**THEMATIC REVIEW**

# School Design and Learning Environments in Seine-Saint-Denis, France

**SEPTEMBER 2019**

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# Executive Summary

This report presents the main findings and recommendations resulting from a thematic review of lower secondary education infrastructure investments in the Department of Seine-Saint-Denis, France. The review was carried out by the CEB's Technical Assessment & Monitoring Directorate. The objective of the review was to examine the links between school design and learning environments. The report provides Department officials with recommendations for enhancing the effectiveness of their education investments.

The Department of Seine-Saint-Denis is one of the smallest in France, but one of the most densely populated and most socially diverse, with about a third of the population of foreign origin. The population of the Department is very young, but generally has few educational qualifications, making access to the labour market particularly difficult and contributing to economic and social hardship. Local officials are responding to the socio-economic challenges with a high commitment to the education sector. This commitment is reflected, among other things, by the high level of education spending per student (€3000 compared to a national departmental average of €1500 per student in 2014).

The five lower secondary schools (*collèges*) visited by the review team were of high technical quality, well-equipped in terms of IT connectivity and met ambitious energy efficiency objectives. The professionalism of the Department's technical staff was evident in the detailed guiding documents and in their efforts to improve and further refine each phase of the investments. The spaces provided are generous. They include ample corridors for circulation, areas for teachers to work in and places for leisure and recreation for students. The facilities also include installations for ensuring the provision of midday meals, sports areas and learning support spaces such as the resource Centres for Knowledge and Culture (*Centre de Connaissances et de la Culture, CCC*).

The review team identified a series of key themes to encourage further discussion and exploration by Department officials in their search for effective strategies to guide investments in the education sector. These include:

▶ The value of having a school design and construction process that encourages students' learning outcomes by involving the school community in the planning process, supports teachers in the pedagogical appropriation of the new spaces and includes post-occupancy studies to promote efficient use of the space;

▶ The importance of conceiving the overall school environment as a learning environment, providing differently sized learning areas to meet different education purposes and individual needs, and creating a space to gather the whole school community so as to build a sense of ownership, belonging and identity;

▶ The need to promote better pedagogical use of the available spaces;

▶ The opportunity to use available resources to support education innovation by calls for proposals that promote ownership and respect for the school buildings, better use of the shared spaces and the evaluation and dissemination of positive experiences.

# 1. Introduction

This thematic review presents the main findings and recommendations resulting from an assessment of lower secondary (*collèges,* grades 6 to 9) education infrastructure investments in the Department of Seine-Saint-Denis, France. The 2014-2018 investments were co-financed by a €200 million loan provided by the Council of Europe Development Bank (CEB). The review was carried out by the Technical Assessment & Monitoring Directorate (TAM) of the CEB as part of its regular technical monitoring. In agreement with the education officials of the Department, the objectives were expanded to have a more in-depth examination of the links between school design and learning environments. More specifically, the review sought (i) to assess how the Department's model school plan for lower secondary schools reflected current international trends in school design and (ii) to explore how the selected facilities were performing pedagogically, i.e. the way teachers and students utilise the opportunities provided by the building design to maximise student learning.

The purpose of this study was to provide Department officials with recommendations on how to enhance the effectiveness of the education investment carried out. A team of experts led by Ms Yael Duthilleul, Education Advisor at the CEB, and comprising Ms Raffaella Carro (Education Specialist), Mr Reino Tapaninen (Architect) and Ms Kristina Maslauskaite (Research Analyst at the CEB), visited Seine-Saint-Denis during the week of March 11-15, 2019.

## 1.1 Methodology

Prior to the visit, the team undertook a review of existing policy documents, studies and statistics on the Department of Seine-Saint-Denis, selected the type of schools to visit, designed specific survey instruments to collect background information on the selected school buildings, their students and teachers, and organised a series of meetings with Department officials and school staff. All visits and data collection efforts were organised thanks to the support of the Department's Directorate for Education and Youth. Information on the schools selected and the instruments designed for data collection purposes can be found in Annex 1.

The team visited five lower secondary schools (*collèges)* in Seine-Saint-Denis. Two were completed in 2014 and the three others in 2018 or were still in the process of being completed. Three of the new constructions were built under a Public-Private-Partnership (PPP) agreement and the fourth under a public contract (MoP or *Maîtrise d'Ouvrage Public*). The fifth school was the subject of a renovation as part of a Global Energy Performance (GPC) contract with works focusing on improving energy performance. The selection of schools attempted to represent the different types of works financed (new construction, renovation and extension) under different contractual arrangements (PPP, MoP, GPC) and with different delivery periods. A separate report will present the experience and lessons learned by the Department in the management of works under the different contractual modalities as part of CEB's efforts to identify effective practices that could be shared with other member countries.

The five schools completed the School Director Survey[1] and the School Background Questionnaire prior to the visit. The Premises Department provided the school plans and completed the School Background Data Sheet. Only two schools completed the questionnaire concerning teachers and students and, even then, some of the background questionnaires were minimally completed. Annex 5 presents the data collected from the schools in more detail.

During the visit, the review team met with school principals, teachers and students from the selected schools and with officials from the Department's Directorate for Education and Youth. A representative from the *Académie de Créteil*, the state level representative for education at Department level also joined the review. All participants provided extensive information on the current status of education in the Department and the challenges ahead.

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[1] The survey was adapted by INDIRE from Imms, W., Mhat, M., Murphy, D., & Byers, T. (2017). Type and Use of Innovative Learning Environments in Australasian Schools- ILETC Survey. Technical Report 1/2017. ILETEC Project/ Melbourne.

Field data was obtained through a combination of informal observations and interviews. No formal classroom observations or interviews were conducted due to time restraints. Informal observations consisted of about one hour of guided tours in each facility led by the school principal. In the majority of cases these looked at all school facilities, from classroom spaces, staff spaces, outdoor spaces, to informal learning areas. In nearly all cases the spaces were in active use, being occupied by students and teachers undertaking normal daily school tasks.

Informal interviews consisted of a round-table discussion, led by the review team, with a group composed of the Principal, at least one member of the school staff, and two members of the Department Regional Units, responsible for school maintenance and catering. On at least three occasions during the school tour, the team had the possibility to ask a few questions to students and teachers on their perception of the school and its operation.

The report starts with a brief introduction to the Department and its education context, followed by a presentation of the conceptual framework developed to respond to the key objectives of the review. The main findings make up the core of the report, which concludes with a set of recommendations. Annex 6 presents the schedule for the week.

## 1.2  Socio-economic Context

The Department of Seine-Saint-Denis, is one of the smallest in France with only 236km², but it is one of the most densely populated with 7 010 inhabitants per km² (national average of 104 inhabitants per km² in January 2019) and with the highest birth rate in metropolitan France (17.9 births per 1 000 inhabitants compared to 11.7 births per 1 000 nationwide in 2016). The Department has been growing at an average rate of almost 1% for the past two decades and a total population growth of 8.7% in the last eight years. It is estimated that there will be 1 855 000 inhabitants by 2050, representing a 19.5% increase since 2013. In 37 years, the Department would have grown by 300 000 inhabitants (INSEE, 2017).

At the same time, the Department has a high unemployment rate (11.9% in 2017 compared to the 9.4% for France), and the rate is even more accentuated for those between 15 and 24 years of age (21% compared with the average of 15.9% in Ile-de-France). The share of people living under the poverty line was 28.6% in 2016 (compared to 14.7% for France). Almost a quarter of all children (23%) in Seine-Saint-Denis live in mono-parental households, 34.1% of which are below the poverty line (the percentage figures for metropolitan France were 19.5% and 29.9% respectively in 2016).

The Department is very diverse: 29% of the population is of foreign origin and only 16.5% of those come from the European Union (compared to 9% and 32.3% respectively for metropolitan France in 2013). Almost 44% of children aged 0-17 have at least one parent of foreign origin and 39.9% of custodial parents do not have any educational qualifications (compared to an average of 21.9% for metropolitan France).

## 1.3  Education Context

French students perform at average OECD levels in the Programme for International Student Assessment (PISA), but the share of low performing students is slightly higher than the OECD average, representing between 21.5% in reading and 23.5% in mathematics in 2015, and this share has been increasing since 2009. The system has become very unequal: students' socio-economic status plays a higher role in determining student performance in France than in most OECD countries, explaining on average 20% of the variance in PISA results compared to 13% for OECD countries.

Given the higher than average representation of disadvantaged families in the Department of Seine-Saint-Denis, and the high impact of socio-economic background on student achievement in France, Seine-Saint-Denis students are at a higher risk of low performance. In effect, the Department

concentrates a large share of low performers in its schools and education results are below the national average. Almost half of the students have acquired insufficient or fragile competences in language and mathematics when they enter lower secondary school. About 63% of the existing 128 *collèges* serving the 73 000 students are part of the Priority Education Network (*Réseau d'éducation prioritaire divided into REP and REP+*) versus 21% on average at national level. In the REP+, only one third of 10-year-olds enter the school with an adequate knowledge of French language, mathematics and science as compared to two thirds in non-priority schools. In Seine-Saint-Denis, the success rate at the Brevet exam at the end of lower secondary school was 85% in 2018, lower than the national average of 90%. A similar situation is reflected for the success rate on completion of upper secondary school (*Baccalauréat*) with 84% for Seine-Saint-Denis versus 91% on average for the country. Student dropout is a major concern for the Department which has put in place different measures to try to bring students back into the system. One out of four students leaves the education system without any certification.

Education in France has a long, centralised tradition with the State defining the education programmes and the recruitment and appointment of teachers and school principals. It was only in the 1980s that certain education responsibilities were transferred to the different levels of local government. It is the Department that is responsible and owns the buildings for lower secondary schools, ensures the provision of school meals and manages the non-teaching staff. This dichotomy in the distribution of responsibilities for the lower secondary levels (also reflected for the other education levels with different levels of government) poses particular challenges to the effective design and use of school buildings.

The fact that teacher careers and appointments are managed centrally, on the basis of teachers' indicated preferences and seniority, and that no adequate incentives are in place to make working in a challenging socio-economic context a professional aspiration, results in Seine-Saint-Denis receiving many young teachers: more than half (53.4%) of the teachers are younger than 35 years old compared to 23.5% nationally. Approximately 9% of all newly graduated teachers in France were assigned to the Department in 2016, of whom 64% were sent to its priority schools (REP), resulting in inexperienced teachers who, in spite of their professional commitment and engagement, face a very challenging education context at the start of their careers. As a consequence, the lower secondary schools in Seine-Saint-Denis also tend to suffer from very high teaching staff turnover: half of the teachers in the Department's *collèges* stay less than two years. In some priority schools (REP) the turnover can reach 65% on a repetitive basis for several years. The Department's schools also suffer from teacher absenteeism with very low replacement rates (5-20%).

To this dichotomy in the organisation of education responsibilities a second layer is added in the functioning of schools. Two categories of adults are responsible for students' education and behaviour: on the one hand, the teachers, in charge of students while in the classroom and, on the other, the support staff who ensure the oversight of students during the daily breaks and at mealtimes, and take care of the students in case of teachers' absences or when students are removed from class due to misbehaviour. These important blocks of time during the day fall under what in France is considered "school life" or "*vie scolaire*". The staff responsible for these areas thus play a key educational role. Moreover, in the case of students' misbehaviour during breaks or other free periods, their removal from class is a frequent punishment which then results in the need to provide extra support to the students to catch up on the lessons missed. To address the needs of students punished or with absent teachers has meant having to create special areas to accommodate the students under close supervision by the adults responsible for this. Indeed, all the schools visited had these dedicated "study" areas (*salle d'études*).

This distribution of responsibilities in the organisation of the school day, combined with the fact that lower secondary teachers' monthly salaries foresee only 18 hours of direct teaching time per week, with no time foreseen to collectively plan and organise their work, clearly defines and impacts on the education role of the teacher and on the development of the student. In fact, one of the benefits of schools classified as REP+ is that the teachers' weekly workload has been reduced to 16½ hours to allow for one and a half hours of planning and coordination. The fact that there are no requirements for professional development attached to career development poses additional challenges to improving the

performance of the system. Moreover, any professional development activity that does take place is carried out during official teaching hours at the expense of students' learning time.

## 1.4  The Department's Education Investment Programme

The Department has launched a major investment programme to renew and expand its lower secondary education infrastructure. The first phase of investments, referred to as the "*Plan Exceptionnel d'Investissement*" (PEI 2010-2015) included the construction/renovation of 21 lower secondary schools, 9 central kitchens, 11 sports centres, one swimming-pool and three student dormitories. The second phase of investments, the "*Plan Ambition Collèges*" (PAC 2016-2020) continues the efforts of phase 1 but with a stronger focus on upgrading the existing school infrastructure (81 renovations, 23 global renovations, 8 reconstructions and 8 new constructions), further developing access to IT equipment, expanding the sports infrastructure and the development of central kitchens to provide catering for schools. Some of the new schools built respond to innovative pedagogical approaches with a thematic focus, smaller size and boarding school facilities to accommodate disadvantaged students. The Department's high level of commitment to the sector and its student population is expressed not only in the renovation of its education infrastructure but also in the €7 million in additional funding that is provided every year to all lower secondary schools to complement its education activities with additional projects.

## 2.    Conceptual Framework for Innovative Learning Environments

A conceptual framework to examine innovative learning environments was developed by the CEB's Technical Assessment and Monitoring Directorate and applied for the first time in the review of Espoo municipal education investments in 2018[2], in Finland. The framework is based on two axes: the architectural characteristics of the building itself and the use given to the building by teachers and students to achieve the educational objectives of the school. For the thematic review of Seine-Saint-Denis, the framework was further refined to better capture some of the specific issues faced by the Department and more globally to assess the learning environment of the whole school. The first axis remained quite similar to the one applied in Espoo: each school visited was assessed according to three key principles that signal important developments in education infrastructure these days: type of space, flexibility and transparency, with the addition of safety and security considerations under the transparency aspects, as it became evident that these issues were important in the context of Seine-Saint-Denis. Under the second axis, the learning environments were studied through the framework of the *1+4 Manifesto: Learning Spaces for a New Generation of School*[3], an analytical framework that provides a useful link between the types of space examined under the first axis and their pedagogical use. The Manifesto was considered a more appropriate framework to capture the whole school as an organisation than the one used for the review of Espoo, which focused on the classroom space and the teacher as the unit of analysis. The 1+4 Manifesto is based on a functional approach: It can be used as an analytical tool aimed at reflecting and proposing solutions, or as a theoretical reference framework for the schools that need to reorganise their space to promote active methodologies that encourage social interaction, collaboration, creativity, creative thinking and an innovative use of technology. From this point of view, the Manifesto is suitable in a context where the school community still has to appropriate the spaces and understand their potential, as is the case for the schools in Seine-Saint-Denis. These two axes are further detailed in the following sections.

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[2]    Duthilleul, Y, Blyth, A., Imms, W., and Maslauskaite, K. (2018). *Design and Learning Environments in the City of Espoo, Finland*. Thematic Review Series. Council of Europe Development Bank, Paris

[3]    Indire (2016). *Manifesto delle architetture scolastiche.* Retrieved from http://www.indire.it/wp-content/uploads/2016/03/ARC-1602-Manifesto-Inglese_LOW.pdf

## *2.1 School Design*

In broad terms, the trend in the spatial design of school buildings is to move away from providing a one-size-fits-all model, where classrooms of the same size are accessed from one or two sides of a corridor. This conventional school building planning model has been challenged for many years in various forms, from the ideas of Montessori to the open-plan designs of the 1960s and 1970s. Along with changes in the design of the physical environment, there has been a corresponding change in the use of language to describe the physical environment in terms of *learning spaces* rather than classrooms. Not only does this emphasise the importance of learning but it captures the notion that *most space within a school building can be used for learning*.

International focus has been on *designing spaces that assist or support the concept of differentiated learning*, a broad goal of global education for decades. The design of spaces being built in recent times around the globe to meet this progressive agenda is conceived to assist teachers in broadening traditional didactic instruction approaches, and for students to control their own learning to a greater extent. These builds are not considered a solution to education's problem of student-centred learning, but rather a tool to assist in achieving that goal.

To be an effective tool, the actual design of the spaces is critical. The search for options has led to new designs, some of which are today called Innovative Learning Environments (ILE). For the purpose of this review, the school buildings visited were assessed according to three aspects that tend to be present in these novel environments: the *types of spaces available in the school and their use*; the *flexibility* of the building, and the *transparency* that facilitates putting learning on display.

### *Types of spaces and their use*

As a response to developments in the conception of learning and individual student needs, the spatial design of school buildings today includes a variety of different sized spaces clustered together to give users the choice of what spaces to use for different activities. Along with the evolution of standard classrooms into a range of different spatial configurations, there is more focus on how to use the whole school building for learning. In other words, rather than restrict learning activities to a narrowly defined set of classroom spaces, the focus is on how other areas, such as corridors and canteens could be used to foster learning and/or the social interactions associated with learning. This has taken the form of a 'streetspace', where the circulation route through the building becomes more than a corridor and provides zones designed to enable different types of learning activities to take place along its way. Their proximity to the main learning zones enables such spaces to be used as break-out space for group work, or for independent learning. Another new and distinguishable space to emerge is the 'commons' area which is best defined as a semi-enclosed learning space that is not part of the main circulation route and is not a classroom space, but provides a range of settings for group, individual and quiet work. Such spaces may be scattered throughout the school or consolidated in one place as a multi-purpose "central commons" area that can be used for having a meal, performances, or assemblies, and which becomes the "heart" of the school building. The concept of different types of spaces is linked to their pedagogical use through the framework of the *Learning Manifesto* that will be presented in the section discussing the uses of the learning environment.

### *Flexibility*

Flexibility of school buildings has also become part of the picture, with the recognition that a building should be able to respond to the needs of users as they change over time. This capacity to accommodate change can be examined over three different time horizons, the long term, the medium term and the short term, in the following way:

a) *Adaptability,* where the building is responsive to change over the long term. For example, it can be made larger to accommodate more students. This involves substantial changes to the fabric and possibly even the structure of the building. To evaluate the adaptability of the building would demand analysis of the structural design, which is beyond the scope of this review.

b) *Adjustability,* where parts of the building can be reconfigured over the short- to medium-term by manipulating elements to create different spatial arrangements. For example, to make a space larger, smaller, or a different shape.

c) *Agility*, which refers to short-term flexibility where the settings, furniture and IT equipment can be rearranged quickly and easily. This relates to changing the use of the space and is the kind of change that individual users might be able to make themselves. An agile learning space is one that can respond to the needs of students and teachers quickly and, in particular, one where the furniture and technology such as projectors and display screens can be easily rearranged. This short-term flexibility of the school building can be complemented by an assessment of the "flexibility in use", that is the extent to which users can use the spaces because they have a choice of whether to rearrange the settings, and can do so easily and quickly, or whether to use other appropriate spaces nearby.

### *Transparency*

Schools are designed today with greater elements of transparency throughout the building, which is often achieved by creating open spaces or using glazing between spaces in the form of fully or partially glazed walls. The arguments for this are that it creates a sense of connectedness whereby people can be participants in education whether as observers or active players. It also contributes to making learning visible, valuable and shared.

People can feel more connected in the spatial environment when they can see what is happening around them, move easily from one place to another, and feel part of that environment. In schools, connectedness can be afforded by visibility across spaces, either because there are no solid walls or because there are glass walls; it can also be afforded by how close the spaces they often use are to each other and how easy it is to move from one space to another.

