped. In this initial stage, all principals cited difficulty getting their ideas included in the building design and subsequent construction. Of course, as municipal officers make clear, budgetary and other constraints come into play. Still, the principals reported successes, too, such as getting wider corridors that can be used for learning activities, a cloakroom, and retractable walls between classrooms instead of curtains. Unsurprisingly, educational and architectural ideas were most successfully combined when educators' pedagogical vision aligned with the flexible design preferences of the municipal officers and architects.

It is also essential to bear in mind that the Finnish national curriculum[3] provides a very clear vision for education, and sets out guidelines for how this vision should be supported by the learning environment. Some of these guidelines are:

Learning environments are spaces and places, as well as communities and practices, where studying and learning take place.

Good learning environments promote interaction, participation and community knowledge building. They also enable active collaboration with experts outside the school community.

A school's spatial solutions, including furniture, equipment and tools, must make it possible to support the pedagogical development of teaching and the active participation of students.

Learning environments should provide opportunities for creative solutions and for examining and researching things from different perspectives.

In the Finnish vision of education, learning takes place everywhere. It is not limited to a classroom or area of instruction, but permeates the entire school space, inside and out. The surrounding community is also seen to provide opportunities to learn. While this approach is not completely proscriptive, it does suggest the need for a range of spaces. This need is generally met through versatile areas that can be reconfigured as needed, and that allow teachers to work together in pairs or teams. New school spaces are being designed to support this

[3] https://www.oph.fi/en/education-and-qualifications/national-core-curriculum-primary-and-lower-secondary-basic-education; https://www.oph.fi/en/statistics-and-publications/publications/core-curriculum-general-upper-secondary-schools-nutshell; https://eperusteet.opintopolku.fi/#/en/perusopetus/419550/tekstikappale/429104

vision of education, and local authorities in charge of financing school construction or renovation are encouraged to follow this approach.

The Italian case: Milan municipality

In Italy, municipalities decide when a new school is needed, whether to respond to population growth or because an existing building no longer meets safety standards. Schools are public buildings, and the construction process is transparent. Municipal officials discuss the building needs with the relevant school principal when developing the initial design brief, but the broader school community is not automatically involved. Once the design brief is set, a public tender is issued to design and build the school.

The municipality of Milan is continuously planning, building and refurbishing schools, and over time it has reflected on the need for new kinds of learning environments that bring design and pedagogical practice together. The municipality is committed to improving school architecture and has experimented with a participatory design process over the last decade. In 2018, it issued a new set of guidelines for upgrading and improving schools. These guidelines appear in the *Milan Manifesto (2020),* which talks about the importance of new, innovative approaches when designing schools and rethinking learning environments.

As a result, the most recent school designs have included the participation of the school community and integrated specific objectives promoted by the municipality, like flexibility, use of outdoor environments and openness to the surrounding community. This is guided by an understanding of a school as a *civic centre* – a social and cultural hub for the whole neighbourhood. One of the Milan schools included in the Constructing Education study, Viscontini Primary School, included some of the innovative steps mentioned above when drafting the design brief.

During the initial planning phase of the new school, pupils participated in an educational project called "The School of Colours" in which children were asked to draw their dream school. One of these drawings ultimately inspired the appearance of the building's exterior. However, the planning process was not truly participatory, and the design was not a collaboration between the school community and other involved parties (like city officials). Moreover, there has been a significant turnover in school principals and teachers in the ten years between the initial planning phase and completion of the building.

Milan involved the school community in the early planning of some new schools, including the Colombo School, the other school included in the Constructing Education project. The objective was to create a building aligned with the needs of educators and students, to strengthen a sense of belonging and the relationship between the school and the surrounding area. For the Colombo School, the participatory planning process was run by AB Città, a non-profit association from Milan. The process followed the IVAC methodology – investigation, vision, action and change – which facilitates constructive collaboration between different groups.

The first steps included consulting with all the classes, setting up workshops with adults and children, and defining project indicators and expected results. The main aim was to gradually find a shared vision with the collaboration of teachers, who touched base with their classes and then communicated their ideas. The workshops involved setting priorities and finding points of discussion for the children as well as for teachers, parents, non-teaching staff, technicians and local authorities. At the end, the participants shared slogans that came to represent the project. The idea of an ecological school emerged: a school that opened up onto nature and to the surrounding area, and that could become a vital centre for the community.

The technical department of the municipality and a purpose-created working group wrote the call for proposals for the new building. They considered the results of the participatory process and translated the various needs in a manner that made room for diverse and original design solutions.

The informal design consultations at the Viscontini school, as well as the more formal consultations for the Colombo School conducted with an external consultant, identified the wishes and needs of the various groups (students, teachers and the principal), but did not develop a specific pedagogical vision that guided the design. AB Città, the consultant that ran the consultation process between designers and users for the Colombo School, had no specific expertise in designing spaces for educational purposes, and there was no national education vision to inform its decisions.

In Finland, the process worked differently. From an early stage, the collaborative consultation process was guided by educational goals. This appears to have improved the effectiveness of the building's design and use.

Summary

Participatory design should be embedded in the process of constructing and refurbishing schools to ensure a better match between design and use. This is already the case in Finland, and it is becoming more systematic in Milan. When it works well, the participatory process provides useful information for the school's design, allowing specific features to be added to make the building better suited to the needs of educators and students. However, to be useful, participatory design must reflect an educational vision supported by the city or country, so that decisions from the consultation process are integrated into a longer, more sustainable vision of education than that of just a few individuals. Consultations are also opportunities to develop and inspire a vision for new schools in the future.

Advisers and other people involved in this consultation need to be well-versed in architectural design and education. They must help educators understand how the space will affect their teaching activities, so they can make informed decisions about the design. Educators also need to develop their skills to make effective use of the new space's potential.

The consultation is thus a dialogue, not a mere wish list. It needs to identify key design features that can help attain educational objectives while respecting budgetary constraints. The challenges educators will face when moving from a traditional space to an innovative one must be identified early on, so that the necessary support can be provided. The architectural template developed for this study can help facilitate this process; see Annex 3 for a sample template.

This first phase will be more successful if the same people from the school and municipality take part in the discussions throughout (although this may be difficult given the number of years it takes to build a new school). Communication between school and city officials also needs to be structured, and resources should be made available to pay participants for the time they spend on the project. Lastly, the educational vision guiding the investment should be made clear to all participants from the start.

Phases 2 and 3: Construction and getting ready to move in

The construction period is the perfect time for school staff to get ready for the new spaces: for example, to try new furniture and different classroom arrangements, and to anticipate how the new spaces will affect the school's organisation, particularly when new, innovative design features have been introduced to facilitate team teaching and other new practices. The Constructing Education study revealed a few interesting things. In some cases, the staff for the new school had yet to be appointed or had changed significantly from the initial consultation phase. As a result, the "getting ready" phase had to be done after construction was completed, which is actually phase 3 of the framework (moving in), when educators and students get to know the new spaces and ensure they function properly.