Openness, transparency, variability and flexibility are regarded as the prime requirements placed on school buildings of the future in many countries. Openness and transparency are not only part of the school's operations, instruction and daily work, but they can also form the prerequisites for the physical environment of the school.

The aspect of transparency has several dimensions. The abundant use of glass walls and glazing in the school building help the users see the activities of the school, facilitate orientation and help create a strong sense of community. The transparency can also be used for surveillance and control purposes: glass windows can be used to monitor the spaces and the use of the facilities. This contributes to strengthening the feeling of safety in everyday school life.

For a more detailed presentation of these concepts see Annex 2.

## *2.2  Use of Learning Environments*

The 1+4 *Manifesto* is a lens through which to analyse the learning environment in its ability to support different learning needs, social well-being and emotional development. The "1+4" formula reflects on the capacity of spaces, in terms of spatial organisation, furnishing and technology to foster student-centric pedagogies, and focuses on five main learning environments with different symbolic and functional values: "1" stands for the former classroom (Group space) and "4" stands for the school's main types of spaces: Agora, Individual area, Informal area and Exploration Lab.

The classroom is the place to start with when talking about redesigning schools, but a system organised around student-centred learning instead of teacher-centred learning requires a different architectural response that takes into account all the spaces of the school, including those not traditionally supposed to be used for learning activities, such as the hallways or the common areas. The focus of the Manifesto is therefore on the whole school as an organisation. For a more detailed presentation of the framework and the different learning areas, see Annex 3.

The 1+4 framework identified "Fourteen didactic situations" that represent a variety of learning activities that a well-designed building should support. The "Fourteen didactic situations" are embedded in the School Director Survey that was completed by the Directors of the schools visited.

## 3.    Main Findings

### 3.1  School Design

#### Agility and adaptability

The Department's school building programme policy and practice relies on a harmonised school plan model that guarantees equality and equal quality in all school buildings. The plan design is characterised by the similarity of the floor plans and the space programmes among the different schools visited, as illustrated in the plans presented below (Graphic 1). The school model foresees five clearly defined key areas: reception, school life, administration, teaching and restauration. In addition, there are some spaces to be shared with the local community, external areas and housing for staff. Detailed information on each school visited is presented in Annex 4.

The visits revealed a very limited use of the spaces dedicated to the community after school hours, except for the sports facilities. The meeting rooms for the parents' associations (20m²), the multipurpose room (120m²) and the space for cultural exhibitions (60m²), representing on average about 265m² including a dedicated hall, toilets, storage and corridors, were hardly ever used. It remains the purpose of subsequent consultation and analysis to decide whether and how this valuable concept of sharing spaces with the local community can be better integrated into the design of the school building in an efficient and effective way in the future.

Figure 1: Comparison of the floor plans of two schools visited



Collège Gustave Courbet                    Collège Dora Maar
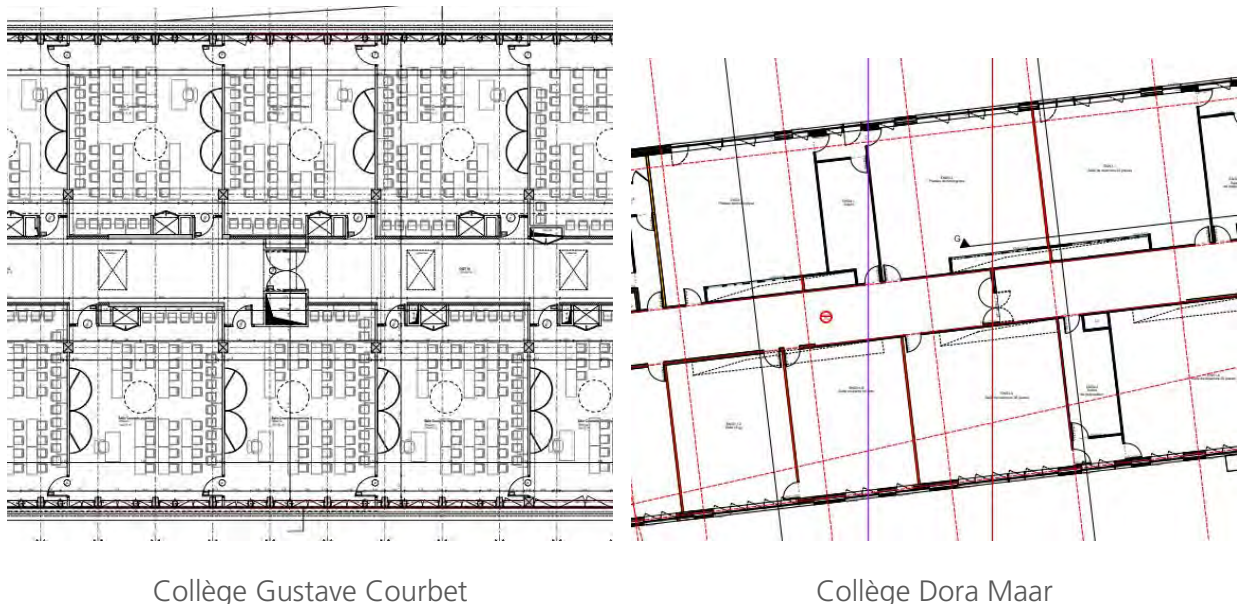
All the school buildings are built on the central corridor principle, where classrooms and special classrooms (e.g. science, arts) are grouped in rows on both sides of the corridor. Room programmes are almost identical, including classroom design and special subject rooms and their sizes. All schools have libraries, as well as dining and kitchen areas. In addition, the schools are quite similar in size of buildings and number of pupils, the model school having been conceived for about 700 students with about 5 000m² of interior space and about 6 000m² of exterior space. Only one of the school directors of the

school that was rehabilitated and extended indicated having participated in the design process and had the possibility to provide some feedback and suggestions. In this case, the teachers were also able to participate in the completion of the spaces by arranging user meetings, for example, for the library, its equipping and furniture. In the three other cases of new constructions, the school director (*principal préfigurateur*) was appointed between 6 and 12 months before the delivery of the school building, too late to give feedback for the design of the school but still an innovation in the efforts of the national education system to engage staff in the process.

The quality of school buildings is very high in terms of materials, infrastructure (ventilation, lighting, ICT equipment) and acoustics. In many of the schools, the architect has also paid attention to the transparency and airiness of the premises. The size of the premises is spacious but also efficient in proportion to the number of pupils.

The French safety regulations are strict, especially for fire safety and exit safety. There can be no obstruction preventing rapid evacuation through corridors and escape routes, such as furniture. Attention has also been paid to the flammability prevention of the materials and furniture.

Figure 2: School Evacuation Plans



Long-term adaptability (e.g. building extension) can be difficult, as all the plots are quite fully built. The adjustability of the spaces is relatively easy, because most of the internal walls between classrooms are not load-bearing. The agility of the spaces is also easy – the classroom furniture is light and easy to move, although there are no wheels on tables or chairs. The height of the furniture is not adjustable.

The ICT equipment level of the teaching facilities is very good. All classrooms and libraries have several computer stations and the teacher has either interactive smart boards or presentation devices connected to the internet.

Special attention has been paid to the energy performance of the buildings, and some schools have also used renewable energy sources such as solar energy.

Although the basic principle of the floor plans of the school buildings (classrooms on both sides of a central corridor) and the room programme is almost identical in all cases, the architecture of buildings is very varied and diverse, even rich. The buildings are placed on the site taking good account of the context of the location and neighbourhood conditions.

The school yards are usually sheltered spaces enclosed by building wings and fences. School yards are used for recreation between the classes - however, the equipment for exercise and play is very limited and the yards are usually asphalted. In some schools, there are pedagogical gardens where the pupils can study phenomena of nature, tend plants and even small animals.

## *Types of spaces and their use*

Information was collected on the proportion of the overall floor area of each school that is used for administration, students, community and circulation, and on the extent to which the circulation area is also used for teaching and learning activities. Table 1 below summarises how the floor area of each school is subdivided.

The table also shows that there are variations between schools regarding the total floor area in relation to the total number of students. Collège Dora Maar is the tightest and Collège Cesaria Evora offers the most space per student but also the least circulation space in proportion to the total floor area. This may be explained by the fact that schools are not identical: some have a larger sports area or a central kitchen, while other may provide boarding or special education programs requiring large workshop areas for the benefit of a few. In the traditional corridor-classroom concept, the circulation area (corridors) usually represents between 20-25% of the total floor area. In Finland, the average ratio (total floor area / student) is between 11-13 m$^2$/student (lower secondary school for 700 pupils). In this sense, the use of space is very efficient in all schools in relation to international averages.

Table 1: Summary of how the floor area of the school is subdivided

| School | Proportion of total floor area (%) | | | | Total area m² | Number of students **** | Total area m²/ student***** |
|---|---|---|---|---|---|---|---|
| | Admin * | Learning activities ** | Community*** | Circulation | | | |
| **Gustave Courbet** | 8 | 78 | 14 | 17 | 9 387 | 800 | 11.7 |
| **Dora Maar** | 12 | 66 | 22 | 25 | 5 607 | 700 | 8.0 |
| **Germaine Tillion** | 11 | 72 | 17 | 18 | 7 730 | 700 | 11.0 |
| **Cesaria Evora** | 10.5 | 71 | 18.5 | 15 | 8 037 | 600 | 13.4 |
| **Pablo Neruda** | 2.9 | 77.9 | 1.2 | 18 | 7 722 | 850 | 9.1 |
| | | | | | | | |

The data in this table have been taken from the data sheets completed by the school principals and officials.

*Administrative activities (i.e. not used for teaching). **Student activities (i.e. learning and recreation). ***Community uses only (e.g. parents' room, healthcare, extended services). **** The numbers of students refers to the capacity of the school given on the background data sheet. *****The area of learning space has been calculated by taking the percentage of the overall area devoted to student activities given 3 and dividing by the number of students.

The evaluation of the school spaces on the basis of the 1+4 Manifesto shows a diversification of school environments from a functional point of view. The spaces dedicated to experiential education are well represented: all the school buildings have laboratories for science, technology and in some cases art and music, all well equipped with technology and various types of materials. The schools also have a pedagogical garden and an educational pond. All the schools have something very similar to an open educational landscape represented by the CCC (Centre of Knowledge and Culture).

In addition to the classrooms and laboratory in the pedagogical area, the schools have many differently sized areas in the school life pole (*vie scolaire*) and in the shared spaces pole (*espaces partagés*) that could support individual studies and personalised learning: *salle d'études*, *salles de travail*, *salles de permanence*, exhibition room and a multipurpose area.

The schools have socialisation sites such as the canteen, the courtyard, the students' foyer and the activity classrooms (internal play area), but their use is governed by very strict rules. There is no internal area where the school community can gather and carry out events of various types (Agora). One of the principals indicated using the canteen for such purposes and another mentioned the courtyard.

The teachers have an environment dedicated to them with spaces to collaborate, technological support and areas for informal meetings equipped with comfortable furniture and kitchen appliances for coffee breaks and light lunches. For the students there is no informal area with similar comfort features, other than a small room, the student foyer.

### *Flexibility and transparency of use*

As noted, school plans are based on a standardised type school design principle. The programme and sizing of spaces follows the same design criteria based on the requirement of the floor area per student. The shape, size and the equipment of the classrooms is very similar in all schools.

In general, in all schools the classrooms are fully enclosed spaces with hardly any or very few opening partitions or openable walls between the classrooms; therefore cannot easily be joined with adjacent spaces. However, most classroom spaces are linked by evacuation doors, which allow inter-class collaboration and cooperation between teachers and study groups (see Graphic 3). Nonetheless, we did not observe any use being made of this possibility during the school visits.

Figure 3: Standard Classroom Plan
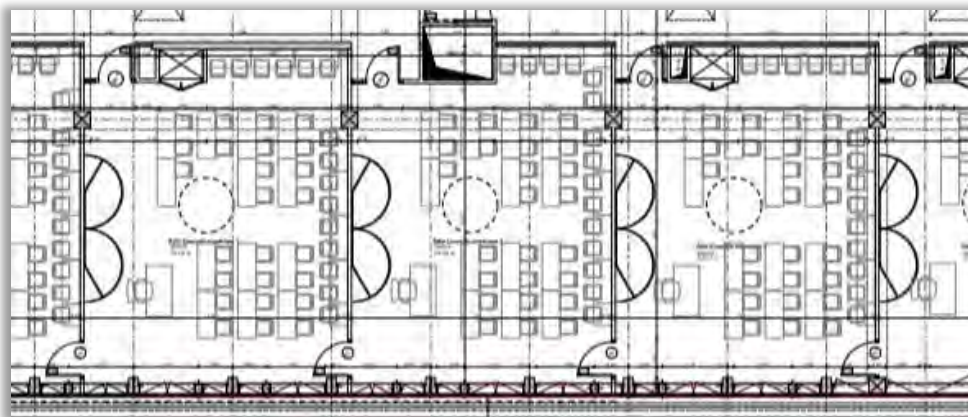


The furniture in the schools is light and can be moved and arranged easily in various formations for different types of teaching situations and piled up for cleaning, even though there are no wheels on chairs or desks. The whiteboards and display screens are usually fixed on the wall, which can force teachers to just one-way teaching.



Light furniture in use

Glass walls have been used to some extent and almost all the classrooms doors have windows, although they can be small and only intended for monitoring the activity or the occupancy of the classrooms. The use of glass walls and glazed doors help the users to see the activities of the school, facilitate orientation and help to create a strong sense of community, thus increasing the feeling of safety.



Use of glass in doors and walls

### *Transparency and safety*

In their responses to the survey, none of the school directors included movement and responsibility in what they considered to be the founding principles of the educational vision of schools. This aspect also emerged clearly during the interviews and the visits to the schools.

Throughout the school visits, principals and teachers expressed their concern over the need to protect the building and furniture from vandalism by students. It was indicated that, in general, there was a small group of students at the origin of such behaviour, but the solutions proposed tended to penalise all the students. As a result, for example, students were not allowed to stay in the school building during breaks and, come rain or shine, were forced to stay outdoors in the courtyard under supervision. This did not prevent the deterioration of the courtyard, with graffiti on walls and damaged lockers, but contained the damage to a limited space.

This lack of freedom also translates into a lack of responsibility on the part of students, who act only under the control of teachers and other adults in charge of their control. The rethinking of spaces in a student-centred learning perspective requires deep reflection on the concept of responsibility and movement, the latter conceived as the freedom of the students to freely appropriate spaces and as a differentiated and dynamic use of all the spaces in the school for educational purposes.
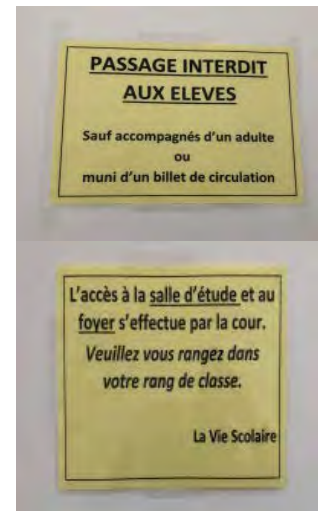


Vandalism and school restrictions

The feelings of a large majority of students living in this environment and under these rules are probably best reflected on a sign found in one of the rooms of the dormitories visited: "leave us in peace, freedom, equality - the boarders are fed up of being locked in this hole".

An effective learning environment must be a safe environment for all members of the school community.
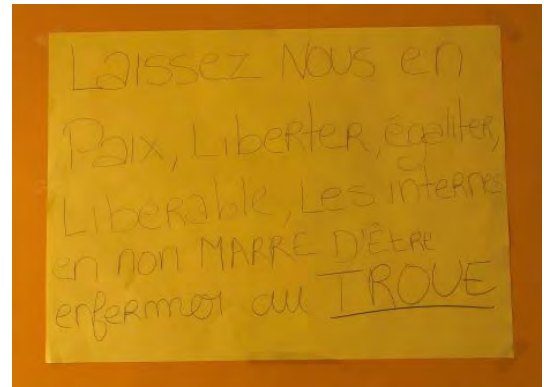


Students call for freedom of movement

## 3.2  Learning Environments

From the different interviews and discussions held, two key themes emerged regarding the links between available space and pedagogy. They are presented below.

### Ownership of the buildings

The consultation process engaged by the Department at the design phase has not translated into a feeling of ownership of the buildings by the school community. The standard functional model for lower secondary school buildings in the Department of Seine-Saint-Denis by which all the Department's new lower secondary (*collèges*) buildings abide was the result of a large consultation with different stakeholders at national and department levels, including professional staff from the National Education system, parents, unions, associations and key experts carried out in 2010. In order to refine the model, a second round of consultation took place in 2015, after the first fifteen new schools were built, to collect feedback from the users, directors, managers, administrative staff and key education actors as well as from local-level organisations and sports associations. Nonetheless, the value of this high-level consultation and the time spent on it has not transferred to the school community in a feeling of ownership of the new building.

In spite of the efforts carried out by the Department to adapt this single functional model of school design to the specific local requirements via consultation with town officials for the shared spaces and the school directors in the cases of renovation or reconstructions, there are no systematic opportunities for the school community to reflect on how to appropriate the spaces and adapt them to respond to their shared education vision. However, the effective use of the new learning environment and the realisation of its full pedagogical potential depends on each school community fully appropriating the spaces to reach its own educational, didactic and cultural objectives.

The current environment seems to provide limited opportunities for the teachers to modify the available space to suit their teaching and learning activities. Some of the teachers met during the walkthrough attributed this not so much to the lack of flexible furnishings, but rather to the fact that in the new buildings they do not have their own classroom and are obliged to share this space with other colleagues.

Most of the school leaders interviewed had only recently been appointed to the schools and therefore have yet to create a team spirit. They are working to improve the school climate as the new spaces by themselves do not necessarily foster higher respect: vandalism was frequent in all schools visited. Even if vandalism tends to be associated with a small share of students, the consequence is that all students are penalised and their life is characterised by prohibitions. They are not allowed to use the different spaces in an autonomous way and they cannot move freely outside the classroom. These rules do not contribute to the development of their sense of belonging to the school or to ownership of the space.

### *Pedagogical potential of the buildings*

There is not yet sufficient awareness amongst teachers about the pedagogical potential of the buildings. The evaluation of the school spaces on the basis of the 1+4 Manifesto shows that the schools in Seine-Saint-Denis offer a rich and diverse school environment from a functional point of view, but the buildings are not yet fully used for the pedagogical potential that they could have. From the responses to the Survey and informal observations, it emerges that about 65% of the environments where teaching is mainly carried out are traditional, with desks mostly arranged in rows with some exceptions of island settings; all classrooms are equipped with desktop PCs, projectors or Interactive whiteboards. The more flexible learning environments (20% of the group spaces) are not used regularly with the whole class. In the interpretation given to the categories worthy of note is the symbolic function attributed to the CCC, which is mainly related to "concentration and individual study", despite the fact that this space presents features much closer to an innovative and multifunctional group space. In all the schools visited, there appeared to be a very conventional use of the space with a formal approach to teaching, subject knowledge, departmental structure and discipline. Despite a wealth of learning environments, educational activities take place mainly in the classroom with poor pedagogical use of the opportunities provided by the building. See Boxes 1 and 2 for possible alternative uses of spaces.