During our consultations for the study, it became evident that no systematic support had been planned to help school principals and teachers prepare for the new building, either during construction or after the move. Even in Finland, these preparations usually took place at the initiative of the school principal, who understood the implications of changing buildings and invested part of the school budget in supporting teachers. In the case of Milan, a single initiative led by the municipality addressed this issue, in collaboration with the local university. Finally, we noticed not only that teachers needed new skills to be able to use the innovative spaces effectively, but also that a significant amount of time had to be allocated to plan the school day and a timetable, and that these changes required effective communication. The experiences from the different schools during phases 2 and 3 are presented below.

The Finnish case: Espoo and Järvenpää

The types of collaboration proposed by the Constructing Education framework for phases 2 and 3 occurred in Finland. Although they did yield some benefits, the collaboration was inconsistent and the results uneven. Unlike the first phase, which was led by the municipality, the collaboration undertaken in the second and third phases often only occurred because the principal took initiative or as a result of lucky timing with other teacher development initiatives. For example, at the Karhusuo School, the principal used funding from the school budget to pay external consultants to work with her staff on how students' needs were changing as they moved from a pure primary school to one that included all grades, which required accounting for older and younger learners. One teacher at Karhusuo also took part in an existing municipal initiative that gave them time to visit other

schools (one day per month for a year), enabling them to reflect on other school designs and organisational approaches.

During the construction phase, Espoo and Järvenpää actively involved school staff in making choices about furniture. This involvement was also possible at the Tuomarila School, despite a procurement approach that limited the principal's engagement in the design process. Once educators moved into the new schools, they seemed largely satisfied with the choices made. Enabling educators to make decisions about furniture and other equipment is a very effective way to connect pedagogy with a physical space. This was particularly successful at Harjula School, where a pedagogical approach developed before the rebuild inspired educators to organise the new space into three mini-schools. This vision was reflected in the design of shared and versatile spaces that, in turn, required flexible and varied furnishings.

However, all the schools had difficulty anticipating their furniture needs before moving in. Furniture and other classroom equipment that teachers did not ultimately find useful were often stored in corners, and extra items were purchased after occupying the new buildings (for example, booths placed in a lively corridor space in the Karhusuo School to provide quiet spots for some students). This experience led officials in Järvenpää to save part of the furniture budget for the second year of use, once real needs were better defined. This is an established practice in Espoo as well, where allocations for school furniture are divided over two years.

Perhaps inevitably, moving in was stressful for all schools. Municipal officers from the department responsible for school premises helped educators learn how to operate technical features of the new buildings, such as retractable walls to adjust the size of the learning space. This was appreciated, but teachers had a lot to learn and did not feel they received enough support to fully exploit the potential of the spaces. Principals shouldered most of the burden of moving in, usually because municipal staff had not sufficiently reflected on ways to smooth the transition. Much of the principals' time during the first year was spent fixing issues that affected how the school functioned, and often they did not have the right information about whom to call to fix problems (builders, equipment suppliers, city officials, etc.).

The phased approach used to build Järvenpää Comprehensive School JYK and Karhusuo allowed for some planning and adjustment before moving in. At Karhusuo, educators' experience in the first phase of works, realised with modular buildings that offered plenty of flexibility, prompted them to make changes to the design in subsequent phases of construction. At JYK, administrators significantly changed the plan for where different classes would be located in the second year of operation, after realising that some sections of the building were less suitable for older students. Surveys of staff and students conducted by the municipalities provided useful feedback on educators' experience and specific shortcomings of the new buildings. However, no baseline data were collected from educators for the old building to compare to their experience in the new one. A survey of Tuomarila staff performed during construction, when many teachers were in temporary buildings, showed rising anxiety and an expectation of being dissatisfied with the new building.

Surveys can be a valuable tool in identifying where teachers need more support. That, in turn, helps educators refine and adjust how the new space will be used.[4]

The Italian case: Milan municipality

In Italy, as mentioned previously, building new schools falls to municipalities, but educational activities are overseen by the national government. However, the municipality of Milan has taken a rather innovative approach to building new schools, supporting teachers' participation in the design and helping them to appropriate the new spaces, as discussed below.

Educators at Viscontini Primary School did not participate in any preparatory activities before moving into the new spaces. In the six months prior to handover, the principal was involved in "soft construction" decisions: plumbing, electrical wiring, paint colours, furniture, etc. The furniture was an integral part of the design, but here the final decisions were made following a discussion with the principal.

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4 In Finland, existing municipal surveys were used together with items from:
OECD School User Survey: Improving Learning Spaces Together (2018). https://www.oecd.org/education/effective-learning-environments/OECD-School-User-Survey.pdf
Rudd, P., Reed, F. and Smith, P. (2008). The Effects of the School Environment on Young People's Attitudes to Education and Learning. Slough, NFER.
Sigurðardóttir, A.K. and Hjartarson, T. (2011). "School buildings for the 21st century. Some features of new school buildings in Iceland." CEPS Journal, 1(2):25-43.

In Italy, the local government purchases school furnishings through public tenders. In the past, the furniture was chosen from a list of standard options. But in Milan, the municipal government has integrated some consultation in the process, resulting in more diverse furnishings. The municipality organises the tenders after considering the needs of the particular school and its pedagogical approach.

To support teachers moving into the new Viscontini Primary School, the municipality reached an agreement with Bicocca University. However, training and other professional development activities were only offered two months after educators took over the new building. When they first met, university staff found teachers quite disoriented, especially because the move came after the two years of the COVID-19 pandemic, which limited contact between teachers. Staff and students needed first to familiarise themselves with the new spaces, furniture and equipment. More experienced teachers were reluctant to change teaching methods they had been using for years, while younger ones lacked practice. Focus groups highlighted that teachers needed support when trying to appropriate the space. Teachers expressed a sense of inadequacy in the face of an "overwhelming challenge."

The first step in the professional development programme were team-building exercises with teachers that explored the potential of new classrooms, materials and technologies – especially the potential of the open spaces within the school, and the outdoor spaces.

In the second step, teachers actively planned how to use the spaces. This involved researching how they might be used and experimenting with different approaches.

Summary

When the school staff was involved immediately from phase 1, the move into the new building was more successful, largely because educators could plan how best to use the spaces to meet their educational objectives. However, that planning was only meaningful when the principal was able to involve staff in the decisions being made by city officials, architects and builders. This approach was more likely to be used when municipalities directly handled the builds, although it still took up a lot of principals' energy – as one remarked, "I didn't realise how many times we had to discuss drains and sockets."

More problematic, however, was the experience of the Tuomarila School, where the procurement process limited the principal's involvement in decision-making. Consequently, the school was less engaged in the planning process. This lack of consultation appeared to increase staff anxiety and dissatisfaction during the construction period, and it produced some disappointment when teachers moved into the new building (although this lessened as teachers settled into the new premises).

When specific support was provided to teachers, it proved to be effective. For the Karhusuo School in Finland, this support was organised by the school principal, who felt her staff needed guidance on how to adapt to changes in the school's organisation. An external consultant was hired to help with this process. For the Viscontini Primary School in Italy, the intervention by the local university helped teachers to view the new school spaces as a resource. The students were involved in personalising the spaces, and teachers reflected on new organisational routines, on active collaboration and on rethinking the relationship between the classroom and the external spaces.

The approach of Espoo and Järvenpää of involving educators in choosing school furnishings, which was also experimented with in Milan, helped ensure educators' active participation in phase 2 and eased the transition to phase 3. Beyond improving satisfaction, this collaborative approach encouraged educators to connect the new spaces and design features with educational objectives. This link is most effective, however, when teachers are already involved in deciding how to use the space, and in creating a vision for the new premises.

The key challenge through phases 2 and 3 is the deep entrenchment of ways of working in the old school building and other existing structures, including how lessons are organised and how students are grouped. If educators want to change how things are done, they need to reflect on how the new school building can foster that change – preferably before the design stage, and certainly during construction. Embedding ways for school staff to collaborate on the design, particularly in the earliest stages, would ensure that this reflection happens. These could include:

- Providing (and funding) time and space for teachers and administrative staff to meet together and plan.
- More ongoing, systematic support for principals and other staff to connect the educational, organisational and spatial aspects of school design.

- External support through mentoring from principals who have experienced school rebuilds and/or using external consultants to help develop educators' skills.
- Initiatives to support inter-school exchanges of successful practices, which build on existing professional development opportunities but are centred on the design and organisation of learning spaces.
- Systematic training for staff when a new building or renovation is planned. Developing the knowledge and skills educators' need to effectively use the new spaces and furniture would help them appropriate the spaces.

Moving in is inevitably a stressful time. Principals and teachers need systematic support during this period. This support can include:

- Concise, clear instructions explaining how building features and furnishing work, that users can consult early on, reference as necessary and share with others. Videos are a particularly effective tool.
- Opportunities for school principals who have been involved in building or refurbishing schools to meet and share knowledge.

Phase 4: Post-occupancy evaluation, reflecting and adjusting

Most countries omit phase 4 of the Constructing Education framework. This is a problem because it prevents educators and officials from learning important lessons that could influence future education investments. The study confirms that an appropriate post-occupancy evaluation[5] provides relevant information to building planners and users that facilitates communication and necessary adjustments to infrastructure. Different tools were tested during this study: time-lapse photography[6] that took photos showing how different spaces were used at different times; a post-occupancy evaluation methodology that combines a pedagogically oriented analysis with an architectural evaluation using a mix of tools, like user surveys and observations;[7] and a pedagogical walk-through[8] in which users move through the different spaces and note their experiences. All three tools provide valuable data that fosters communication and adjustments. City officials also used information gleaned from questionnaires that were sent to educators and students.

The Finnish case: Espoo and Järvenpää

Change takes time and effort. The four schools underwent different amounts and types of change, including merging schools, increased numbers of students and staff, and expanding primary schools to include lower secondary students or pre-schoolers. The principals in the study reflected on the challenges their schools were facing and commented on ways to facilitate successful change. These included displaying and disseminating documents explaining the new pedagogical vision, as well as recruiting new staff who understood the school's pedagogical principles. These attempts at progressive, if gradual, change in staff culture can fuel steady educational evolution.

However, connecting these developments to the design and use of the premises was more evident in some schools than in others. Furthermore, it can be difficult to make changes to how a building is used after the stress and disruption of moving in have subsided. As noted above, the phased building work at JYK offered

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5 Baird, G., Gray, J., Isaacs, N.,Kernohan, D., & Mc Indoe, G. (1995). *Building evaluation techniques*. New York, NY: McGraw-Hill.
Blyth, A., Gilby, A., & Barlex, M. (2006). *Guide to post occupancy evaluation*. London: Higher Education Funding Council for England (HEFCE).
Daniels, H., Stables, A. Tse, H.M. and Cox, S. (2019). *School Design Matters: How School Design Relates to the Practice and Experience of Schooling*. Routledge, Abingdon.

6 https://www.researchgate.net/publication/245283549_TimeLapse_Digital_Photography_Applied_to_Project_Management and Lindsay Persohn. "Exploring Time-lapse Photography as a Means for Qualitative Data Collection." (University of South Florida, Teaching and Learning Faculty, 2015), https://digitalcommons.usf.edu/tal_facpub

7 Fianchini, M.; Zuccoli, F., (2020). "Updating Users' Needs Framework in Middle Schools. A Field Research Activity." In Fianchini, M., (Ed.). Renewing middle school facilities, Springer Nature, pp. 65-127.
Imms, W., Cleveland, B. and Fisher, K. (2016). Learning Environments Evaluation: Snapshots of Emerging Issues, Methods and Knowledge. Sense Publishers, Rotterdam.

8 Costa p. (2014), Valutare l'architettura. Ricerca sociologica e Post-Occupancy Evaluation, FrancoAngeli, Milan.
De laval s. (2014), Gåturer: Metod för dialog och analys, Svensk byggtjänst, Stockholm.
De laval s., Frelin a., Grannäs j. (2019). Ifous fokuserar: Skolmiljöer. Utvärdering och erfarenhetsåterföring i fysisk skolmiljö, Ifous rapportserie, Stockholm.
Sanoff h. (2001). School Building Assessment Methods. National Clearinghouse for Educational Facilities, Washington DC. https://www.ncl.ac.uk/cored/tools/walk-through/

opportunities for ongoing adjustment of how the space was used, and the principal is actively exploiting that option.

All the schools included some design features intended to facilitate pedagogical change, such as "flexible" spaces separated by retractable walls, or furniture that can be rearranged to accommodate the more varied learning activities required by the Finnish national curriculum. Furthermore, all principals recognised the advantages of having teachers collaborate in a shared space, such as complementary expertise. However, despite these intentions, the use of these features was more limited than planned. Educators in all schools said that the "agile/fluid"[9] aspect of flexibility, which was facilitated by light and moveable furniture, was more immediately useful than "convertible" spaces that could be opened up or closed down to facilitate different pedagogical approaches. The spaces that can be opened and closed tend to be used in one position (most often a standard-sized, enclosed classroom). Aside from these limitations, it was evident that teachers were using a range of furniture and spatial configurations.