From the answers to the Survey questions concerning the relationship between educational space and learning activities, (see Figure 4 below) it is clear that in traditional classes there is a prevalence of frontal teaching with some moments of individual and small group activities.

Figure 4: Percentage time spent on each activity in relation to the type of learning environment
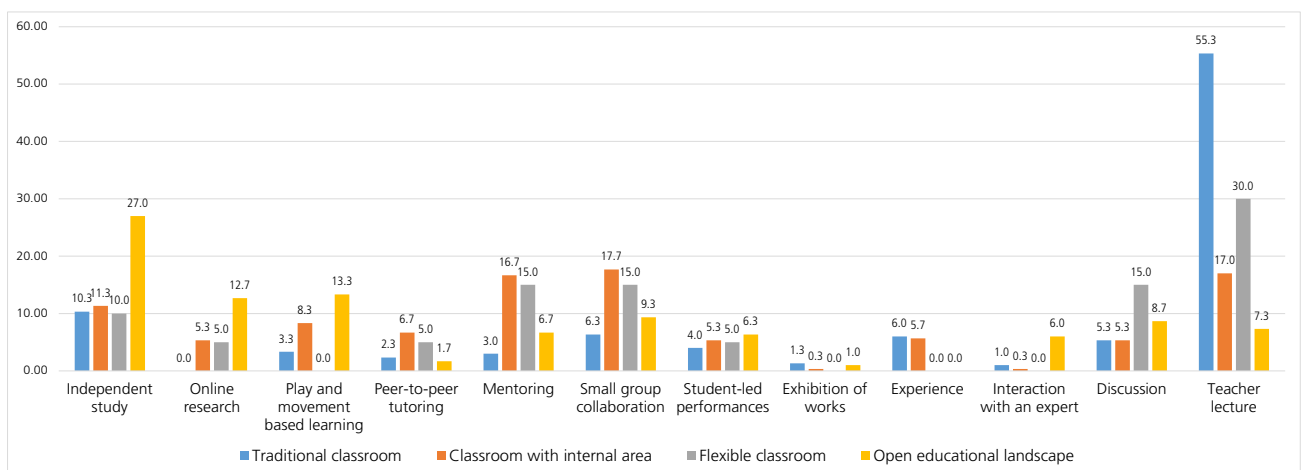


In classrooms with internal areas and in flexible classrooms, identified by respondents as laboratory classrooms and the CCC, frontal teaching is significantly reduced to make room for more active and student-centred methods. In these less traditional environments the percentages of time dedicated to discussion, collaboration in small groups, online research, gaming activities, mentoring and student presentations of the work to their classmates are more significant. These findings confirm that flexible spaces can encourage more effective teaching and promote the use of more diverse pedagogies, place greater focus on personal learning, and help students to be self-reliant learners capable of working in groups (OECD, 2017)[4]. However, to succeed in doing this effectively, teachers need to be able to rethink their current practice and consider how they can use the relationship between pedagogy, space and technology to maximise the potential of their students. The intentions of the space can only be fully realised if the inhabitants of the schools completely understand and support the pedagogical principles informing the provision of these spaces.

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[4]     *OECD Framework for a Module on the Physical Learning Environment - revised Edition* (2017) Retrieved from:
http://www.oecd.org/education/OECD-FRAMEWORK-FOR-A-MODULE-ON-THE-PHYSICAL-LEARNING-ENVIRONMENT.pdf

One of the most effective ways to promote and experiment an active and student-centred teaching is by creating connections between different spaces in order to differentiate teaching and learning. The presence of environments of different sizes and the use of unconventional spaces to carry out more individualised activities, such as corridors, commons or hallways, for example, can be an opportunity to expand the standard class, often equipped with low flexible furniture and with a size in terms of floor that is not adequate to support innovative settings.

**Box 1**

## Pedagogical potential of the CCC

In all of the schools visited there was a space that has many innovative aspects in the perspective of an Innovative learning Environment: the CCC - *Centre de Connaissances et de Culture* (Centre of Knowledge and Culture). This is more than a place where students can find needed information. It offers a place to read, to collaborate, and to do research in a kind of relaxing and comfortable environment that we do not find anywhere else in the school. The CCC gathers in a single environment spaces for individual study, comfortable corners for more informal learning, tables for study in pairs or in small groups, and widespread technology. Around this common learning space are some classrooms of various sizes with transparent walls that allow the work of the various groups to be easily monitored. Finally, this environment is managed by an expert, the documentalist teacher who can support subject teachers in an innovative use of the learning environment. This place could be a sort of laboratory where teachers can experiment more active and engaging learning activities.



Dora Maar CCC



Gustave Courbet CCC

In the schools visited it was possible to identify some aspects that do not facilitate a greater appropriation of the spaces in this sense: the first is the strict safety norms that appear to constrain the use of corridors for learning purposes; the second concerns the functional organisation of the building which has placed many rooms of various dimensions far from the educational centre. The consequence is that the space actually used by the students every day is much lower than the space available in relation to the total area and the number of students.

In none of the schools have teachers been supported in the transition to new school spaces with the organisation of a professional development plan aimed at acquiring the necessary skills for an effective use of the environment from a pedagogical point of view. In two of the schools, school directors declared that a process of reflection on the affordances of their school's spatial arrangement is a priority, but there is still a lack of consciousness regarding the power of space and the influence it has over school organisational structures and learning.

The schools have numerous spaces that could be used to personalise the teaching through multi-disciplinary, inter-class skills activities. The "salle d'étude" or study room, the foyer or the classrooms for special needs students for example, already have a more innovative design concept: students' tables that can be more easily arranged, larger tables for cooperative activities, sofas and a relax corner to work individually in a more comfortable setting.



Study room Gustave Courbet
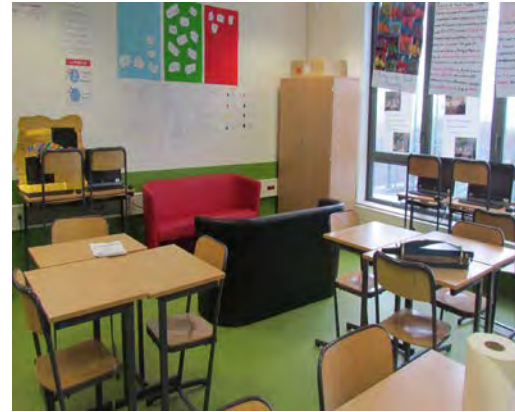


Special needs classroom Cesaria Evora

### *Use of technology in schools*

All classrooms are equipped with desktop PCs, projectors or interactive whiteboards. Technology is widespread in the laboratories and in the CCC as well, whereas mobile technology (laptops and tablets) is less used. The desktop PCs placed on benches leaning against the walls along the perimeter of the classroom are used predominantly for internet-based research, individual exercises and assessment. Results from the survey (see Figure 5) confirm that there is a tendency towards a teacher-directed and classroom-located use of technology. Students are mainly consumers of learning contents and resources, and technology is used to perform the same task that was done with pen and paper before. There is no evidence of high-end uses of technology like programming and the production of creative outputs such as graphic-arts projects, 3D objects and publications. Interactive whiteboards are mostly used as a lecturing aid by teachers.

Figure 5: Reported use of technology available
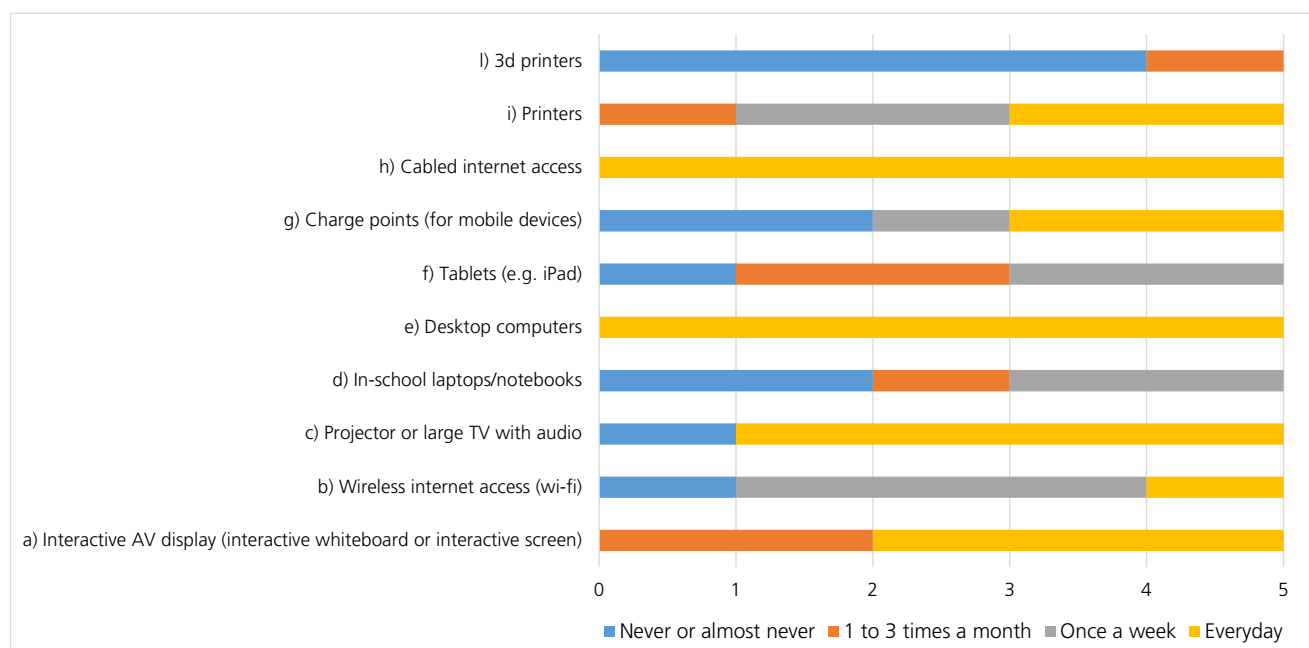
## Pedagogical potential of available technology

Innovative use of technology creates new tasks and activities which were previously inconceivable within a traditional classroom and gives a more creative role to the student. Instead of presenting their findings and conclusions in writing, students can present their work using different multimedia tools and applications such as a video documentary or a photo slideshow with an original musical soundtrack. Using real time response personal devices, teachers can get immediate feedback on the comprehension level of the lesson with the possibility of taking immediate corrective action so that no student is left behind (see picture 1).

Using Internet-connected devices, each group can work on a specific task assigned by the teacher. In this way the teacher can personalise the learning content, taking into account the different students' learning style and group composition (see picture 2).

Modern technologies also facilitate internet-based collaboration and promote the use of applications for the sharing and remote editing of contents. Using sensors, data loggers and hands-on dynamic systems, students can work on science-related topics interacting directly with outside world materials and manipulating variables and values (see picture 3).

The Interactive whiteboard enables students to communicate with experts and schools in other countries (see picture 4).

Exploration labs of the latest generation such as Makerspaces (see Annex 5) also support innovative use of technology. The teachers and directors met agreed on the need for ICT training for teachers in order to improve the impact of technology on teaching and learning.
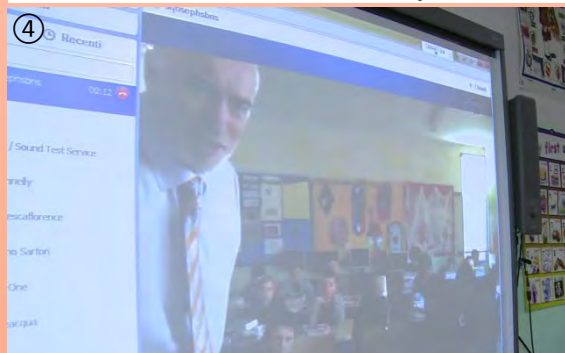

Istituto di Istruzione Superiore Ettore Majorana, Brindisi (Italy)


Istituto Comprensivo San Giorgio, Mantova (Italy)


Fiera ABCD di Genova (Italy)


Istituto Comprensivo Lastra a Signa, Firenze (Italy)

Cesaria Evora



Dora Maar

## 4.    Recommendations

Local officials are responding to the socio-economic challenges faced by the Department with a high commitment for the education sector. This commitment is reflected in the long-term investment vision and the continued support to the sector as evidenced by the high level of investments. For the period 2015-2018 education investments represented 38% of the Department's total investments. The education infrastructure being provided is of high technical quality; it is well-equipped in terms of IT and connectivity and meets ambitious energy-efficiency objectives. The professionalism of its technical staff is evident in the detailed technical documents and their efforts to improve and further refine each phase of investments. The spaces provided are generous and offer ample corridors for circulation; the buildings ensure the necessary space for teachers to have a place to work, for students to have places for leisure and recreation, and for the provision of midday meals, sports facilities and learning support areas.

These investments are also being accompanied by interesting educational initiatives such as the creation of smaller experimental schools with a thematic focus on languages, sports and arts, an increase in student dormitory capacity to provide disadvantaged students with adequate and stimulating surroundings, and complementary grants to support the implementation of school education projects.

These capital investments are being implemented in a governance context that constrains the role of the Department to financing the infrastructure and providing for the social support of students, but leaves the educational aspects to the State level. Designing and building a new school provides a unique opportunity to impact on the teaching and learning process. A new building is an opportunity to stimulate the education process to better respond to present challenges. To make good use of this, it is essential to see the process of designing and building a school as an essential input to the education process and not as a mere capital investment. This requires that all levels of government work together in a coordinated way to ensure the opportunity is not missed. It is the belief of the review team that developing a shared vision of learning that integrates the potential role of the physical space in the expected learning outcomes among all education stakeholders could enhance the impact of the investments in promoting learning.

The recommendations presented below derive from the review team's brief immersion into the Department's context and situation These ideas are to be considered as suggestions to encourage further discussion and exploration by the Department's different education stakeholders.

## 4.1  School Design Process

### Involving the school community

One of the underlying ideas of participatory design has been to democratise design so that users (staff) and customers (students) are involved in designing facilities or services for themselves. User-oriented design converts tacit knowledge from end-users into shared knowledge and promotes the interaction between experts and users.

Involving users in the design of the premises at an early stage and throughout the process until the premises are completed ensures that the premises will meet the needs of users and that users will be satisfied with the facilities, their furnishings and equipment. User participation in the whole process from the needs assessment up to completion of the building takes more time than a usual construction project where a subscriber orders a finished building and hands it to users without consulting them. This investment in time has proven to be profitable and has become common practice in many countries. See Box 3 for more information on the consultation process.

The centralisation of the planning process existing in France which results in a single school functional model for the Department should not be seen as a limitation for a participatory design process. The planning process can be refined to give more opportunities to engage the school communities in imagining the future and subsequently adapting the standard model to their own school vision.

**Box 3**

## Summary and step-by-step user involvement in different school design cases in countries where the school community is highly involved in the process

### Roles, tasks and results in different project cases

#### *Refurbishment and possible extension of an existing school building - users are known*

At the same time as the building is undergoing a condition survey before refurbishment, the teachers are involved in thinking about the school's working methods and working culture: how best to achieve the goals of the curriculum, learning outcomes and the well-being of the school community. This process will lead to the definition of the school's pedagogical mission and vision, but not to actual drawings of the school.

The process leading to the definition of the school's mission and vision might be facilitated by an expert who is familiar with school activities, usually an educator/pedagogue or an architect specialised in learning environment planning: a Pedagogical Planning Expert. The user group meets in several workshops and visits new schools and learning environments over a period of 4-6 months. The result of the workshops and school visits is a pedagogical vision and a functional plan of the school, a written scenario with diagrams and illustrations. This vision and the manuscript form the basis for the detailed design brief, the room programme and the actual architectural design.

#### *New building on the site of the demolished old building or on a new plot - users are not known*

The school administrator (municipality or department) can form a Design Group and invite representatives for the initial planning of the new school. The group consists of a part-time director and teachers in charge of different subjects from other schools. These representatives may be partially exempt from their teaching or administrative obligations in their own school. The task of the Design Group is to determine the pedagogical vision of the new school and give guidelines on how the new school could work and what its activities and functions are. At the same time, the recruitment of the teachers for the new school may start. The design brief and the room programme will be based on the work of the Design Group.

The introduction of a new school building or renovation does not always go smoothly - situations can arise in which it is stated that the building or its details are not working as planned, it is therefore important that the users are assisted in the use of the facilities and receive guidance at least during the first months of transitioning into a new building. Here, too, the importance of the adaptability and flexibility of the building, its spaces and furniture will be emphasised.

### *Post-Occupancy Evaluations*

Post Occupancy Evaluations (POEs) help improve the ways that buildings are used to support productivity and wellbeing. POEs provide feedback on how successful the workplace is in supporting the occupying organisation and the requirements of individual end-users. Its forms and methods may vary, although some standard models have also been developed. Most POEs involve seeking feedback from the occupants of the place being evaluated; this may be achieved through various survey methodologies including questionnaires, interviews or focus groups. Specifically, the POE is used to:

- Account for building quality
- Inform planning and briefing (programming) for new buildings and alterations
- Troubleshoot building/use problems (such as change management and new work styles)

In Finland, it has been found that the majority of new school buildings and learning environments have been built in accordance with international trends where learning environments are more open and traditional classrooms are no longer necessarily recognised.
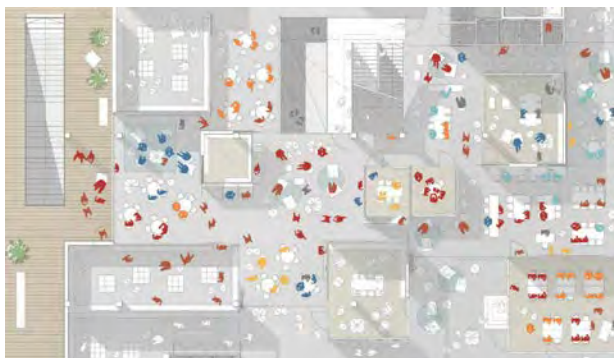


Anonymous competition proposal
for a new school in Helsinki (2015)

Open learning environment
of a new school in Hämeenlinna (2018)

In recent years, a debate has emerged about the need to examine the impact of these new types of open learning environments on the learning outcomes, satisfaction and well-being of users.

Metropolitan cities such as Helsinki have already implemented some POE surveys by interviewing the users or observing the activities in new or refurbished schools. In the next few years, the Finnish Ministry of Education is to launch a programme to study new learning environments using POE methods after the school has been in use for 1-2 years. This will provide a solid research data base for future school planning.

The costs involved in financing a participatory design process and conducting post-occupancy evaluations should be built into the construction costs and considered as essential inputs to an effective investment.

## *4.2  The Learning Environment*

### *Promoting learning everywhere*

The innovative teaching methods that put the student and his/her creativity at the centre, such as flipped classrooms, collaborative methodologies or project-based and problem-solving approaches are based on the differentiation of student activities; students do not all do the same thing at the same time. This aspect requires changes in the configuration of the classroom to allow movement and flexibility, but also the possibility of having environments of various sizes and with different characteristics that adapt to the particular activity assigned: research activities, creative and design activities, moments of interaction in small or large groups, more reflective and individual activities.

The *1+4 Manifesto* is based on the assumption that promoting student-centred learning requires overcoming the idea of a school as a set of closed rooms (classrooms for daily teaching, laboratories for "experiments", computer room, etc.) connected by corridors reserved only for passage. The key word is flexibility. Flexibility supported by furniture that eases the reorganisation of spaces, by the existence of learning areas of different sizes, by different pedagogical activities and flexible scheduling. This leads to a conception of the overall school physical space as a whole environment that provides opportunities for learning, as learning can take place everywhere and cannot be confined to the classroom. The inclusion of common spaces as learning areas increases the learning area available per student.

**Corridors and commons fostering social interactions and learning opportunities**
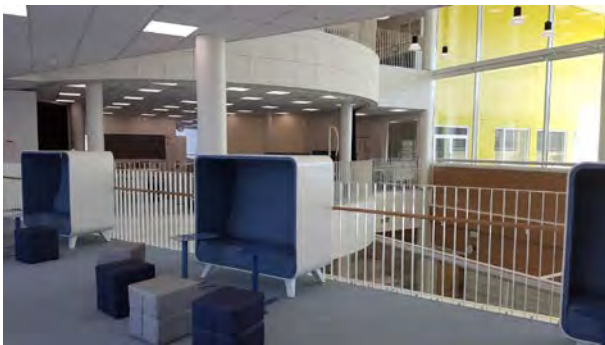


Furniture as a space for individual studies,
Hämeenlinna, Finland



Lobby area for individual or group studies,
Turku Teacher Training School, Finland





Hellerup Skole, Copenhagen (Denmark)

## Floors and walls as learning surfaces


Kirkkojärvi School, Espoo (Finland)


Päivänkehrä School, Espoo (Finland)


Päivänkehrä School, Espoo (Finland)


Vittra TelefonPlan, Stockholm (Sweden)

## Multipurpose areas: cafeteria, learning and leisure


Istituto Comprensivo Cadeo e Pontenure, Piacenza (Italy)


Lernhaus Ahron, Ahorn-Eubigheim (Germany)

## Conceiving different sized learning areas

Learning takes place in different social organisations: individual, in pairs, in a small group, in a class, at the level of the school as a whole (Seydel, 2018)[5]. But learning is an individual process. In almost every educational system, students are organised in classrooms by age, however, each student learns in a unique way. Pupils of the same age in a seemingly homogeneous class are quite obviously different from one another in terms of cognitive conditions and learning methods, social background, motivation to succeed, state of physical development, and so on. To constructively manage the heterogeneity of a school class, there is one condition: the social organisation of a learning activity must be extremely flexible.

The development of 'additional spaces' of different sizes including 'the reflective environment', 'the creative learning environment', and 'the interactive learning environment' strikes a balance between the 'traditional classroom' and spaces that encourage alternative ways of working.

**Commons and open learning areas**
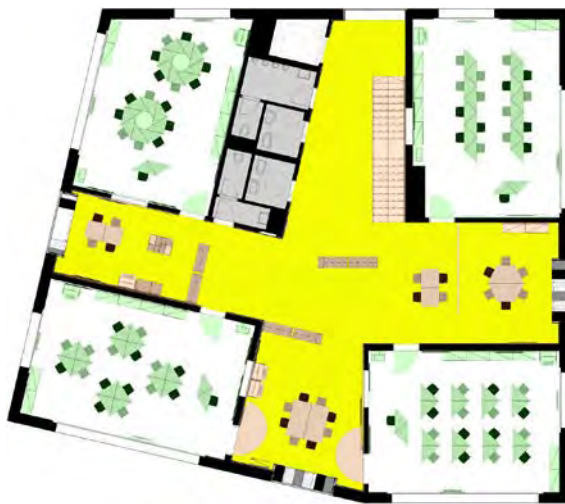


Istituto Comprensivo Monguelfo, Bolzano (Italy)
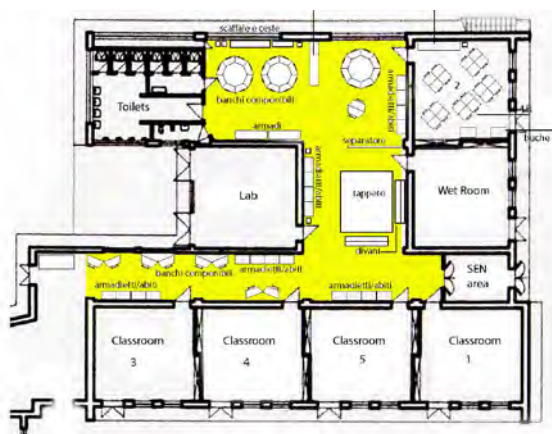


Istituto Comprensivo Montagnola, Florence (Italy)

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[5]   Seydel, O. "Cluster - Open Learning Environment. Three Different Lines of Development to Redesign Schools in Germany", in Borri, S. (2018) *The classroom has broken.Changing School Architecture in Europe and Across the World*. Cava de' Tirreni: Ediguida.

Student-centred pedagogies require these different sized learning areas to promote the types of activities that are conducive to the learning outcomes expected today and for teachers to make the pedagogical connections between the spaces available.

## *The added value of the Agora*

The Agora, the space for the enlarged community, deserves deeper study. This space fulfils the school's need to create a sense of belonging that goes beyond the team spirit between classmates. Such a space is not always foreseen in schools: the experience of auditoriums tells us that they are places of little use and represent a cost that is not justified by the benefits they can offer.

However, most schools do have environments large enough to carry out whole school events: in some cases, it is the school's atrium in others the school canteen. Transforming these spaces into multi-purpose environments that can be adapted to various activities is a way to inhabit the whole school and make all places productive in terms of space/time use. Flexible furniture contributes to this versatility. Future schools could benefit from including such dedicated spaces in their design.

### Different versions of an Agora



4th Gymnasium, Amsterdam (The Netherlands)



Aurora School, Espoo (Finland)



Floorplan of Latokartano School in Helsinki
(PES Architects, 2009)



Model of a home area with a central agora for grades 7-9, © Nevari
("Koulusta oppimisen ympäristöksi", Kuuskorpi-Nevari, 2018)

Latokartano School, Helsinki (Finland)


Lernhaus Ahron, Ahorn-Eubigheim (Germany)

## 4.3  Using Available Resources to Support Education Innovation

The Department currently provides about € 7 million per year in grants to schools to support their education projects. About half of this amount is directly linked to the budget of the Education and Youth Directorate, while the remaining funds originate from other Directorates. This level of commitment is a choice made by the Department to support education activities. Having access to these resources can prove itself a very influential tool to support the priorities of the Department and encourage more effective use of the education investments financed. All the schools visited had responded to the Department's call for proposals (*"Appel de projets pédagogiques"*). Through this mechanism, activities with specific Department objectives could be supported and encouraged and their impact measured.

Three areas emerged during the discussions with the different education stakeholders that could benefit from a call for proposals:

### Calls to promote ownership

Safety is essential to promote learning, but safety also relies on trust and respect. Encouraging these values and collective actions to promote a safe environment through student-based initiatives can become a line of action favoured by the Department in their call for school project proposals. Rewarding and disseminating successful initiatives can contribute to extending their effects to other schools.

### Calls to better use the shared spaces

A call for proposals could help identify associations that could provide a service to the school and the community in exchange for the space available for community purposes. Projects in the spirit of Makerspace and the Future Classroom Lab (See Annex 6) could be encouraged in this way. In this type of partnership, the association runs workshops either in or out of school hours with expert technicians in cooperation with subject teachers. The partnership makes technical and professional skills available, in some cases it offers the equipment, and participates in educational activities. The school makes available the free use of the space to the association that can use it to organise paid courses.[6] The FabLab experience at the Collège Louise Michel in Seine-Saint-Denis is a good example of this type of collaboration. More initiatives like this could be encouraged by the Department.

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[6]    For Makerspace see also http://www.makerspaceforeducation.com/

Scuola Città Pestalozzi, Florence, (Italy) Carpentry lab.



Makerspace at Comprehensive institute Montessori-Bilotta, Francavilla Fontana, Brindisi (Italy)



Comprehensive institute Largo Castelseprio, Labaro, Roma (Italy)

## *Calls to support evaluation and dissemination*

For grants to become an effective tool to support and promote innovation, it is essential to measure their impact and disseminate best practices. Data is needed to prove the effectiveness of the resources invested and impact should be captured by results indicators and not just by the number of schools or students participating. For each line of action, specific measurable results should be identified and agreed on with partner schools to be eligible for funding. Disseminating best practices is also important to give recognition to those involved in making results happen and to inspire others to do the same. Department officials are encouraged to reserve some funds for these purposes, which are essential inputs to the further development of the grant mechanisms by providing lessons learned and by expanding the number of potential candidates.

## Annex 1    Schools Visited and Data Collection Instruments

The review team designed two questionnaires and an interview protocol to collect the necessary data. In addition, the school directors completed a Survey on the uses of the learning space. All instruments are presented below.

## A. Schools Visited

### Table 1: Schools visited by the review team

| School | Collège Gustave Courbet | Collège Dora Maar | Collège Germaine Tillion | Collège Cesaria Evora | Collège Pablo Neruda |
|---|---|---|---|---|---|
| **Location** | Pierrefitte-sur-Seine | Saint-Denis/Saint-Ouen | Livry-Gargan | Montreuil | Aulnay-sous-Bois |
| **Works objective** | Major reconstruction and extension Dorms, central kitchen and sports facilities | New construction | New construction | New construction | Energy Performance renovation |
| **Tendering** | MOP | PPP | PPP | PPP | Energy Performance Contract |
| **Costs (in € million)** | €35.5 | €21.9 | €25.9 | €26.9 | A batch of 5 schools €34 million |
| **Surface area (m²)** | 10 306 | 6 608 | 7 560 | 8 537 | 7 722 |
| **Number of students planned** | 800 | 700 | 700 | 600 | 850 |
| **Number of students enrolled** | 604 +40 SEGPA | 539 | 343 | 473 | 646 |
| **Completion date** | Sept 2019 | 2014 | 2018 | 2014 | 2019 |

## B. School Background Datasheet on Teachers and Students

| Section 1: **The school** | | | |
|---|---|---|---|
| **1.1** | *Name of school:* | | |
| **1.2** | *How long has the Principal been in post at the school?* | *Years:* | |
| **1.3** | *Role of the different actors in latest renovations?* | | |
| | **a.** **Was the Principal involved?** | **Yes:** | **No:** |
| | If yes, please briefly describe his role: | | |
| | **b.** **Were the teachers involved?** | **Yes:** | **No:** |
| | If yes, please briefly describe their role: | | |
| | **c.** **Was the support staff involved?** | **Yes:** | **No:** |
| | If yes, please briefly describe his role: | | |
| | **d.** **Were the students involved?** | **Yes:** | **No:** |
| | If yes, please briefly describe their role: | | |

| Section 2: **About the students at the school** |
|---|
| **a.** **Total school enrolment** (number of students) |
| **b.** **Number of part-time boarders** |
| **c.** **Number of students with special needs enrolled at the school** |
| **d.** **Number of students benefiting from scholarships** |
| **e.** **Number of students receiving financial help** |
| **f.** **Number of nationalities represented at the school** |
| **g.** **Number of foreign-born students enrolled** |
| **h.** **Number of students who have at least one foreign-born parent or who do not speak French at home** |
| **i** **Total student capacity of the school** |

| Section 3: **About the teachers at the school** | |
|---|---|
| **3.1** | *Number of teachers employed at the school* |
| | **a.** **Number of teachers** *(A full-time teacher is employed at least 90% of the time as a teacher for the full school year. All other teachers should be considered part-time.)* |
| | i)    Full-time teaching staff |
| | ii)    Part-time teaching staff |
| | **b.** **Number of non-teaching staff** |
| | i)    Full-time non-teaching staff |
| | ii)    Part-time non-teaching staff |
| | **c.** **Annual teaching staff turn-over** |

| **3.2** | *Teachers' work experience* | |
|---|---|---|
| | **a.** **How long have teachers been at the school** *(Percentage of total)*: | |
| | i)    Less than one year: | _____% |
| | ii)    1 to 5 years: | _____% |
| | iii)    6 to 10 years: | _____% |
| | iv)    More than 10 years: | _____% |
| | **b.** **Teaching experience, percentage that have been teachers for:** | |
| | i)    Less than one year: | _____% |
| | ii)    1 to 5 years: | _____% |
| | iii)    6 to 10 years: | _____% |
| | iv)    More than 10 years: | _____% |

| **3.3** | *Teachers' workload* | |
|---|---|---|
| | **a.** Average weekly workload for teachers employed full time | Hrs |
| | **b.** Average number of hours per week that teachers spend planning, sharing experiences as a team (per subject, grade, or overall school) | Hrs |

| **3.4** | *Teacher professional development* | |
|---|---|---|
| | **a.** Number of days per year that teachers are given for professional development activities *(Average)* | ____days |
| | **b.** Number of days (Approx.) that these professional development activities take place: | |
| | i)    In the school | ____days |
| | ii)    Outside the school (e.g. attending courses, seminars etc.) | ____days |

## C. School: Background Data Sheet

Section 1 - **The school**

**Name:**

**Year school building originally constructed:**

Section 2- **Spatial configuration and size**

**Total land area of the school site:** m²

**Total gross internal floor area of the school buildings
(total floor area measured to the inside of external walls)** m²

**Proportion of overall floor area for:**

Administrative activities (i.e. not used for teaching / learning activities) %

Student activities (i.e. learning and recreation) %

Community use only (e.g. parents' room, healthcare, extended services) %

**Proportion of the overall floor area used as circulation space (such as corridors, staircases and hallways)** %

**Proportion of the circulation space used for structured or unstructured learning/ teaching activity** %

Section 3- **New construction / renovation
(new building construction includes a whole new building or a building addition which is a new structure)**

**Total gross internal floor area (floor area measured to the inside of external walls)**

New building(s) constructed (m²)

Renovated buildings (m²)

**Form of procurement:**

**Start and completion dates of construction/renovation works:**

Start date:

Completion date:

**Cost of construction project:**     **Total project cost:**

**Nature of renovation work:**

Section 4- **Hours school in use**

**Hours per day during term time the school is used for education**

**Hours per day during term time the school is used for after school activities**

**Hours during the year the school is used by associations**

# D. Interview Protocol - Guiding Questions

The interview protocol contained clusters of questions to explore the following aspects:

| | |
|---|---|
| **Preconditions for students** | Differences in observed behaviours of students and teachers in the (new) physical learning environment |
| **Preconditions for teaching (and with technology)** | Extent to which the new physical learning environment – and/or the school leadership – encourages teachers to use new or innovative teaching methods and/or materials, employ more learner-centred approaches in general; |
| **Allocation and use of space** | Allocation and use of different spaces for different student age groups and teacher groups over time; use of outdoor spaces for learning |
| **Comfort** | Quality of the physical learning environment in terms of temperature, humidity, lighting (natural and artificial) and acoustics (i.e. noise levels) |
| **Community collaboration (e.g. industry, interagency collaboration)** | Collaboration with new community stakeholders (e.g. industry, interagency, associations, etc.) ; use and encouragement to use common spaces in school hours; |
| **Leadership and innovation** | Responsibilities for learning and innovation in the school; structures and processes in place to support teachers' leadership and professional development especially in regard to the physical learning environment |
| **Outdoor spaces, social spaces, favourite spaces and shared visual workspace** | Response by students to (new) spaces (indoor and outdoor spaces, special spaces, flows between spaces); intended vs actual use of spaces |
| **Participation in design** | Participation of school principals in the design of the new spaces; extent to which principals include leadership team; and extent to which this team includes classroom teachers |
| **Professional development** | Professional development (or related) activities to prepare school principals and teachers for occupancy and during occupancy; general responsibility for professional development activities; involvement of teachers in professional learning networks to share ideas about space |

## E. Survey - School Director- Space and Use

Section 1: **About school community involvement in the building design process**

*1.1*     *Have the teachers been involved in the building design process?*
[please describe in no more than 150 words]

*1.2*     *Have teachers been supported in the transition to new school spaces with a professional development plan to prepare
teachers for pre- and post-occupancy?*
*If the answer is yes, describe the type of training*
[please describe in no more than 150 words]

Section 2: **About the founding principles of the school**

*How does your educational vision translate these principles?[7]*
[please describe in no more than 150 words]

   a.  **Welcome**
   b.  **Communication**
   c.  **Cooperation**
   d.  **Diversity**
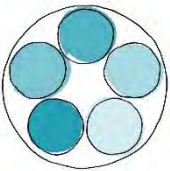   e.  **Movement**
   f.  **Responsibility**

Section 3: **About variety of school environments**

*How have the functional environments described in the Manifesto 1 + 4 been interpreted in your school*
*[please describe in no more than 150 words]*

   a.  *Group space*
   b.  *Exploration Lab*
   c.  *Agora*
   d.  *Individual area*
   e.  *Informal area*

Section 4: **Types of learning environments**[8]

*Of the six types of Group spaces described in the Manifesto 1+4 (Traditional classroom, Classroom with internal areas, Flexible
classroom, Plus classroom, Cluster classroom, Open educational landscape), please indicate the percentage of each type prevalent in
your school.*

*Type of learning environment*                                                    *Percentage*

**Traditional classroom**



____%



CLASSROOM WITH
INTERNAL AREAS

____%

---

[7]   Carro, R. (2019.) "Principi per l'allestimento di ambienti centrati sullo studente" in Tosi, L., *Fare didattica in spazi flessibili.*
Firenze: Giunti Scuola.
[8]   This section was adapted by INDIRE from Imms, W., Mhat, M., Murphy, D., & Byers, T. (2017). Type and Use of Innovative
Learning Environments in Australasian Schools- ILETC Survey. Technical Report 1/2017. ILETC Project/ Melbourne.