With some school designs, these limitations do not affect the overall efficiency of using the building – although they may constrain educational approaches or organisation. However, in more open designs, such practices can reduce the available area so that students and teachers are confined to smaller spaces, while large areas only used for students to circulate.

Of the schools in the study, the design of Harjula made the most specific demands on how the space was used, since the classroom space per student in the new building was reduced to allow for more shared space. While this new layout was achieved very effectively, it required creating an extremely precise timetable for various school activities. That effort was led by the principal, and it demanded more cooperation between staff than is needed when each teacher has their own space to use as they see fit. A minority of staff considered this to be a problem. One teacher commented, "I miss a more permanent space of my own." Another suggested that the "multiuse and changeability of the spaces creates restlessness." The majority of staff comments, however, were more positive.

Currently, the Harjula principal and her staff are generally guided by a pedagogical vision they have all developed, and the school is working well. It has incorporated a greater variety of learning approaches that require less space than in a traditional school. However, turnover of the principal, staff or even students could affect the use of such an innovative design. It is also worth noting that this school remains a primary school, with generalist teachers, who tend to find it easier to collaborate than teachers specialised in particular subjects. More specialised teachers might prefer to have designated spaces that related to their disciplines.

The evaluation conducted by Espoo city officials in Karhusuo School in 2021 included interviews with staff and students as well as a questionnaire. Although questions were centred on satisfaction rather than how spaces were used, certain comments revealed that some of the retractable walls between a classroom and the hallway were "almost never kept open or used." However, the comments suggested that the retractable walls between two classrooms were used more often.

Time-lapse photography was used in the post-occupancy evaluation of two of the schools. In Harjula School, the images revealed that the shared, versatile spaces were broadly being used as intended, and enabled minor adjustments to be made to specific school spaces like the auditorium, which was not being used for most of the day. More importantly, these evaluations enabled the municipality to better understand how such a school design (with a reduced total floor area) could be made to work, which has implications for the next phase of school investments.

In Karhusuo, the time-lapse photography seemed to reveal very limited use of the flexible features of the design – including retractable walls and extra width in the corridors. While staff agreed that the retractable walls that opened onto hallways were not often used, they felt that they did use the other retractable walls as much as was pedagogically appropriate. The wider corridors for learning activities were a feature of the design that the principal had pushed for during phase 1, so it might be expected that she will try to find ways to help the staff use them. Overall, teachers and principals largely believe that the spaces are being used effectively, even though they might not be. This belief may be the biggest obstacle to further change.

[9] Dovey and Fisher (2014) make this distinction between 'agile' or 'fluid' design features and a 'convertible' design. See: Dovey & Fisher (2014). "Designing for Adaptation: The School as Socio-spatial Assemblage." The Journal of Architecture 19 (1): 43–63.

The Italian case: Milan municipality

In the Viscontini Primary School, the reflection process started with a pedagogical walk-through led by the research institute INDIRE, and continued with the post-occupancy evaluation conducted by the Politecnico of Milan in collaboration with the Milan University of Bicocca. The data collected during this process confirmed the impact the new space had on teaching. Two-thirds of the teachers indicated that the new building and furnishings led them to significantly change their practices, and all of the teachers indicated that they had changed their way of working. However, the data revealed some of the constraints on using the building more effectively.

The INDIRE walk-through investigated the use of five types of spaces: group spaces, exploration spaces, individual spaces, gathering spaces for the whole school community and informal spaces. The environments were evaluated according to four criteria: how the space was used when the school was first occupied, how the usage developed, how the new spaces added value, and critical aspects of the usage. In particular, the investigation focused on how the overall premises were used and the strengths and weaknesses, as well as the likelihood of sustaining new practices developed by teachers and students, which were reinforced by training, in the years after the move.

The walk-through provided an overview of the rooms and how they were being used one year after moving in. It emerged that the school's different functional spaces allowed teachers to choose where to teach, selecting the most functional space for the type of lesson. The walk-through illustrated constraints that affect pedagogical practices like the noise level and room temperature, and the limited use of space like informal areas, outdoor spaces and the large atrium. It also showed how existing norms, like teachers' belief that they must be present to ensure students' safety, affected how the informal and open spaces were used.

The post-occupancy evaluation survey and observation confirmed that certain spaces were not being used as initially intended. For example, the auditorium is not flexible enough to be used as an internal gathering area for the whole school community, and is too small to host large external community events. The library is currently not open to external use and its outdoor area is not adequately equipped to be used by teachers and pupils during the school day. The six open informal spaces located along the large corridor and planned for educational purposes are not used on a regular basis.

Summary

Surveys of staff and students are an effective way to gauge general satisfaction and discover specific problems with the building, but they may be less apt to reveal how spaces are being used. Nor are the data they yield always objective, as staff often think they are using a space in ways they are not. Student surveys can help evaluators understand how spaces are used, as can visits from external advisors or partners.

Time-lapse photography, or even just photographs of the school taken by an external company or by students, can provide some information on how the building is being used. Such images present staff with evidence of use, and can help start conversations about how it is being used vs. how it could be used. However, this requires a formal way of sharing findings with the school staff. Organised events that systematically bring principals and teachers together to discuss how the building and furnishings are used could help address the issues of objectivity and teachers' readiness to change their habits.

Pedagogical walk-throughs and post-occupancy evaluations can help explain why teachers are not making full use of the spaces available. Some of these constraints may be technical, while others may concern the norms, values and pedagogical approaches used. Talking to teachers and the school community about the data collected is the first step in making the adjustments needed to use the space more effectively. At the same time, the data collected can guide future investment decisions, improving on the technical constraints identified and adjusting buildings to real needs and use. These walk-throughs and evaluations are also useful for engaging with the school community in the building planning process. Finally, collaborating with research institutes and external experts can also encourage reflection on how the school building is used. The experience gained during the study confirms the value of these tools in promoting more effective and efficient investments.

The costs of implementing the Constructing Education framework

When the Constructing Education framework was developed, it estimated that engaging with school staff during the design phase, providing the support needed to effectively use the building, and fostering ownership and adjustments to promote student learning would represent around 5% of the total construction cost.

To assess the accuracy of such a hypothesis, information on the costs incurred by all three municipalities was collected throughout this three-year study. The table below summarises the different activities that entail costs that are in addition to conventional construction:

Table 2. Constructing Education framework activities

Phase 1	Phases 2 and 3	Phase 4
Consultations between the school community and staff of the construction/education departments Participatory planning Visits to renovated schools	Professional development Testing prototype spaces/furniture Surveys School staff involvement in soft construction (furniture, final details of school construction, etc.)	Post-occupancy evaluation (time-lapse photography, pedagogical walk-through, surveys, classroom observation, focus groups, etc.)

The kinds of activities included, which were drawn from different municipalities and schools that either pre-dated our study or were developed during the project, are highlighted below, along with the time they took. The main cost linked to such activities is the time that school staff – especially principals – must devote to them. If it is not formally recognised or remunerated, involvement in school construction might come at the expense of other important pedagogical and planning activities, or place an extra burden on teachers and principals. Educators must therefore be paid for their time, either through overtime pay or by paying agency staff to cover in their absence. Although the hours suggested seem quite demanding, the associated costs are just a small percentage of the overall investment.

Phase 1: Participatory design and collaborative planning led by the municipality

The Finnish cities of Espoo and Järvenpää had established procedures for involving school communities in the planning and design of a school project. One is the initial planning event, which may be held at the school and involves all staff and students. It generates early-stage ideas about the planned facility, in line with the school vision. This requires between 130 and 160 hours of professional time, depending on the size of the school. Alongside this broad participation, there is more in-depth collaboration between architects, planners and the school principal, who is generally accompanied by other educators with knowledge of special needs. These meetings are held every third week in the early stages of the project, increasing to once a week as the construction period approaches, and then continuing through construction. In phase 1, these meetings required a further 500 to 600 hours of educators' time, in addition to the city officials' time. Additional hours were also spent within school as the "user group" – the principal and a selected group of teachers, who held meetings that continued through phase 2.

Phases 2 and 3: In-school professional development

During the project, two of the schools initiated activities that helped their staff better understand the new spaces and to plan how to use them.

In Milan, one of the schools ran a two-year professional development programme after moving into the building to appropriate the new spaces and learn to exploit their potential. It included focus group discussions, surveys and training sessions as part of an active research initiative. This took up about 830 hours of staff time in total, as 30 teachers met for about two hours each time.

In one of the Finnish schools, the principal sought to provide time and support for her staff to prepare for the various organisational and spatial changes required by the new building, which included expanding the school to

include older students. The support encompassed professional development in the form of sessions for all staff (teachers and support staff) led by two consultants hired by the school, who specialised in helping educators through periods of change. The activities required about 36 hours from each participant, so just under 1 000 hours for all educators involved, plus the consultants' fees.

These sessions occurred alongside in-school "user group" meetings and the principal's regular meetings with municipality officials. She used these meetings to communicate updates on the building to her staff and to convey school requests and comments to the construction team. In this way, staff could link the professional development sessions to the building process. The ideas that arose from these meetings were then solidified through the collaborative selection of furniture by school staff, which is a notable feature of the Finnish system. Through phases 2 and 3, these recurring meetings required approximately 1 000 hours of professional time.

The cost of preparig the training materials and delivering the sessions, which was usually done by external consultants, ranged from €2 000 to €15 000 per activity.

The Constructing Education activities listed above are time consuming, but much of that time comes from the school principal, whose leadership position calls for active involvement throughout the process.

Finally, activities for phase 4 were conducted by external researchers or consultants. The cost of implementing the post-occupancy evaluations range from €15 000 to €25 000 per school.

Assuming that all staff time participating in Constructing Education activities is remunerated and adding the costs of all services by external providers, the study still shows that the total cost of implementing the framework is residual compared with that of building the schools. Even after imputing missing costs for schools that did not perform all the activities in the four phases, these costs represent only 1% of the total investment.

Conclusions

Over the last three years, we have held rich and stimulating exchanges with city officials and school principals as part of our research on the feasibility of implementing the Constructing Education framework. The data collected in testing the tools proposed by the framework provided valuable information on how to structure school investments to better promote student learning and create buildings that use space more efficiently. Interweaving educational goals with construction processes leads to school buildings that better respond to a pedagogical vision, foster learning and promote innovative teaching.

For this to happen, however, educators – and especially teachers – must understand the role space and building design play in pedagogical practice. They then need to develop their skills to fully exploit innovative spaces' potential to support learning, respond to students' individual needs, and promote social cohesion and inclusiveness. This will allow them to effectively contribute to the design, and use the resulting spaces to accomplish their pedagogical objectives. In broad terms, school designs should have a nationally defined vision for education to guide them, but should cater to the particular needs of their communities.

The study confirms the following:

- Costs associated with implementing the four phases of the Constructing Education framework. The additional funds needed to engage with principals and teachers during the planning phase, support their professional development during the construction phase and collect post-occupancy data are very small compared to the cost of building a new school. On average, they represent between 1% and 5% of the infrastructure costs. They could therefore easily be included in overall financing, in the same way that design costs, technical studies, supervision and furniture are included. Collaborative activities require a significant amount of time, but those costs are included in our calculations. The time that educators devote to planning the new building should be formally recognised and remunerated accordingly, to ensure that their involvement does not crowd out other pedagogical activities.
- During phase 1, teachers, students and the school community should all provide input to design the new building, but this consultation must be guided by a clear educational vision at the state/municipal level to ensure that the investment will meet long-term needs. Cities large enough to design new school buildings regularly will be able to develop a more standardised approach from past experiences and lessons learned.

This may limit the involvement of particular school communities in the consultation process, reducing the consultation time to the critical elements pertinent to each school and to validating the proposal.

- During phases 2 and 3, it is essential to provide the necessary time and support for principals and teachers to get ready for the new building. This starts early on, by ensuring they have the skills to effectively use the learning environment to support pedagogical practices. This professional development should continue during the construction and moving-in phases. Allowing educators to help choose furnishings and equipment, including testing furniture protypes and familiarising themselves with the space, will mean they can use the building more efficiently after moving in.
- During phase 4, it is essential to understand what is happening inside the school, and to verify that the reality aligns with the vision of how the spaces should be used. Several tools and methods exist to support this understanding, and using multiple methods will provide a more complete picture of the situation. When the space and furnishing are not being used as intended, it will be necessary to investigate why that is not happening. Revisions can then be made that will guide subsequent investments.

International agencies and multilateral development banks have a key role to play in increasing awareness about the importance of learning environments among policymakers and school staff. The experience of the World Bank in supporting the implementation of the Constructing Education framework in Uruguay confirms the general relevance of the framework for education investments, as participants in Uruguay faced similar challenges when trying to engage educators in the design and construction process.

Agencies and multilateral banks that co-finance education infrastructure investments by governments should encourage including the costs of the education activities identified in this study in total project costs. Collaboration with educators is imperative if we want investments to perform long term and achieve their goal of promoting learning for all students.