FLEXIBLE
CLASSROOM

____%

PLUS
CLASSROOM

____%

CLUSTER
CLASSROOM

____%
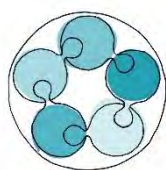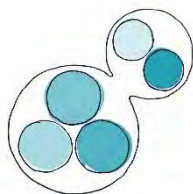
OPEN EDUCATIONAL
LANDSCAPE

____%

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Section 5: **Use of different types of learning activities**

*Of the 14 types of learning activities, please indicate the percentage of time spent on each approach in your school, with reference to the type of learning environment used*

|  | SUITABLE LEARNING ENVIRONMENTS | | | | | |
|---|---|---|---|---|---|---|
| **LEARNING ACTIVITIES** | **Traditional classroom** | **Classroom with internal area** | **Flexible classroom** | **Plus classroom** | **Cluster classroom** | **Open educational landscape** |
| *Independent study* | ---% | ---% | ---% | ---% | ---% | ---% |
| *Online research* | ---% | ---% | ---% | ---% | ---% | ---% |
| *Play and movement-based learning* | ---% | ---% | ---% | ---% | ---% | ---% |
| *Peer-to-peer tutoring* | ---% | ---% | ---% | ---% | ---% | ---% |
| *Mentoring* | ---% | ---% | ---% | ---% | ---% | ---% |
| *Small group collaboration* | ---% | ---% | ---% | ---% | ---% | ---% |
| *Internet based collaboration* | ---% | ---% | ---% | ---% | ---% | ---% |
| *Student-led performances* | ---% | ---% | ---% | ---% | ---% | ---% |
| *Exhibition of works* | ---% | ---% | ---% | ---% | ---% | ---% |
| *Experience* | ---% | ---% | ---% | ---% | ---% | ---% |
| *Interaction with an expert* | ---% | ---% | ---% | ---% | ---% | ---% |
| *Discussion* | ---% | ---% | ---% | ---% | ---% | ---% |
| *Teacher lecture* | ---% | ---% | ---% | ---% | ---% | ---% |
| *Seminar* | ---% | ---% | ---% | ---% | ---% | ---% |

Section 6.1: **Technology at the school**[9]

*Are the following technologies available in the spaces/rooms in which you teach? (Please tick one box in each row)*

| | In all of the spaces | In most of the spaces | In a few of the spaces | In none of the spaces |
|---|---|---|---|---|
| a) Interactive AV display (interactive whiteboard or interactive screen) | | | | |
| b) Wireless internet access (Wi-Fi) | | | | |
| c) Projector or large TV with audio | | | | |
| d) In-school laptops/ notebooks | | | | |
| e) Desktop computers | | | | |
| f) Tablets (e.g. iPad) | | | | |
| g) Charge points (for mobile devices) | | | | |
| h) Cabled internet access | | | | |
| i) Printers | | | | |
| l) 3d printers | | | | |

*If there are other types of technologies available in the spaces/rooms in which you teach, please briefly describe here:*

Section 6.2: **Technology at the school**

*How often do you use the following technologies in the spaces/rooms in which you teach?(Please tick one box in each row)*

| | Never or almost never | 1 to 3 times per month | Once a week | Every day |
|---|---|---|---|---|
| a) Interactive AV display (interactive whiteboard or interactive screen) | | | | |
| b) Wireless internet access (Wi-Fi) | | | | |
| c) Projector or large TV with audio | | | | |
| d) In-school laptops/ notebooks | | | | |
| e) Desktop computers | | | | |
| f) Tablets (e.g. iPad) | | | | |
| g) Charge points (for mobile devices) | | | | |
| h) Cabled internet access | | | | |
| i) Printers | | | | |
| l) 3d printers | | | | |

*If there are other types of technologies available in the spaces/rooms in which you teach, please briefly describe here:*

Section 6.3: **Technology at the school**

*In a typical week, approximately how often do you use technology devices or you ask the students to use technology devices to do the following learning tasks? (Please tick one box in each row)*

| | Never | Once a week | 1 to 3 times a week | Everyday |
|---|---|---|---|---|
| a) online research | | | | |
| b) complete an assessment task | | | | |
| c) watch a video | | | | |
| d) listen to audio | | | | |
| e) complete homework | | | | |
| f) practice skills | | | | |
| g) express ideas creatively | | | | |
| h) prepare presentations/reports | | | | |
| i) collaborate with students in other schools | | | | |
| j) collaborate with students in other countries | | | | |
| k) If you use technology in other ways, please briefly tell us here: | | | | |

Section 7: **Response to call for educational projects**

*Has the school responded to the call for educational projects from the Department of Seine-Saint-Denis?*
[please describe in no more than 150 words]

If the answer is no: explain why not
If the answer is yes:

    On which axes of the PED?
    How was the project integrated into the school curriculum?
    How was the project communicated to the school community?
    How will the expected competencies be assessed and how will they contribute to the overall assessment of the student?

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[9]    Sections on "Technology at school" was adapted from *The OECD School User Survey: Improving Learning Spaces Together* (2018) http://www.oecd.org/education/OECD-School-User-Survey-2018.pdf

# Annex 2    Analytical Framework: School Design

## Space Types and Uses

### Evolution of existing types of space

There is a trend towards designing schools with more open space and with fewer walls between learning spaces, although it falls short of the open-plan forms created during the 1960s and 1970s. The far end of this spectrum might be characterised as a school building with spaces that tend to comprise a mixture of semi-enclosed and fully enclosed spaces with varying degrees of convertibility enabled by the provision of sliding or folding walls. Plans with this type of space are often arranged so that there is a large space connected to smaller spaces which may not be entirely closed off, but are defined by a wall on two or three sides and described as the 'learning landscape' model (Schneider, 2015)[10]. Although this might describe the direction of travel in terms of school building design, relatively few schools have been designed like this.

The uniformity of 'classrooms' in the conventional model is giving way to greater variation in the sizes of learning spaces. To some extent there has always been some variation in classroom space sizes for example, science laboratory classrooms have generally been larger than standard classrooms for the same group size. However, there is now greater focus on creating smaller spaces, providing opportunity for small group work, individual work or quiet areas. These may often be clustered with larger spaces as shared breakout spaces.

There has also been growing emphasis on creating multi-functional spaces with larger spaces such as halls being convertible to an auditorium, or to a sports hall. The trend is to reduce the amount of space that has a fixed or specialist use because it limits the use and is less efficient. For example, in a science laboratory, the fixed benches containing the sinks are placed around the perimeter of the room so that moveable tables and chairs can be put in the middle of the space, thus enabling the space to be more easily used in different ways.

There has also been a growing focus on the use of external areas for learning, for example by creating external classrooms which may be accessible from internal spaces. Clearly the applicability of this strategy depends on the climate.

### New types of spaces

There are some new spaces that are now appearing more frequently in schools. These are the following:

*Streetspace:* learning zones are being incorporated within circulation routes so that corridors are becoming what Dovey and Fisher[11] describe as 'streetspace'. These zones are free spaces for students to use whenever they like, or they can be used for specific structured learning activities where they are adjacent to larger learning spaces.

*Commons* space: this is a semi-enclosed learning space that provides a range of settings for group, individual and quiet work. They are not necessarily large spaces; Dovey and Fisher suggest that they should be greater than 40m². These spaces are not part of the main circulation route in that people will not pass through them to get anywhere else. They may be scattered throughout the building, perhaps combined with clusters of learning spaces.

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[10]  Schneider, J., *Learning from school buildings*, in Ed: Meuser, N., School Buildings: Construction and design manual, Dom Publisher, Berlin, 2014

[11]  Dovey, K; Fisher, K, *Designing for adaptation: the school as a socio-spatial assemblage*, Journal of Architecture, 2014 19(1), pp.43-63 (21)
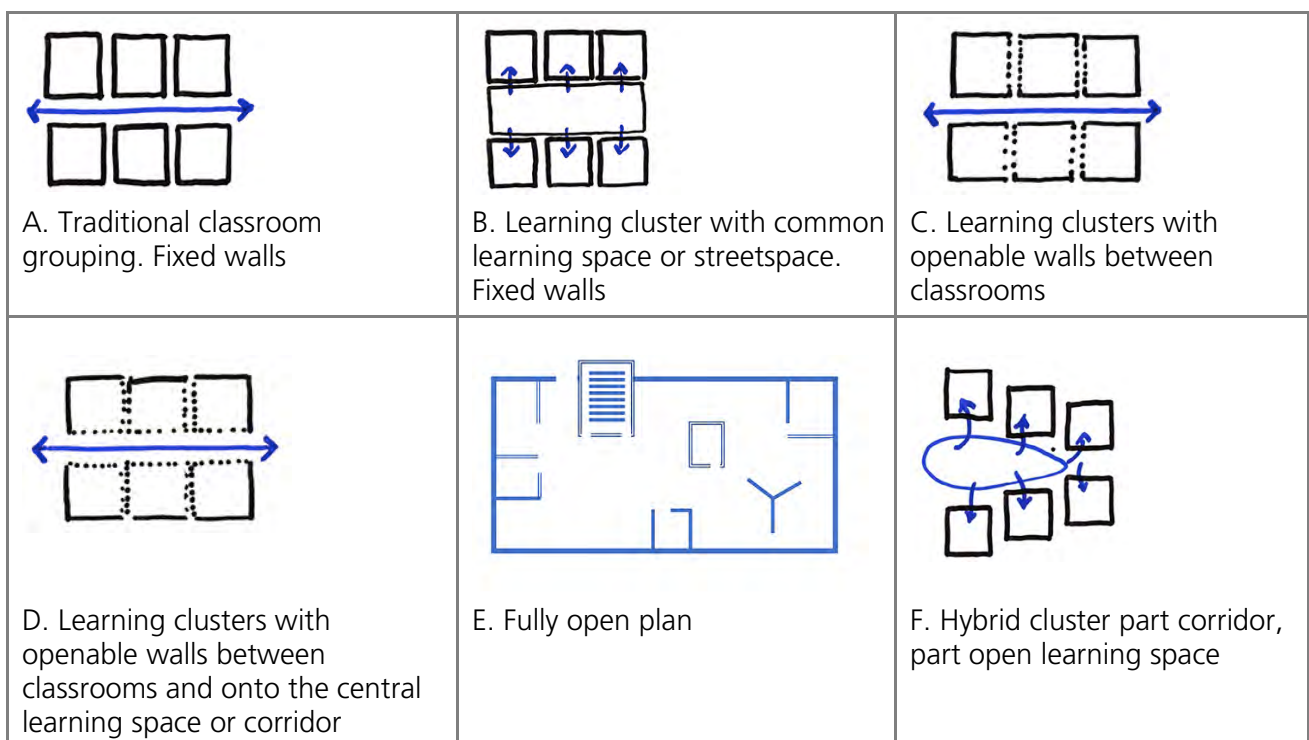
*Central commons area:* this is primarily an area for social interaction, but may have a range of different 'learning settings' such as quiet areas, or areas for group study or individual work. This space will often incorporate the dining/canteen areas and possibly the library. The trend has been to locate this space in a relatively central position in the plan of the school, near the entrance and in a way that gives access to the teaching areas. In school buildings that are more than one storey high, this space may well be an open space the full height of the building with a visual connection to each floor.

*Creating a relationship between spaces*

The individual spaces are the 'building blocks' for the overall school spatial design. What is also important is how the spaces are assembled to create relationships between them. Grouping spaces in a particular way suggests a possible pattern of use, but also, as Hillier (2005) points out, "space is an intrinsic aspect of everything humans do (…), in the sense of moving through space, interacting in space"[12]. There is a growing trend towards grouping spaces in a range of different ways and using openable walls such as sliding or folding partitions to provide more flexibility.

The spaces might be grouped around a common learning space to form a learning cluster, or open onto an adjacent streetspace to enable teachers to create different permutations of spatial arrangements, or the space may be opened up so that there are no fully enclosed spaces. Researchers have mapped these differently: Schneider (2015) who describes learning clusters[13], Loop.bz, a Danish consulting firm, talked of traditional, varied and learning landscapes, and Dovey and Fisher (2014) presented five broad cluster types that lie along a continuum from the traditional corridor to fully open plan[14]. Figure 1 summarises the different groupings.

**Figure 1: Summary of the space groups**



| | | |
|---|---|---|
| A. Traditional classroom grouping. Fixed walls | B. Learning cluster with common learning space or streetspace. Fixed walls | C. Learning clusters with openable walls between classrooms |
| D. Learning clusters with openable walls between classrooms and onto the central learning space or corridor | E. Fully open plan | F. Hybrid cluster part corridor, part open learning space |

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12   Hillier B (2005) "The Art of Place and the Science of Space." *World Architecture* 11/2005 185, Beijing, Special Issue on Space Syntax pp 24-34 in Chinese, pp 96-102 in English.

13   Schneider, J., "Learning from School Buildings," in *School Buildings: Construction and Design Manual*. Ed. Meuser, N. Dom Publisher, Berlin, 2014.

14   Dovey, K.; Fisher, K., "Designing for Adaptation: The School as a Socio-Spatial Assemblage." *Journal of Architecture*, 2014 19(1), pp.43-63 (21).

Different versions of these arrangements may appear in the same school, for example figure 2 below shows a finger plan form with different cluster arrangements.

**Figure 2: Different clusters can appear in the same school building**
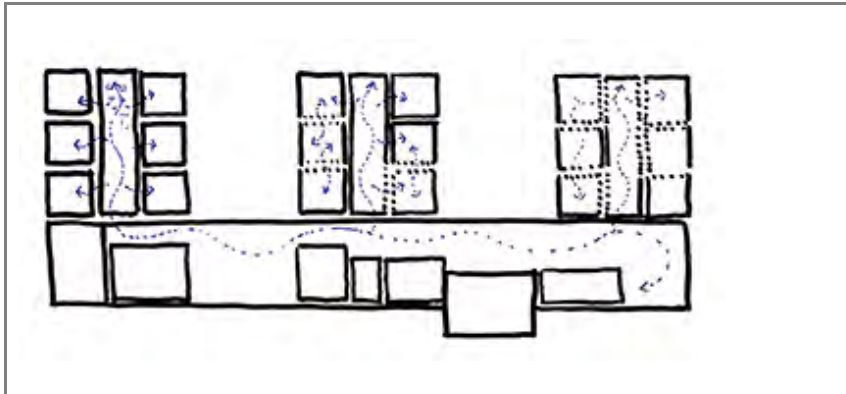


## Flexibility

One reason for the evolution of space types is the changing approach to teaching and learning that has developed from a better understanding of how students learn. The greater focus on different approaches to learning, from whole group presentation to individual work, requires spaces that can accommodate this variety but that can also be reconfigured during the day.

Flexibility of school buildings has become important because of the recognition that a building should be able to respond to user needs as they change over time. Three arguments often underpin the need for flexibility. First, a building constructed to meet a limited set of demands may well be liable to early obsolescence; second, spatial efficiency – it is more efficient to use the same space for different activities than have several different spaces used infrequently; third, the size and arrangement of spaces may need frequent adaptation to suit variations in, for example, sizes of student groups. Not only is education subject to continuous change, whether driven by government policy, technology or pedagogical approaches, but also the needs of students and teachers can change from day to day. The less flexible a building is, the more it will constrain how people can use it.

There is no single definition of flexibility with an agreed meaning. However, a useful way of considering this is to consider how a building should respond over three different time horizons, the long term, the medium term and the short term. Taking these time-horizons into account, there are three broad ways in which a building can accommodate change:

- *Adaptability,* where the building is responsive to change over the long term. For example, it can be made larger to accommodate more students. This involves substantial changes to the fabric and possibly the structure of the building.

- *Adjustability,* where parts of the building can be reconfigured over the short to medium term by manipulating elements to create different spatial arrangements. For example, to make space larger, smaller, or a different shape.

- *Agility*, which refers to short-term flexibility where the settings, furniture and IT equipment can be rearranged quickly and easily. This relates to changing the use of the space and is the kind of change that individual users might be able to make themselves. An agile learning space is one that can respond to the needs of students and teachers quickly and, in particular, one where the furniture and technology such as projectors and display screens can be easily rearranged. The flexibility afforded by the furniture and ICT equipment is key to this, and so too is the general usability of the environment, which should ensure students and teachers can move openable or folding walls easily.

To evaluate the adaptability of the building would demand analysis of the structural design, which is beyond the scope of this review. From the point of view of this review the three particular aspects to consider are adjustability, agility and flexibility in use. To evaluate adjustability, we can look at the extent to which there are ways of reconfiguring the spaces, generally with the use of openable walls. Agility can be evaluated by considering the ease with which it is possible to rearrange the furniture, IT equipment and any openable walls. Flexibility in use refers to flexibility from a user perspective: How does the space, configuration of individual spaces and assembly of all of the spaces support different uses? This brings together aspects of adjustability and agility. A number of technical characteristics of space support flexibility and can be used as a basis for the analysis. They are summarised below:

## Summary of Technical Characteristics Supporting Flexibility

### Size of space

The space used for learning, or any other activity, has to allow not just for the people but also for their ability to move around the room, and must allow for space between people or groups of people, as well as any necessary supporting furniture. Accessibility by wheelchair not only means providing sufficient width of uninterrupted space, but also space for the wheelchair to turn and be pulled up to a table or desk. The space needed for people to walk around a room may be less.

The size of the space in terms of floor area determines how many people can use the space for any given activity or purpose. For example, in a space which is 10m x 6m, it may be possible to seat 50 people in lecture room style with no tables and allowing space at the front for the presenter, and at the back and sides for circulation. However, in the same space you might be able to seat 30 people seated at desks, again in rows facing the presenter. If group tables were needed, then the capacity would be still less, possibly 24.

Other factors which also impact on capacity include shape (discussed below), the amount of equipment in the room, and furniture that cannot be easily moved. How the furniture in the space can be laid out is determined by its shape and by the location of entry and exit points and how far people are from each other or from the teacher.
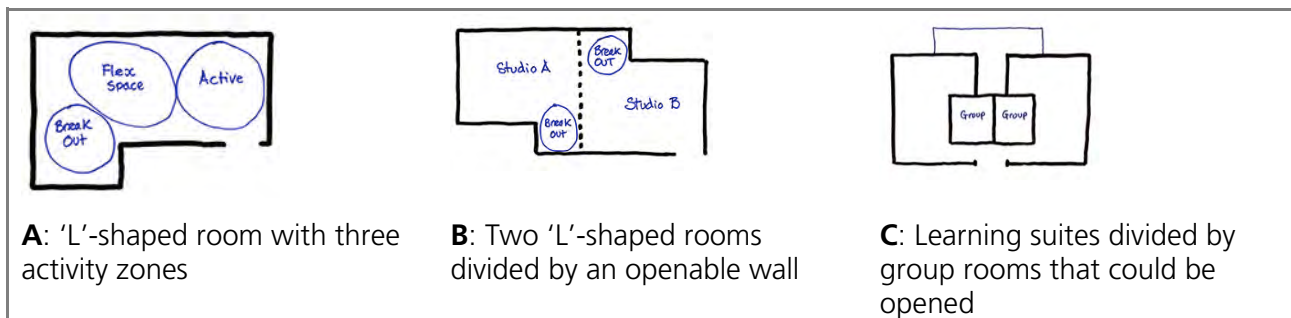
For specialist spaces such as science laboratories, the space allowance per student is often greater to allow for fixed furniture such as benches and sinks, but also enough space to conduct the specific investigative activities required by the curriculum.

### Shape of space

The shape of the space suggests how the space may be used for different arrangements and groupings of furniture. Conventionally, a rectangular shaped space is used, although irregular shapes such as trapezoids and circles and ovals can work with different furniture arrangements. Spaces with tight angles can be harder to use efficiently.

The shape of a space can suggest that there is an opportunity to create different zones. For example, an 'L'-shaped room lends itself to being arranged so that one activity can take place in one leg of the 'L' and another activity can take place in the other. This feature can be useful for zoning space, as, for example, in diagram 3. This may be a more useful feature for classrooms for younger students.

**Figure 3: Different options for arranging spaces to create a range of opportunities**



| | | |
|---|---|---|
| **A**: 'L'-shaped room with three activity zones | **B**: Two 'L'-shaped rooms divided by an openable wall | **C**: Learning suites divided by group rooms that could be opened |

A long thin shape might well reduce its usefulness as there are very long rows with longer distances between the presenter and the end of each row than might be the case in a squarer-shaped space. See diagram 4.