Annex 1: List of participants

FINLAND

Espoo

Premises Department

Design and Engineering Management Unit

- Kimmo Martinsen, unit head
- Maini Alho-Ylikoski, project chief
- Kaisa Sjövall, project planner

Growth and Learning Sector, Premises Unit

- Roosa Nääppä, chief specialist

Karhusuo School, Espoo

- Mimmu Hellsten, principal

Tuomarila School, Espoo

- Timo Turtiainen, principal

Järvenpää

- Merja Narvo-Akkola, chief of education services
- Jan Mikkonen, pedagogical facility development manager

Harjula Campus, Järvenpää

- Tarja Edry, principal

Järvenpää Comprehensive School JYK, Järvenpää

- Pia Pohjanpalo, principal

ITALY

Municipality of Milan

Premises Department

- Edoardo Marco Candiani, director, Territorial Services Control
- Diego Mora, Department of School Building
- Enrico Gianni, Department of School Building
- Elena Nannini, director, Technical School Area

Education Department

- Roberta Guerini, Department of Education, director of School Service Area
- Francesco Sardella, Department of Education, head of the school network
- Sabina Banfi, Department of Education, former director of School Service Area
- Cristiano Scevola, Department of Education, former head of the school network

Viscontini Primary School, Milan

- Giovanni Latrofa, former principal
- Giovanni Poggio, principal since 2023
- Cristina Colombo, teacher
- Raffaele Mercuri, teacher

Console Marcello Comprehensive School (new school in Via Pizzigoni), Milan

- Maria Luisa Di Nardo, principal

Annex 2: School projects

Country/Locality:	**Finland/Espoo**
School:	**Karhusuon koulu (Karhusuo School)**
Number of students:	500 (grades 1-9), small groups of students on the autism spectrum.
Number of personnel:	Around 95 (48 teachers and 25 teaching support staff)
Gross floorspace:	Modular wing consists of 2 810 m2; extension wing consists of 8 390 m2
Construction costs:	€22 996 000

Basic characteristics of the school project:[10] Previously a relatively small primary school (grades 1-6), the school was extended, and also now accommodates grades 1-9. The new building is designed for 693 students but for now only 500 are enrolled. The first phase of building (modular, semi-permanent, initially intended to last 10-15 years but now to be retained) was completed in 2019; the second phase (the permanent building) was completed in 2020. The planning and construction were undertaken directly by Espoo municipality, with the school designed by a municipal architect.

The new wing is connected to the modular wing, with the school's main entrance located between these two wings. The modular wing, where the primary students are located, consists of a central hallway with classrooms on both sides. These classrooms can be partly opened onto each other and onto the central hallway. The older students (grades 7-9) are based in the new wing, which also houses sports facilities and an auditorium, the kitchen and the school restaurant. It has retractable walls to be able to open up areas and spaces for natural sciences, crafts, music and general education.

Floor plan of the first floor shows the modular wing (bottom) and new wing (top). Photographs show a break-out space within modular wing (bottom) and a view of the exterior (top).

[10] More information about the planning process for this school: https://www.eib.org/en/essays/finland-education-school-design

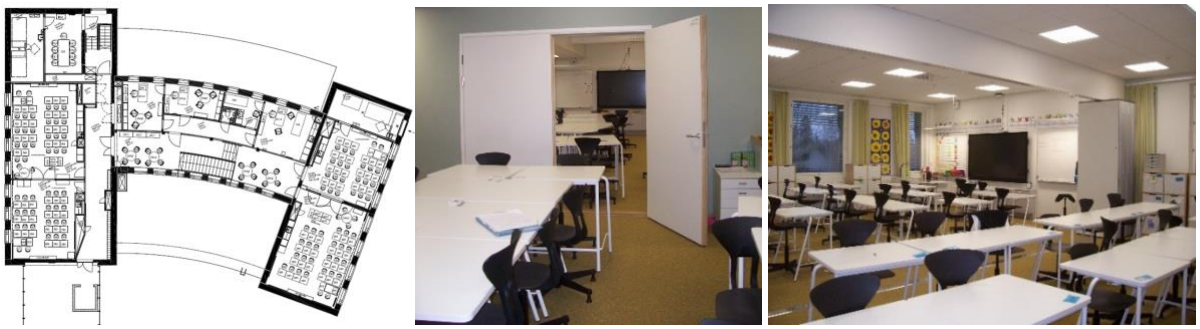
Country/Locality:	**Finland/Espoo**
School:	**Tuomarilan koulu (Tuomarila School)**
Number of students:	Approximately 320 (grades 1–6)
Number of personnel:	Around 50 (around 30 of which are teachers)
Gross floor space:	Refurbishment consists of 1 797 m2; extension consists of 4 546 m2
Construction costs:	€22 595 989

Basic characteristics of the school project: This primary school (grades 1-6) was refurbished and extended, with the intention of accommodating a total of 480 students in the future, equal to three groups of classes per year level, with a staff of approximately 65. The architectural goal was to buid a school that would meet the needs of its life cycle and was energy efficient, with good thermal insulation and efficient ventilation, and easy maintenance and upkeep.

The old school, built in 1958, is a typical Finnish 1950s school building, with a traditional floorplan of classrooms opening onto a main corridor or common spaces. With the renovation of the old building and the new extension, the spatial character of the school has been transformed, from a school centred around corridors and classrooms to a more flexible, modern design. Across the school, spaces can be combined or separated by using double doors or sliding walls, and common areas are furnished to encourage learning. The extension is connected directly to the old building, allowing free movement between both building wings.

While the building work was underway, the school community was housed in temporary accommodation. Students and teachers moved into the completed building in February 2022, where they initially hosted another school's grade 1-3 students and staff (whose own school was being rebuilt). This school was relocated in August 2023, and since then Tuomarila has occupied the entire premises.

The procurement and construction approach used for this project differs from other projects. The construction company will own and maintain the building for 20 years, whereas in other projects in the city, the municipality retains ownership.



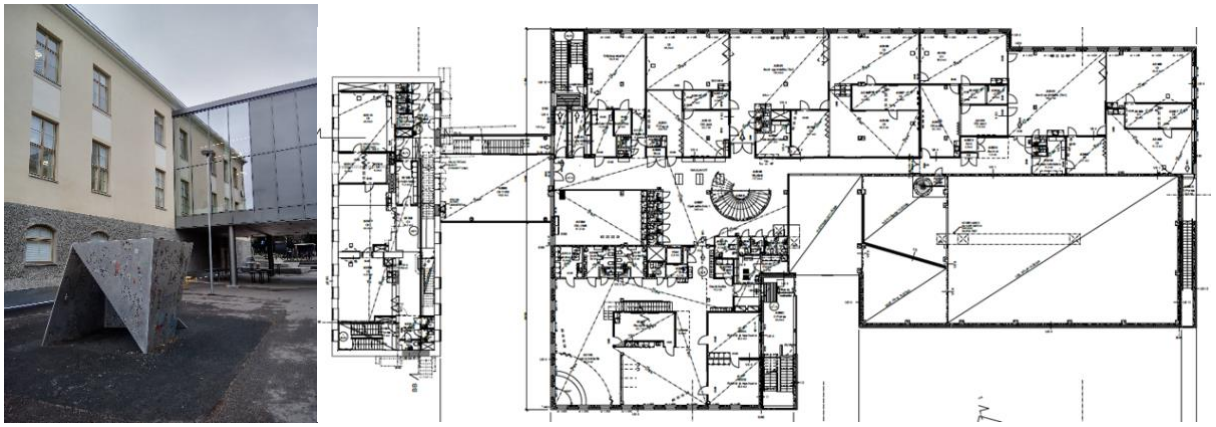
Floorplan of first floor of the renovated building (left). In the original building, double doors connect teaching spaces (centre) while sliding walls are used in the new wing (right) .

Country/Locality:	**Finland/Järvenpää**
School:	**Harjulan kampus (Harjula Campus)**
Number of students:	450 (grades 1-6) and 150 (preschool and kindergarten)
Number of teachers:	42 at the primary school
Gross floorspace:	5 811 m2
Construction costs:	€21 398 462

Basic characteristics of the school project:[11] This primary school (grades 1-6) underwent extensive rebuilding. It now includes a pre-school and kindergarten on site, and the two share facilities such as a dining room and an outdoor area. Current student numbers are close to designed capacity (522 primary pupils and 96 day care places). The oldest part of the school (a building dating from 1931 with a colourful history) was refurbished, while some light-build blocks dating from the 1960s and 1970s were demolished and replaced with a large new wing. The old building is connected to the new building with a wide glass corridor which also works as a learning space (interior) and as a covered outdoor area (exterior).

The school has a history of stable leadership, and the current principal had worked at the school for 20 years (16 as principal, when the project commenced in 2019). Mould in the existing building, and construction from the fall of 2020, had required the school community to disperse to different locations across the city in temporary accommodation.

Students and educators moved into their new premises in August 2022. The new school is designed with three areas with flexible spaces that house mini-schools for children in grades 1-6. The teaching spaces open up onto each other and onto smaller group rooms. A strict organisation timetable giudes activities and maximises the use of space (one "homeroom" space can be shared by multiple groups, as some students will be elsewhere doing arts or sport). The school's indoor area has a considerably smaller footprint than is normal for Järvenpää, or Finnish schools more generally.



Original, refurbished building and connecting bridge (left). Plan of first floor showing learning spaces in a hallway connecting the old and new buildings (right).

[11] More detailed information on this school project: https://www.eib.org/en/essays/finland-education-school-design

Country/Locality:	Finland/Järvenpää
School:	JYK Järvenpään Yhteiskoulu (Järvenpää Comprehensive School)
Number of students:	800 students (grades 1-9)
Number of personnel:	110
Gross floorspace:	New main building consists of 6 596 m2
Construction costs:	€20 599 742 (new main building)

Basic characteristics of the school project: JYK is a school that resulted from merging three schools in 2019. It provides education for students in grades 1-9. The new school was built in phases and included the construction of temporary modular buildings, a modular building that will be incorporated into the new school (in use from 2020), a new main building completed in the spring of 2023, and the planned refurbishment of a 1950s building (currently postponed). The construction and refurbishment is expected to be completed by 2026 and will accommodate 1 100 students.

The school currently consists of several buildings that were built in different stages, and some older buildings that are no longer in use and will be demolished. Changes have also been made to how the modular and new main buildings are used. Both these buildings have classrooms that are separated by partition walls or doors, and both include lobby spaces that can be used for learning.

The buildings:

A The modular school, built for permanent use

B The Kansakoulunkatu building, currently empty but scheduled to be refurbished

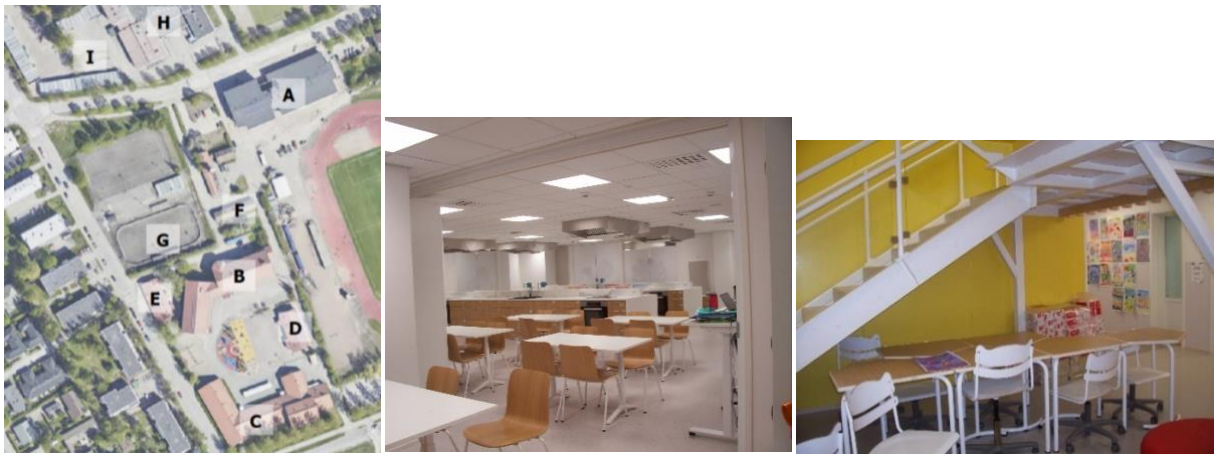
C The Juhola school building, to be shut down when the new buiding is completed (G)

D, E, F Modular buildings that have been removed

G Site of the new main building

H Old main building, no longer in use and set to be demolished

I A temporary modular building, since removed



Site plan (left); home economics teaching facilities for two groups in new main building (centre); break-out space in the double corridor of the modular building (right).

Country/Locality:	Italy/Milan
School:	Lower Secondary School Cristoforo Colombo (Comprehensive Institute Console Marcello)
Number of students:	Approximately 200/apacity 400
Gross floor space:	Total building area 6 747 m²/ Total lot area 9 490 m²
Construction costs:	€14 937 143

Basic characteristics of the school project: The new building will accommodate about 200 students, but the attractiveness of the new spaces is expected to increase enrolment. The new Console Marcello school building (located on Via Pizzigoni, Milan) can accommodate up to about 400 students in junior high school.

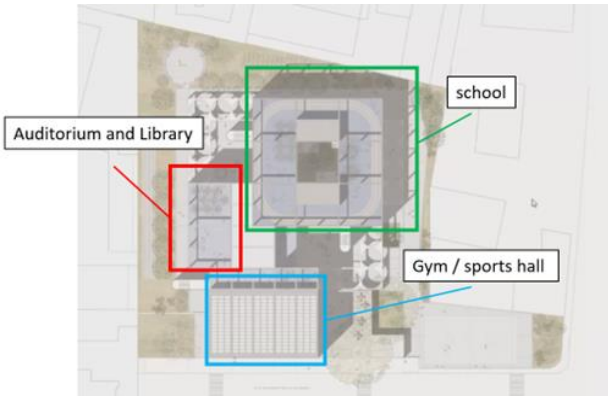
The Colombo School design and tender is the result of a wide collaborative effort that included many different departments of the government of Milan.