**Figure 4**
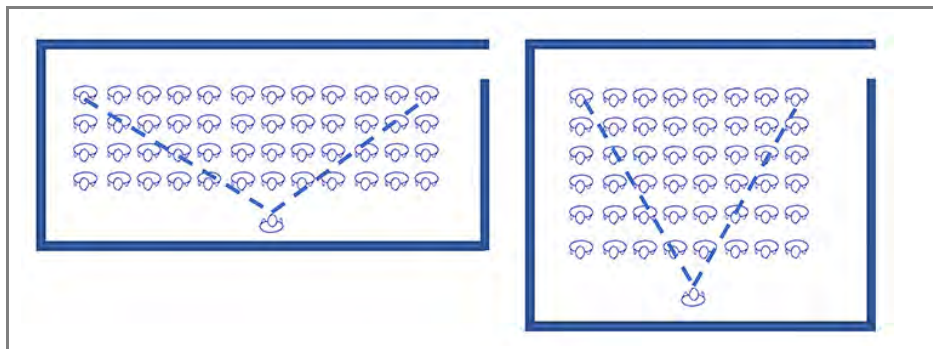


*Adjacency*

Spatial adjacency describes whether one space is next to another. It is often important to cluster certain spaces so that people can access them easily and quickly. It is also important to keep some separation between certain types of spaces, for example, keeping spaces with noisy activities away from those where there may be a need for quietness. Common clusters include small group rooms with a larger learning space to create variety and flexibility of use. Other ways in which spaces can be grouped are noted above.

*Interconnectivity*

Openable walls are the principal feature, and these enable different spaces to be joined or subdivided. Doors between spaces are more limited, but provide physical links. While openable walls are useful for reconfiguring spaces, users can find them difficult to move because they are heavy or awkward. Also, if poorly fitted and there are gaps at the top or bottom of the panels, then sound can travel easily between spaces; care is therefore needed to ensure that sliding partitions provide the level of sound quality needed.

*Furniture*

Although there is some discussion in research on the ergonomics of furniture, little linkage is drawn with student outcomes. Some research suggests that discomfort with seating was more likely to be raised at secondary level because the students are bigger (Nielson, 2004). Some argue that the ergonomics of furniture may be more important in spaces where students will be focusing for longer periods of time than in those areas where there is more casual use, such as cafeterias, or when students are more likely to be moving around, such as in art or science. Whether adjustable furniture is the

solution may depend on the extent to which students are expected to move around a space during a class and so have to keep readjusting the height of the chairs or tables.

Round tables facilitate conversation, but rectangular tables can be put together in different ways to create a larger surface for a different sized group.

Being able to move the furniture easily facilitates quick rearrangement of spaces to create different learning settings.

### White board and display screens

Given that common features of learning spaces are whiteboards and display screens connected to multi-media terminals, an issue that does arise is the extent to which these can be easily relocated in a space. If they are fixed in one position, for example mounted on a wall at one end of the room, then the focus of the space tends to remain fixed, whereas the teacher may want or need to change that focus during the lesson.

## Transparency

Another clear trend these days is that schools are designed with greater transparency throughout the building. This is often achieved by creating an open space, or using glazing between spaces in the form of fully or partially glazed walls. The arguments for this are that it creates a sense of connectedness whereby people feel more connected to the school as a whole and can be participants in education whether as observers or active players. However, there are arguably both advantages and disadvantages in increasing transparency, and little research to draw upon in the matter.

The benefits generally include the value of passive supervision, where it is argued that students working in groups outside the main classroom or learning space can be easily seen; a sense of openness while retaining acoustic separation that makes the culture of learning visible and increases the perceived connections of people to the school; and the opportunity to bring natural light further into the building. However, while some argue for the benefits of monitoring student activity others argue that greater transparency leads to students being distracted and that teachers and students lose some privacy and feel uncomfortable with being 'observed'[15] This would suggest that a balance needs to be struck to maximise the benefits of transparency but alleviate the disadvantages, whether by reducing the extent of fully glazed walls or by being very selective about where transparency is actually used.

People can feel more connected in the spatial environment when they can see what is happening around them, and can move easily from one place to another so they feel part of it. In schools, connectedness can be afforded by visibility across spaces, either because there are no solid walls or because there are glass walls; and it can also be afforded by how close the spaces people often use are to each other, and how easy it is to move from one space to another.

## Safety and security of learning environments

The comprehensive safety and security of learning environments can be divided into four different areas:

Physical security (secure spaces)
Psychological safety (cognition and emotion)
Social security (participation and interaction)
Pedagogical security (security education)

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[15] *The impact of physical design on learning spaces*, Ministry of education, New Zealand, 2016

*Physical security*

The prerequisites for holistic security are created in a safe physical growth and learning environment. The safety of the physical growth and learning environment includes an appropriate, safe and healthy environment as a whole: buildings, structural security and their technical systems, as well as immediate surroundings with outdoors and out-of-class shelters, traffic areas, sports areas and nearby parks and forests. A poorly constructed built environment can prevent security from happening. In addition, a physically safe learning environment includes physical integrity and non-violence of children and adults.

*Structural security*

The building must be functional and safe, primarily for its daily use, in which case the security needs must take into account the different needs of different user groups. In buildings with multiple services, the functional and safety needs of different user groups must be reconciled.

Safety also includes access to facilities for users whose levels of activity are impaired, for example, due to physical or sensory impairment. Consideration should also be given to the smaller size and differences in size of children and the limitations in the ability of the growing child and special need groups.

In addition, the environment must support safe operation in the event of an accident or disorder. It must be possible to exit or be protected from the building and be able to be rescued. From the point of view of the rescue service, the personal safety of fire situations, such as escape routes, fire detection and reporting equipment, fire compartmentation, smoke extraction efficiency, rescue and fire attack functionality, is emphasized. The most important issues relating to the safety of buildings in terms of police activity are the alarms, the locking, the sight protection and the marking of the premises.

By recognising the requirements of the operational activities of the rescue authorities and the police at a sufficiently early stage of planning, the best solutions for operations can be sought. The means here are, for example, the structure of the premises, the construction of facilities supporting security and desired behavioural patterns, and the locking, access control and security solutions.

*Transparency*

Openness, transparency, variability and flexibility are the prime requirements placed on school buildings of the future. Openness and transparency are part of the school's operations, instruction and daily work but they may also form the prerequisites for the physical environment of the school.

The aspect of transparency has several dimensions. The abundant use of glass walls and glazing in the school building help the users see the activities of the school, facilitate orientation and help create a strong sense of community. Transparency can also be used for surveillance and control purposes: glass windows can be used to monitor the spaces and the use of the facilities.

Some also see risks in the transparency of the school and in the abundant use of glass walls. Often, there is a fear of an external intruder threatening the people in a school with abundant use of glass, which makes it easier to find victims of violence. However, this can be solved by evacuation routes, interlocking spaces, and curtain solutions. Transparency benefits are therefore considered to be greater than the risks they generate.

*Features of a safe, healthy and accessible school building:*

- Facilities and dimensions appropriate to the operation (operational safety, circulation, flexibility, prevention of infectious diseases, maintenance of hygiene)
- Space arrangements that support positive encounters and sociability
- Indoor and courtyard control (facility features and technical control)
- Consideration of shared use and off-site use in safety planning
- Safety of outdoor spaces and furniture, as well as operating and play equipment
- Sufficiency of toilet facilities

- Ventilation, heat, sound environment, lighting and other indoor climate factors
- Hygiene and cleanliness of premises
- Structural safety of the building
- Safety and trouble-free operation of building technology
- Locking arrangements and access control and other compliant and operationally appropriate security technology
- Prevention and protection against interference, vandalism, violence and crime, as well as disruption (including safe evacuation and protection)
- Accessibility and ergonomics of premises and furniture
- Easy-to-see and understandable signs
- Security of digital devices and systems
- Work safety
- Chemicals are properly placed
- The building is equipped with initial fire-fighting equipment

### Psychological safety (cognitive and emotional)

Mental growth and learning environments can be thought of as being related to feelings of security or insecurity and cognition. Children, pupils and students have the right to grow in a psychologically safe environment. A psychologically safe environment enables the child and the pupil to express negative emotions as well as the ability to get reliable and safe adult help.

The starting point for a safety culture is a confidential and safe working atmosphere. Because security is also a feeling, the environment needs to be designed to support the individual's security experience. The environment to be implemented must promote the positive security experience of all users.

### Social Security (inclusion and interaction)

Social security includes issues of inclusion, participation and interaction. Everyone has a basic need to be part of the community. In early childhood education, schools, and colleges, it is up to the adult to ensure that every child, pupil and student can be part of a peer group.

### Pedagogical security (security education and safety know-how)

All children, pupils and students have the right to a secure growth and learning environment. The starting point for education is to ensure the safety of children, students, and staff in all situations.

Safety pedagogy builds on the growth and learning environment, the children and adults working in it, and their networks and activities.

Security expertise or know-how is part of the broad-based skills of all the levels of education. The aim is to direct the pupils' self-care and the building of everyday skills among others, so that the student understands that he or she is influencing his or her own well-being, health and safety. Pupils are encouraged to take care of themselves and to increase the well-being of others. Teaching should seek to ensure that students learn knowledge, skills, values and attitudes that promote well-being, health and safety.

### Skills related to security expertise include:

- Operations in different situations for the safety of yourself and others
- Moving safely in traffic
- Anticipating and operating incidents
- Identifying key security symbols
- Protecting privacy and personal boundaries
- Action as a consumer
- Responsible use of information and communication technologies

# Annex 3    Analytical Framework: Learning Environments

## The Manifesto 1+4

The *Manifesto: 1+4 Learning Spaces for a New Generation of Schools was* developed by INDIRE[16]. The 1+4" formula reflects on the capacity of spaces, in terms of spatial organisation, furnishing and technology to foster student-centric pedagogies and focuses on 5 main learning environments with different symbolic and functional values: "1" stands for the former classroom, now a modern learning environment (*Group space*) that is open to the rest of the school and to the world and "4" stands for the school's main types of spaces: *Agora, Individual Area, Informal Area, Exploration Lab*.

The purpose of the Manifesto is, where possible, to direct the policies and choices of local officials to inspire the projects of architects and to support the efforts of schools in their common desire to promote innovation through the configuration of a new, integrated and functional educational space that help to overcome the teacher-centred pedagogies in favour of active methodologies that encourage social interaction, collaboration, creativity and creative thinking.

The framework does not support a purely deterministic approach and needs a qualitative approach. It is not based on the assumption that there is a direct cause-effect relationship between the space and academic outcomes but rather that the elements linked to the teaching practices, the school organisation and the learning processes are complex and mainly affected by factors that cannot be considered in isolation but need to be studied through their reciprocal relationships, including the socio-economic backgrounds, the human factors and the pedagogical aspects.

INDIRE's approach to developing the Manifesto included the following steps:

- Desktop research: the analysis of existing theoretical references (including, among others, studies by Prakash Nair, Randall Fielding and David Thornburg for example)
- Analysis of the pedagogical architecture of some international schools of excellence
- Analysis of the innovative experiences of Italian Avant-garde Schools that have been working on innovative spaces for a long time (http://www.indire.it/en/progetto/avanguardie-educative/)
- Exchanges with other international contexts such as the EUN ICWG group and plans for innovation of the spaces promoted by political decision-makers

In the Manifesto, the "Group space" is the environment for daily education, a place where students have the equipment, the contents, and the furniture to carry out the various activities and be able to interact with others. It is here that the identity of the class group is built and it is here that the major part of the teacher's teaching activity takes place.

The layout of this environment must therefore allow for various possibilities such as:

- *Collaborating and working in groups*, with workstations usually arranged in islands, equipped with Internet access and tools for data acquisition and processing, where it is possible to interact, plan, process and analyse data.
- *Designing in a group and creating products* through the aid of creative tools and digital technologies, with instruments for jointly dramatizing, developing, assembling, and editing multimedia content.
- *Performing individual tests*, with workstations isolated in a way that favours the concentration of the individual and the carrying out of exams, tests, or other type of checks.
- *Presenting works*, whether individual or group, with tools for collective viewing or for the projection of multimedia content and sessions set up for optimal viewing.

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[16]    INDIRE (2016). *Manifesto delle architetture scolastiche.* Retrieved from http://www.indire.it/wp-content/uploads/2016/03/ARC-1602-Manifesto-Inglese_LOW.pdf

- *Discussing mutual problems*, with a setting that encourages the communicative dimension, moments of interaction and exchange, favouring problem-solving and the evolution of decisions (Borri, 2018, pp. 158-159)[17].

**Figure 1: The Manifesto 1+4**



The "*Exploration Lab*" is a space of discovery, a place designed for learning by doing, where students develop problem-solving skills, observe phenomena using suitable instruments, apply action strategies, analyse, and describe the outcomes of their experiments. Examples of this type are the 'maker' space, the disciplinary laboratories and other full-immersion environments.

The "*Agora*" is the area for the larger school community where seminars, presentations for large groups, and group lessons of teaching programmes are held. It is a more convenient and informal alternative compared to the traditional auditorium or classroom, with seats arranged frontally for group events. This space is characterised by a large broadcasting or interactive screen, a projector, able to read any digital medium; a solution can be foreseen with a single stand in amphitheatre shape, or with movable seats which can be re-arranged according to the type of presentation and audience size. The Agora can also be obtained from spaces generally designed for other prevalent purposes such as: the canteen, the school lobby and the stairs to the upper floors of the school.

The "*Individual Area*" is a 'personal area' suitable for informal learning methods in which skills that promote individual awareness and autonomous management of time are developed. It is an area with sheltered spaces, niches, private environments and dedicated spaces where any student can go to read, reflect, study and undertake personal programmes in a "protected" context. In this environment, the

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[17]   Borri. S., "1+4 Learning Spaces for a New Generation of Schools in Italy", in Borri, S. (2018) *The classroom has broken. Changing School Architecture in Europe and Across the World*. Cava de' Tirreni: Ediguida.

student can stay alone or with a tutor to perform activities that require particular facilities or a context able to favour focus.

The "Informal Area" is for relaxation, recreation, and leisurely meetings. Students can use these environments during the breaks between lessons and in their free time to reflect, read, listen to music, or simply relax. It can be considered as a separate environment or a group of facilities made available within the context of the other types of functional spaces, such as hallways, corridors or stairs.

The *Group space* and the *Exploration lab* qualified in the Manifesto "1 + 4" are the environments in which the activities proposed by the teacher to the pupils in their school time ("educational environment") are most frequently performed. The uniformity of the classroom in the traditional model loses its hierarchical hegemony and quasi-monopoly of school time and gives way to a variation of spaces differing in size and in furnishing that can be modulated according to need. The focus is on how the spaces are assembled to create relationship between them, i.e. opportunity to create different zones and arrange the settings in order to be used for different activities, also simultaneously: smaller spaces providing opportunities for small group work, individual work and quiet areas.

The evolution of space types for a more active approach to teaching and learning gives several alternative solutions to the traditional classroom setting and grouping. It is possible to identify two educational environments that maintain the classroom as the prevailing environment for daily teaching *(Classroom with internal areas*, *Flexible classroom*); two solutions that provide for an "exit" from the classroom that opens up so that it is not a fully enclosed space (*Plus classroom, Cluster classroom*) nor a totally open plan (*Educational landscape*).

*Classroom with internal areas*. The space is divided into stable functional areas for different types of activities (area dedicated to experiential education, one-to-many communication area, collaborative activity area, individual learning corner). The areas are used on the basis of the working method and the size of the working group.

*Flexible classroom*. The space has flexible furniture that can be rearranged quickly and easily according to the different activities to be carried out. These classrooms can also have physical elements to separate the spaces (libraries and mobile shelves, openable walls).

*Plus Classroom*. This is an extension of a conventional classroom with additional space and/or connected group rooms. This solution maintains a predominant teaching space but also has contiguous spaces for differentiated activities. Where possible these learning zones can be cut out in the corridors and circulation areas.

*Cluster classroom*. This is a combination of several classrooms, an associated didactic area, more functional areas, and independent socio-spatial units. This space organisation allows various solutions: spaces that provide a horizontal merger for the school year, spaces which provide a vertical merging with the setting up of real "Houses of Learning" or cluster departments where spaces are grouped under the same subject or disciplinary area (for example a humanistic, scientific, or expressive area). This space solution gives the possibility to form a "small school within the larger school organisation". This is particularly important for schools that are very large, with more than 600 pupils. Students gain a clear and manageable social orientation, without being limited to the small community of one class. The class community and "one's own place" are preserved. The Cluster also promotes closer cooperation between the members involved, it strengthens "inter class" activities, and provides opportunities for differentiation (Seydel, 2018)[18].

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[18]  Seydel, O. "Cluster - Open Learning Environment. Three Different Lines of Development to Redesign Schools in Germany", in Borri, S. (2018) *The classroom has broken. Changing School Architecture in Europe and Across the World*. Cava de' Tirreni: Ediguida.

*Open educational landscape:* This is a large open or partially open space, also organised with flexible furniture to create functional spaces and differentiated spaces. It can be freely structured, but it can also provide areas for specific functions. In this case, there is less of a connection between the space and the (traditional) group classroom, or between the space and the discipline (subject-specific classroom/laboratory) and the areas are used on the basis of the working method and the size of the working group (we could, for example, have an input area, an area for small groups, an area for silence).

**Figure 2: Learning Environments[19]**

CLASSROOM WITH INTERNAL AREAS   FLEXIBLE CLASSROOM   PLUS CLASSROOM

CLUSTER CLASSROOM   OPEN EDUCATIONAL LANDSCAPE
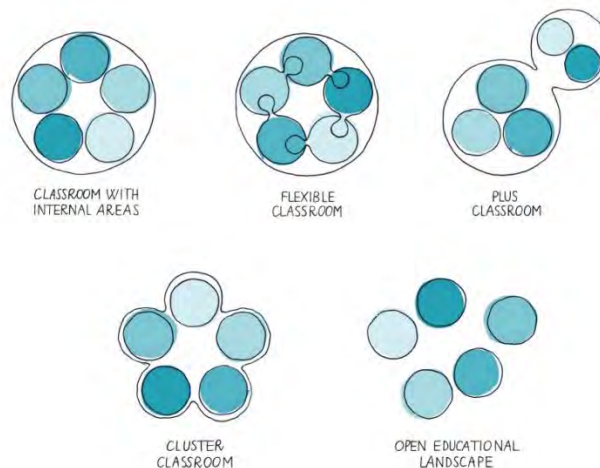
The flexibility of the learning environment, not only within the classroom space, but in the entire school building, is also one of the main orientations of the departmental model-Programme for the construction, reconstruction or renovation of colleges in Seine-Saint-Denis (*Programme-type départemental pour la construction, la reconstruction ou la rénovation des collèges de la Seine-Saint-Denis* 27/09/2016):

"The school building and its various elements will serve as support for the different moments in the life of the student, which, combined with each other, contribute to the primary vocation of the school: moments of concentration, moments of exchange, moments of reception of the information and knowledge, moments of creativity, socialisation, moments of conviviality and relaxation, ... All means will be sought to make the school building and equipment best suited to the transmission of knowledge and supervision of students: adaptability over time, modularity and versatility of teaching sites, ergonomics of space (natural lighting, acoustic comfort, thermal comfort, functionality), quality of technological equipment." (PFT Collèges, 2016 p.15)[20].

This way to conceive the school building or school physical learning environment goes deeper than just articulating the arrangement of spaces. It must take account of how space is used over time and recognise the interactions between teaching, the organisation of learning, content, leadership and the context of government education policy (Blyth, 2018)[21]. The organisation of the spaces is closely linked to a more generic organisational change and demands another way of designing educational activities.