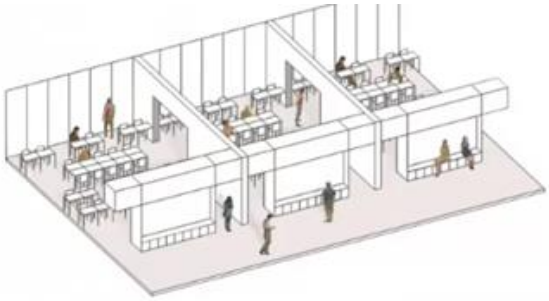
The design reflects research studies on how environments affect learning. It also reflects the municipality's efforts to renovate schools in a way that not only creates more modern and sustainable buildings for students, but also includes a gathering place for the surrounding neighbourhoods. Colombo's design is the result of specific requests from the municipality for flexible spaces, outdoor environments and openness to the surrounding areas.

The municipality expects the school to be delivered in 2025. The school has been designed as a civic centre that can act as a social and cultural hub for the whole neighbourhood and community.

The project includes three main buildings: besides the school, it also has an auditorium/library, as well as a gymnasium/sports hall (accessible to the whole community).

Outside spaces include green areas and spaces specifically for educational activities and social events. There is a green belt that can be used for outdoor education. Some zones can be used as a running track, a garden, a playground, an amphitheatre, etc. Moveable walls and flexible furniture make it possible to change classroom configurations according to educational needs. Classrooms connect with informal common spaces, and can also be expanded to form a larger integrated learning environment. The classrooms on the upper floors have terraces, so that the teaching space to be expanded to include outdoor activities.





Internal extension of the classrooms.

Country/Locality:	Italy/Milan
School:	Scuola Primaria Matilde Viscontini (Comprehensive Institute Borsi)
Number of students:	Approximately 253 (2021/2022)/ Capacity 600
Number of personnel:	45 (32 Teachers)
Gross floor space:	Total building area 7 488 m2/total lot area of 13 668 m²
Construction costs:	€9 504 328

Basic characteristics of the school project:[12] The Viscontini Primary School is being built on the same plot of the land as the old school, which has been demolished. The students were previously distributed among the existing schools of the Borsi comprehensive institute, which lacked sufficient space to accommodate the students. The new school is located on the outskirts of Milan and borders Trenno Park, one of the largest parks in the city.

Students and teachers moved into the new school in 2021, just as the Constructing Education study began. The municipality had symbolically handed the school over to the new pricipal on 21 May 2021. The Viscontini Primary School is part of the comprehensive institute Borsi, which has 1 083 students. About 27% of the students are foreign nationals.

The new school premises can now accommodate up to approximately 600 primary school pupils. The building includes 20 classrooms, 6 laboratories, a technological hub equipped with interactive and digital tools and a special classroom for "energy awareness." There are interactive white boards in all classrooms connected via WiFi, a theatre, a gym, a library, a refectory, an office and service spaces, as well as shared spaces equipped for teaching activities. The outdoor space also raises environmental awareness. It provides enormous opportunities for outdoor movement and education, with many specialised areas, such as the vegetable gardens, large play areas, a stage with tiered seating, a covered square, a green classroom and a library terrace.

The school's design is unique in that it includes multipurpose spaces of different sizes on each floor. Flexible furnishings enable the setting to be changed as needed – allowing, for example, for parallel teaching with small group of students and peer-to-peer instruction to take place at the same time. Laboratories provide spaces for experience-based teaching to develop creativity. These spaces are especially popular with children who enjoy project-based and collaborative activities, and they enable teachers to bring togther different groups of students thanks to retractable walls that easily open up or close down the classroom. The school library is located on two floors and allows immediate access to all classrooms. The school also has a large terrace that can be equipped in the future to allow for outdoor reading and work activities.

Retractable walls close off or open up areas. Shared common spaces.

[12] More information on this school project: https://www.eib.org/en/essays/education-financing-italy-infrastructure

Annex 3: Design template

SCHOOL

1. NEW SCHOOL BUILDING

1.1. BACKGROUND INFORMATION

COUNTRY/LOCALITY	
NAME	
ADDRESS	
SIZE	
EDUCATIONAL OBJECTIVES	
CAPACITY	
NUMBER OF STUDENTS	
NUMBER OF TEACHERS	
NUMBER OF OTHER STAFF	
PHASE UNDER REVIEW	

1.2 BUILDING CHARACTERISTICS

Describe

1.3 ARCHITECTURAL PLANS

Floor plans (+ other available plans)
Describe

2. EXISTING SCHOOL BUILDING

2.1 BACKGROUND INFORMATION

COUNTRY/LOCALITY	
NAME	
ADDRESS	
SIZE	
EDUCATIONAL OBJECTIVES	
CAPACITY	
NUMBER OF STUDENTS	
NUMBER OF TEACHERS	
NUMBER OF OTHER STAFF	

2.2 BUILDING CHARACTERISTICS

Describe

2.3 ARCHITECTURAL PLANS

Floor plans (+ other available plans)
Describe

3. BUILDING DESIGN AND EDUCATIONAL PRACTICES

BUILDING DESIGN	IMPLICATIONS FOR EDUCATIONAL PRACTICES
Describe the proposed change to design instrumented in the new building. *Is the new building similar or totally different to the old one?*	*Describe the implications for educational practices.*
A. CLASSROOM AREA A modern learning environment that is open to the rest of the school and to the world	
Describe the new classroom areas.	*Describe the implications for educational practices.*
B. GROUP LEARNING SPACE Place where students build and maintain their identity	
Describe how this has been taken into consideration in the new building. For example: group area that enables multiple flexible settings and solutions to meet the needs of different types of learning activities.	*Describe the implication for educational practices.*
C. INDIVIDUAL WORK Individual insight area to concentrate, read, reflect	
Describe how this has been taken into consideration in the new building. For example: pods, caves, reserved zones with reading/writing tools.	*Describe the implications for educational practices.*

D. EXPLORATION LAB Exploration and discovery zone	
Describe how this has been taken into consideration in the new building. For example: dedicated tools and resources to observe, experience, explore, observe, experiment.	*Describe the implications for educational practices.*
E. AGORA Space for the whole school community	
Describe how this has been taken into consideration in the new building. For example: seats and facilities to participate in plenary events.	*Describe the implications for educational practices.*

4. RECOMMENDATIONS TO PROMOTE THE EFFECTIVE USE OF THE NEW LEARNING ENVIRONMENTS

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