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[19]  Graphic editing Pieraccini, G. in Tosi, L. (2019) *Fare didattica negli spazi flessibili. Progettare, organizzare e utilizzare gli ambienti di apprendimento della scuola*. Firenze. Giunti scuola, p 131

[20]  "L'infrastructure immobilière et ses différents éléments constituants serviront de support aux différents instants de la vie du collégien lesquels, conjugués entre eux, concourent à la vocation première du collège: instants de concentration, instants d'échange, instants de réception de l'information et des connaissances, instants de créativité, de socialisation, instants de convivialité et détente,...Tous les moyens seront recherchés afin de rendre l'infrastructure immobilière et les équipements les mieux adaptés à la transmission du savoir et à l'encadrement des collégiens: adaptabilité dans le temps, modularité et polyvalence des lieux d'enseignement, ergonomie des espaces (éclairage naturel, confort acoustique, confort thermique, fonctionnalité), qualité des équipements technologiques." (Département de la Seine-Saint-Denis, Programme fonctionnel type des collèges, (2016). p. 15).

[21]  Blyth, A. "Preface", Borri, S. (2018) *The classroom has broken. Changing School Architecture in Europe and Across the World,* Cava de' Tirreni: Ediguida.

The wide range of approaches that place students at the centre of the learning process, at the basis of the active learning, include several intersections between pedagogy, technology and architecture that open up before us a path of cultural change rather than a regulatory one. In this way, the role of particular importance is reserved for innovation processes that must be properly introduced, graded, and followed through (Tosi, 2018)[22].

The Manifesto 1+4 is complemented by a reflection on educational activities (didactic situations) that represents one of the tools for the analysis of the use of the learning environment.

By "didactic situation" (Mialaret, 1989[23], Brousseau, 2008[24]), we mean a set of relations and roles between one or more subjects who, to communicate, use the so-called "milieu", that is to say - all those physical objects, and cultural and social aspects that are part of the environment and that have a consequence on learning. The didactic situation is "the silent actor", the third element that together with the teacher and the student, contributes to the development of the didactic action (Cannella, 2019)[25].

The 14 types of didactic situation identified have been reworked on the basis of the 20 "learning modalities" identified by Prakash Nair and Randall Fielding (Nair, 2014):

1. Independent study
2. Online research
3. Play- and movement-based learning
4. Peer-to-peer tutoring
5. Mentoring learning
6. Small group collaboration
7. Internet based collaboration
8. Student- performances
9. Exhibition of works
10. Experience
11. Interaction with an expert
12. Discussion
13. Teacher lecture
14. Seminar

[22] Tosi. L., "Designing New Learning Scenarios", in Borri, S. (2018) The classroom has broken. Changing School Architecture in Europe and Across the World. Cava de' Tirreni: Ediguida.
[23] Mialaret, G. (1989), Introduzione alle scienze dell'educazione. Bari: Laterza.
[24] Brousseau, G. (2008) Ingegneria didattica e epistemologia della matematica. Bologna: Pitagora.
[25] Cannella, G. (2019.) "La mappatura delle situazioni e dei setting didattici" in Tosi, L., Fare didattica in spazi flessibili. Firenze: Giunti Scuola. and Across the World. Cava de' Tirreni: Ediguida.25 Mialaret, G. (1989), Introduzione alle scienze dell'educazione. Bari: Laterza.
[25] Brousseau, G. (2008) Ingegneria didattica e epistemologia della matematica. Bologna: Pitagora.
[25] Cannella, G. (2019.) "La mappatura delle situazioni e dei setting didattici" in Tosi, L., Fare didattica in spazi flessibili. Firenze: Giunti Scuola.

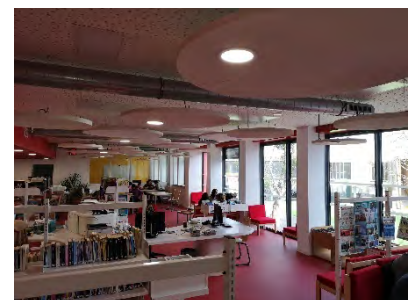# Annex 4    Technical Characteristics of the Schools Visited

## ❶ Collège Gustave Courbet Pierrefitte-sur-Seine

The building consists of four different wings, the oldest of which was built in 1974. The new wings and the renovation were completed in 2019. In the centre of the buildings there is a beautiful luminous sheltered courtyard used for recreation and also as a learning environment. The new and old building wings are almost seamlessly connected by a high space area. This space can be used for different kinds of exhibitions. The architecture of the school is clear and beautiful, and the spaces are luminous. In one of the building blocks there is a school dormitory that is not yet fully operational. In the dormitory there is also a multifunctional space, and spaces for recreation, studies and group work.

The learning spaces are arranged on either side of the central corridor; glazed panels are used in many parts of the interior of the building to enable the light to penetrate throughout the building. The overall impression is a visually light building where one gets a sense of the connection between spaces and the cosy, inviting school yard.

All classroom doors have one small window that provides visibility into the space: it is easy to see if the space is occupied. Acoustics are comfortable and soft. From each classroom there is a door to the adjacent classroom, which helps in emergency evacuation and also allows co-operative teaching. The size of the classrooms for general education is about 60 m². The facilities for special subjects (arts and crafts, home economics) are well equipped. The sports hall is large and allows versatile activities and simultaneous groups. The large and luminous centrally located library is the heart of school and allows individual and team work.

The building materials (such as natural finish wood) are warm and pleasant to touch, the furniture and equipment are ergonomic. The colours, both indoors and outdoors, are fresh and cheerful.
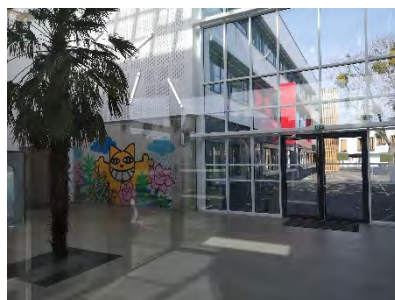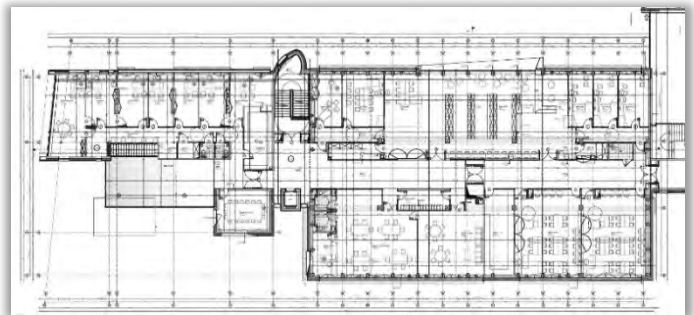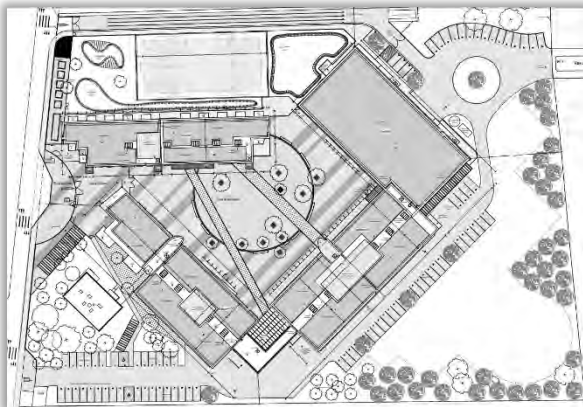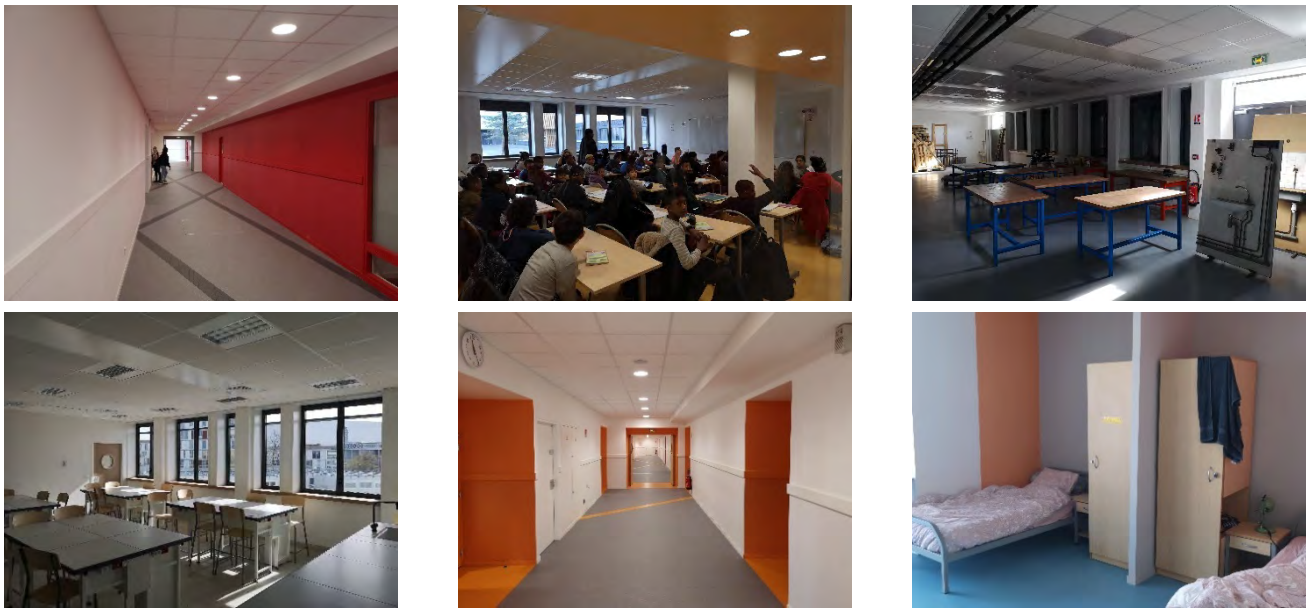
## 1. Technical characteristics of the main learning spaces

- **Size**: Classroom sizes range from about 30m² to 63m².
- **Shape**: Rectangular.
- **Adjacencies**: Classrooms are located on either side of the central corridor. Most classrooms have doors connecting to adjacent classrooms.
- **Interconnectivity**: Not a feature in this school.
- **Furniture**: Generally, the chairs are not adjustable but can be piled on the tables for cleaning. In the classrooms, rectangular shaped tables are mostly used and can be arranged in a variety of layouts for individual or group work.
- **Whiteboards / display screens**: Whiteboards/blackboards are fixed at the front of the classroom.
- **Transparency**: Some of the spaces have glazed panels, some have full-height glazing and some have only partly glazed doors (round windows). Large glazing in some interior walls adjacent to corridors (the library and some study rooms) enable light to penetrate into the interior.

## 2. Classrooms
The classrooms are in a row along a long corridor, where the lockers are located. The corridors are not furnished because of fire and evacuation regulations.

## 3. Library/commons
The library/commons area is situated on the first floor. It is a fully enclosed space with a glazed wall on one side and large windows overlooking the school yard. Bookshelves are arranged centrally in the space, with freestanding tables and chairs throughout the space. There are computer workstations for data search and individual or pair work.

## 4. Multi-function space
The dormitory has a multi-function space that can be used for performances and meetings. The dining hall is centrally located and may also be used for multipurpose functions after lunch hours.

## 5. Adjustability, Agility and Flexibility in use
Most of the learning spaces, i.e. classrooms, have fixed walls and there is therefore limited opportunity to adjust their size. The spaces themselves seem to be quite agile and the furniture can be easily rearranged. The flexibility in the use of the spaces, or the immediate choices that teachers and students may have for using different spaces or spatial configurations, is to some extent constrained by the fixed walls of the classrooms; however, the larger spaces, such as the multi-purpose spaces and library/commons, do offer some opportunities for flexibility.

# ❷ Collège Dora Maar in Saint-Denis/Saint-Ouen

The Collège Dora Maar is a new construction completed in 2014.

The plan of the Collège Dora Maar is, in principle, linear with classrooms on either side of a corridor running down the centre of the building. There is a slight twist in the main frame of the building. The ground floor is separated into three parts with the main entrance in the middle section. One section includes the school restaurant, kitchen and maintenance spaces. The central section includes the reception, toilets for students, offices, multimedia hall and other activity spaces for students. The third section includes a multi-function space, meeting and exhibition spaces and health care facilities. The classrooms and the administration are located on the two upper floors. The two-storey high library is located at one end of corridor offering a splendid view of the cityscape. The library has several rooms with glazed walls for group work and meetings. There is a separate sports hall on the plot.

The architecture of the building is ambitious. Natural light has been brought inside the building not only through facade windows but also through skylights and gaps between the floors. The use of material is experimentally courageous with lots of unpainted or unfinished wood in the facades. Much attention has been paid to the acoustics of the premises.
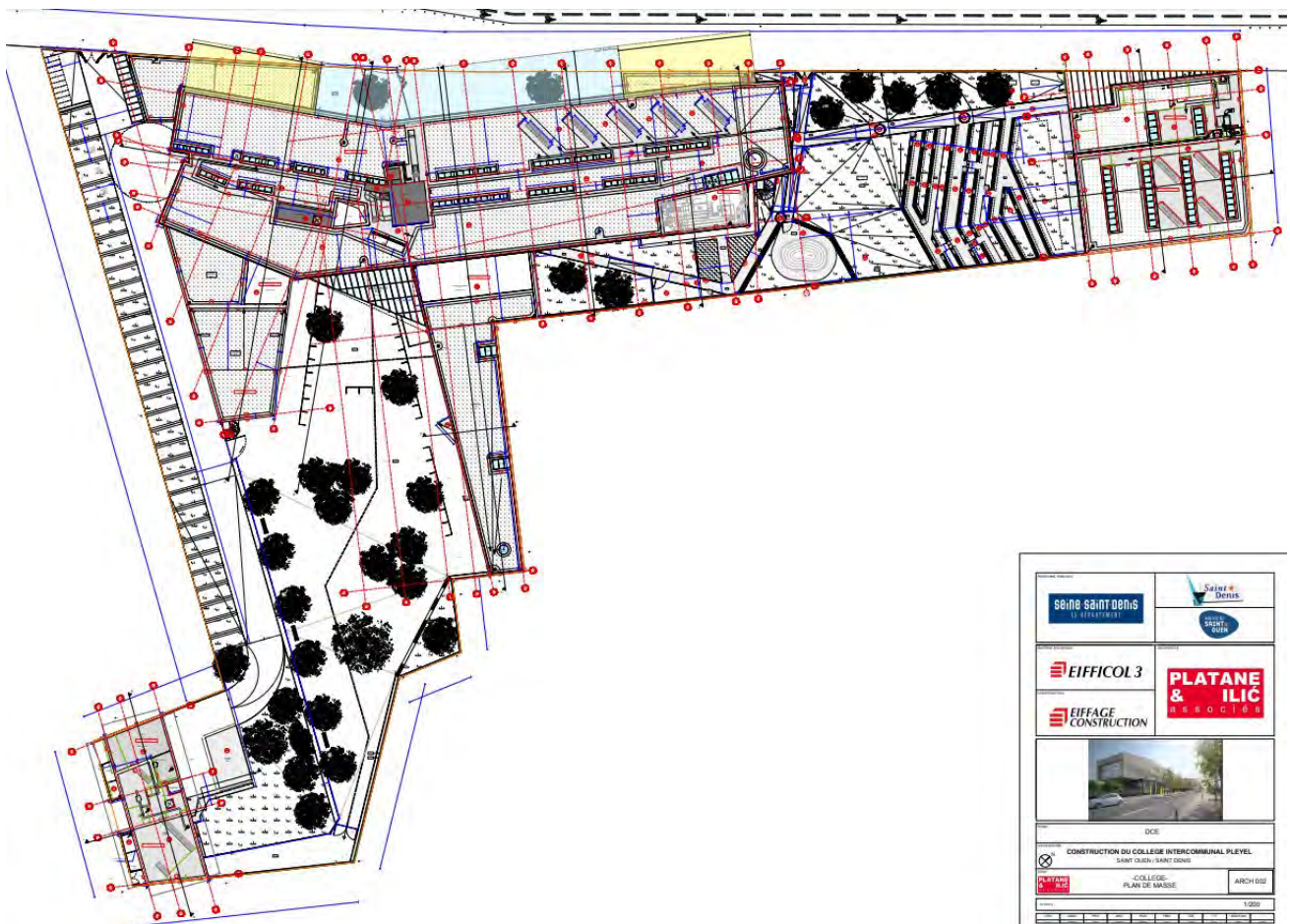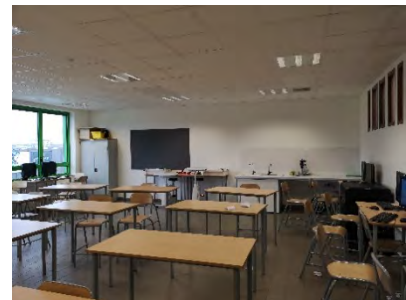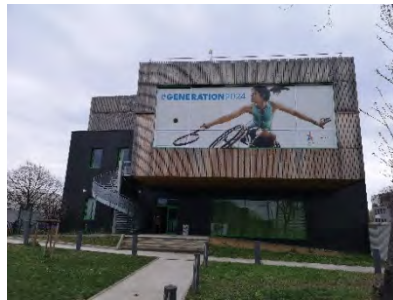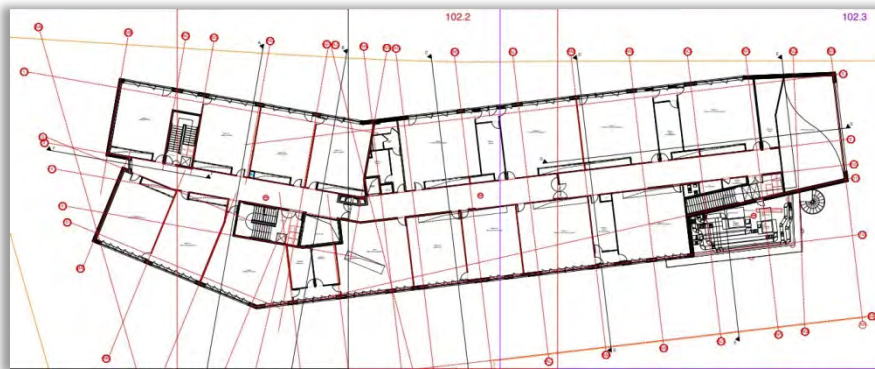
## 1. Technical characteristics of the main learning spaces

- **Size**: The classrooms are of very similar size.
- **Shape**: Rectangular or with a slight twist.
- **Adjacencies**: Classrooms in a row along a long corridor. Most classrooms have doors connecting to adjacent classrooms.
- **Glass walls**: At the top of the classroom walls there are windows giving onto the corridor but in most cases not at eye level.
- **Interconnectivity**: As noted above, classrooms are connected to each other and/or the corridor by an evacuation door.
- **Furniture**: Generally, the chairs are not adjustable but can be piled on the tables for cleaning. In the classrooms, rectangular shaped tables are mostly used and can be arranged in a variety of layouts for individual or group work. We observed some rooms particularly used for art with larger tables.
- **Whiteboards / display screens**: Whiteboards are fixed at the front of the classroom.

## 2. Classrooms

The classrooms are mostly of similar size and are linked to each other by an evacuation door so that the overall configurations of the rooms remain the same but enable connectivity between one and another.

## 3. Corridors

The corridors are not furnished because of fire and evacuation regulations.

### 4. Library/commons
The library/commons area is situated on the first floor. It is a fully enclosed space with a glazed wall on one side and large windows overlooking the city and the sports hall. Bookshelves are arranged centrally in the space, with freestanding tables and chairs throughout the space. There are computer workstations for data search and individual or pair work. The library has several adjacent rooms with glazed walls for group work and meetings.

### 5. Multi-function space
The multi-function space with its exhibition and meeting rooms is located on the ground floor in the third section of the building, a little separate from the other activities of the school. The same applies to the school restaurant which is on the opposite side in another section of the building. There is no interconnectivity between these two spaces.

### 6. Adjustability, Agility and Flexibility in use
Most of the learning spaces, i.e. classrooms, have fixed walls and therefore there is limited opportunity to adjust their size. The spaces themselves seem to be quite agile and the furniture can be easily rearranged. The flexibility in use of the spaces, or the immediate choices that teachers and students may have for using different spaces or spatial configurations, is to some extent constrained by the fixed walls of the classrooms; however, the larger spaces, such as the multi-purpose spaces and library/commons, do offer some opportunities for flexibility.

# ❸ Collège Germaine Tillion in Livry-Gargan

Construction of the Collège Germaine Tillion was completed in 2018. The plan of the school is in the shape of a twisted monobloc that is linked to a sports hall wing by an entrance shelter and an intimate schoolyard.

The entrance to the school is pleasant and inviting, the architecture gives a welcoming feeling with wooden facades and large windows. The school building has three floors. On the ground floor are located the administration spaces and the school restaurant which has a nice view over the schoolyard. The classrooms are located on the two upper floors along a central corridor. The school wing together with the sports hall encloses a well-dimensioned schoolyard which offers versatile possibilities for recreation activities and outdoor pedagogics: there also is a small garden for biology studies. On the plot there is also a small apartment building for staff.

The scale of the school and the use of natural materials are well suited for children. The learning spaces are built on both sides of the central corridor, glazed panels are used in many parts of the interior of the building to enable the light to penetrate throughout the building. The upmost floor is divided in smaller blocks with openings in-between, these openings are used for exhibitions of small works of art which gives a thoughtful impression. The overall impression is a visually light building where one gets a sense of the connection between spaces. All classroom doors have a small window that provides visibility into the space: it is easy to see if the space is occupied. Acoustics are comfortable and soft.

At the other end of the corridor on the second floor there is a large luminous library with a splendid view onto green spaces, the canal and trees.

In general, the classrooms range from 40m² to 60m², are rectangular in shape and open directly onto the corridors. There are some classrooms that are larger, such as for science classes. There appear to be no moveable partitions between the rooms or other spaces. The doors to the classrooms have full height vision panels allowing some view into the rooms.

The facade finishes are generally exposed wood, which gives the building a warm feel.
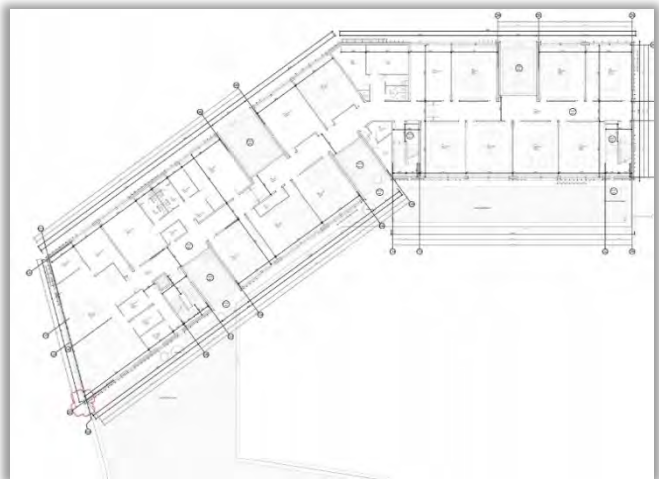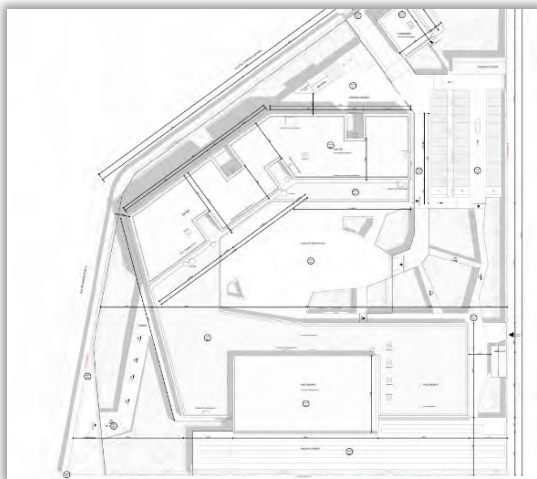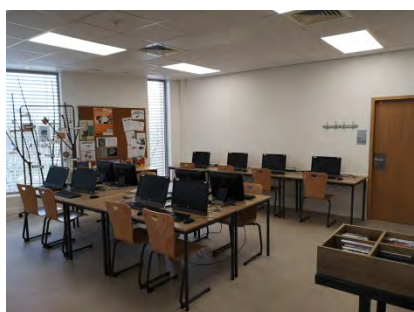
## 1. Technical characteristics of the main learning spaces
- **Size**: In general, classrooms range from 55m² to 60m². Special classrooms (science, music) are generally larger, up to 90m².
- **Shape**: Rectangular.
- **Adjacencies**: Classrooms off corridors.
- **Interconnectivity**: Openable walls are not a feature in this school, but some classrooms are connected by doors.
- **Furniture**: Generally, classrooms have no chairs on wheels. The desks are rectangular without wheels although they seemed light enough to be relatively easily movable. We observed some rooms particularly used for art with larger tables.
- **Whiteboards / display screens**: Whiteboards are fixed at the front of the classroom.
- **Glass walls**: There is usually a narrow high glass window next to the class door which makes it possible to see if the classroom is occupied or empty.

## 2. Classroom arrangement
The classrooms are arranged in a row along the corridor, which is not furnished because of evacuation reasons.

## 3. Library / Open commons
The library is a closed space at the other end of the corridor. It is a large luminous space with views in three directions. There are several adjacent rooms for group work and discussion.

## 4. Multi-purpose
The position of the multi-purpose space in the sports hall means that it is a little separate from the daily activities of the school. As a multi-use space within the sports hall it can be used in a variety of ways.

## 5. Adjustability, Agility and Flexibility in use
Most of the learning spaces, i.e. classrooms, have fixed walls and therefore there is limited opportunity to adjust their size.

## ❹ Collège Cesaria Evora in Montreuil

The construction of the Collège Cesaria Evora was completed in 2014. The building consists of three wings which all are connected to each other internally. The administration, classrooms and staff apartments are situated in a five-storey wing, and the school restaurant with the kitchen facilities and the sports hall in their own single-storey wings. The main entrance is located at the street-side end of the main wing. The ground-floor of this block includes mainly spaces for reception, some offices and a multi-function space. The three wings enclose an intimate tapered courtyard. The next floor is dominated by administrative spaces, but there also is the school library and some classrooms. The next two floors are occupied by classrooms and the upmost floor only apartments for key school staff. The central corridor widens in both directions, which makes it easier to exit through the stairs located at the ends.

The architecture of the building is colourful and playful, perhaps to the extent that some details are quite challenging for maintenance (window shades).
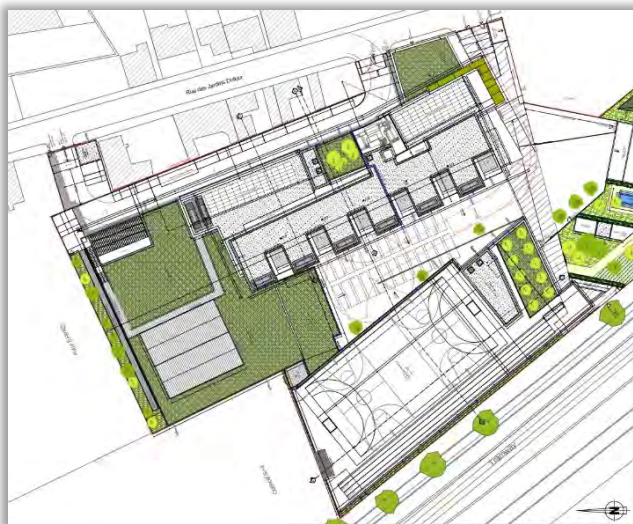
## 1. Technical characteristics of the main learning spaces

- **Size**: Classroom sizes generally range from about 55m² to 60m². Classrooms for special studies (science, arts) were larger.
- **Shape**: Rectangular.
- **Adjacencies**: Classrooms in a row along a long corridor. Most classrooms have doors connecting to adjacent classrooms.
- **Interconnectivity**: As noted above, openable walls are not a feature in this school, but most classrooms are connected by doors.
- **Furniture**: Generally, the chairs are not adjustable but can be piled on the tables for cleaning. In the classrooms, rectangular shaped tables are mostly used and can be arranged in a variety of layouts for individual or group work. We observed some rooms particularly used for art with larger tables.
- **Whiteboards/display screens**: Whiteboards are in a fixed position.
- **Transparency**: Glass walls are not a feature of the classrooms. The glazed doors and glass vision panels beside the doors give some sense of transparency and make the activities in the classroom visible from the corridors. As the glazed areas are relatively small they limit distraction and enable the classroom to maintain a degree of enclosure.

## 2. Commons/library

The library is a closed space at the other end of the corridor. It is a large luminous space with views in three directions. There are several adjacent rooms for group work and discussion.

## 3. Corridors

The corridors are not furnished because of fire and evacuation regulations.

## 4. Multi-function space

This rectangular multi-function space is linked to the large sports hall together with the exhibition hall and some meeting rooms available for use after or within the school hours.

## 5. Adjustability, agility and flexibility in use

Most of the learning spaces, i.e. classrooms, have fixed walls and therefore there is limited opportunity to adjust their size. The spaces themselves seem to be quite agile and the furniture can be easily rearranged. The flexibility in use of the spaces, or the immediate choices that teachers and students may have for using different spaces or spatial configurations, is to some extent constrained by the fixed walls of the classrooms; however, the larger spaces, such as the multi-purpose spaces and library/commons, do offer some opportunities for flexibility.

## ❺ Collège Pablo Neruda in Aulnay-sous-Bois

The building of the Collège Pablo Neruda was originally completed in 1972 and is undergoing renovation which partly is completed. The renovation includes renewing the ventilation system and other infrastructure improvements.

The main building is a four-storey building with a rectangular lay-out. The square shape of the building encloses the atrium courtyard. On the ground floor there is the teachers' staff room, offices, the school library and restaurant. On the upper floors, there are classrooms for general studies and special subjects (science, arts). The classrooms are arranged in a row on either side of central corridor.

On the plot there are four other buildings, of which some are still under renovation. One of the buildings includes premises for the administration and apartments for key school staff. Two buildings include facilities for handicraft studios.

The plan of the main building and the arrangement of the classrooms follow a conventional layout with classrooms along the corridors. The classrooms are rectangular without glazing to the corridor.

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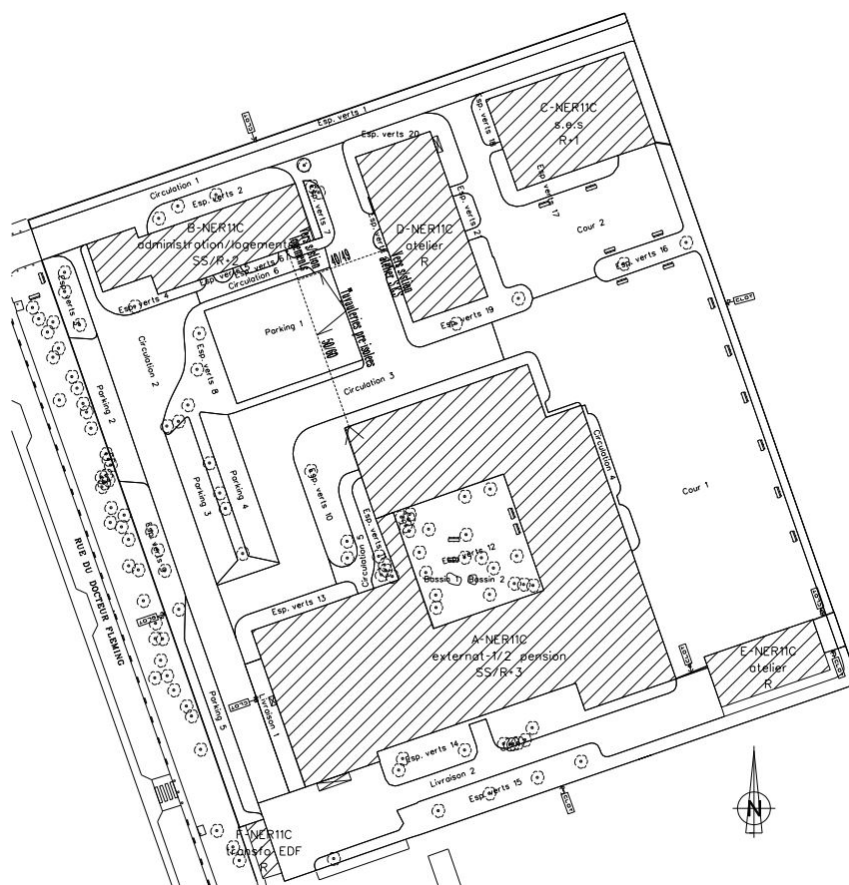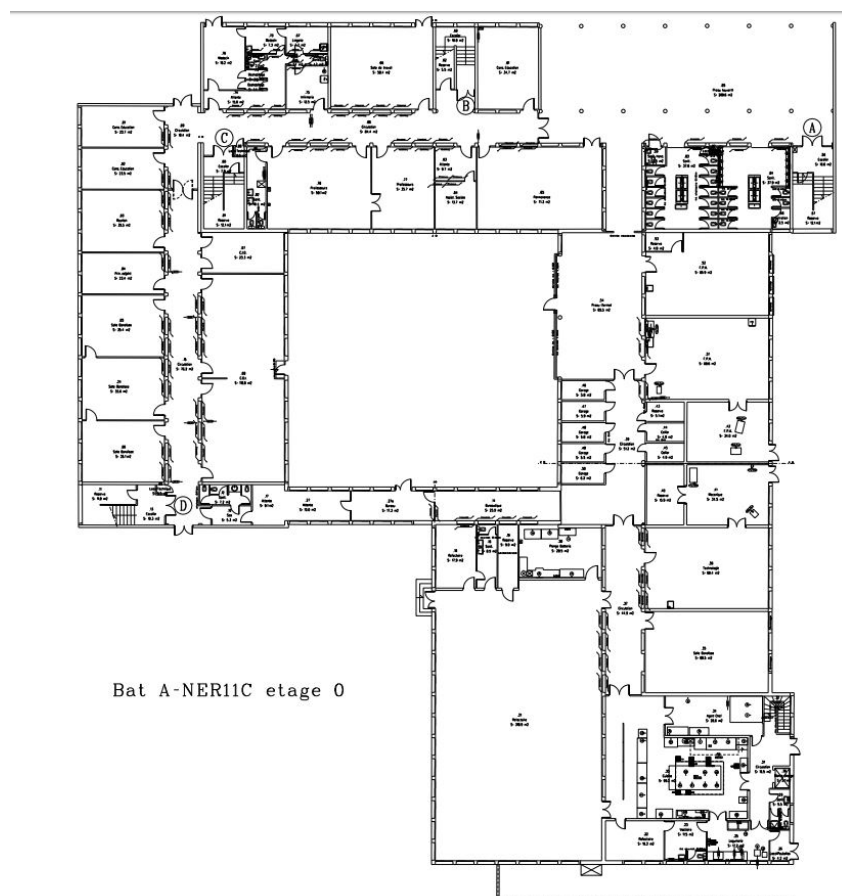
**Courtyard plan**
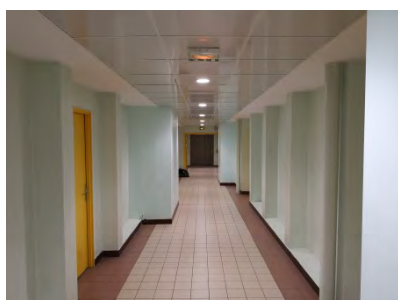


## 1. Technical characteristics of the main learning spaces

This summary focuses on the main learning spaces, the classrooms.

- **Size**: Typically, the rectangular classrooms accommodate 20 to 30 students. During the review visit, most were conventionally set out with desks arranged in rows facing the front.
- **Shape**: Rectangular.

- **Adjacencies**: Classrooms directly connected to the corridor. Science labs have a common preparation room.
- **Interconnectivity**: Not a feature in this school. Some classrooms are connected by a door.
- **Furniture**: Generally, the chairs are not adjustable but can be piled on the tables for cleaning. In the classrooms, rectangular shaped tables are mostly used and can be arranged in a variety of layouts for individual or group work. We observed some rooms particularly used for art with larger tables.
- **Whiteboards/display screens**: Whiteboard and display screens are fixed at the front of the classroom.
- **Transparency:** Glass walls are not a feature of the classrooms. The glazed doors and glass vision panels beside some doors give some sense of transparency and make the activities in the classroom visible from the corridor wall of classrooms.

## 2. Commons/library

The library is a closed space on the ground floor of the main building. There are several adjacent rooms for group work and discussion. While there are some bookshelves, the space generally has freestanding furniture with tables as well as more informal seating areas enabling students to work in groups or individually.

## 3. Corridors

The corridors are not furnished because of fire and evacuation regulations.

## 4. Multi-function space

The canteen area on the ground floor is in fact a multi-function space which can be used in a range of ways.

## 5. Adjustability

In terms of adjustability, the school is relatively constrained by the existing plan layout and there is little opportunity to reconfigure the spaces quickly or easily.

## 6. Agility

The spaces themselves seem to be quite agile and the furniture can be easily rearranged.

## 7. Flexibility in use

Flexibility in use, or the immediate choices that teachers and students may have to use different spaces or spatial configurations, is constrained by the difficulty in adjusting spaces and the fact that the main teaching spaces are located off the corridors, with a few small spaces or areas where students can work outside the classrooms.

# Annex 5    Makerspace and Future Classroom Lab

*Makerspace* is a constructivist and constructionist movement that could represent an opportunity to collaborate with community stakeholders and encourage the use of common spaces.

A makerspace is a collaborative work space inside a school, library or separate public/private facility for making, learning, exploring and sharing that uses high tech to no tech tools. These spaces are open to students, adults, and entrepreneurs and have a variety of maker equipment including 3D printers, laser cutters, soldering irons and even sewing machines. However, makerspace does not need to include all of these machines, or even any of them, to be considered a makerspace. Cardboard, Lego bricks and art supplies are sufficient. It's more of the maker mindset of creating something out of nothing and exploring your own interests that is at the core of a makerspace. These spaces also help to prepare those who need the critical 21ˢᵗ century skills in the fields of science, technology, engineering and maths (STEM). They provide hands-on learning, help with critical thinking skills and even boost self-confidence. Some of the skills that are learned in a makerspace pertain to electronics, 3D printing, 3D modelling, coding, robotics and even woodworking, Makerspaces also foster entrepreneurship and are utilised as incubators and accelerators for business start-ups.

The "making" in the education represents innovative learning using modern technology, real world design principles, and creative, hands-on experience[26]. The principles underlying the maker movement and which are recognisable in the activities that take place within a Makerspace are as follows[27]:

- create the context that develops a positive approach to a given problem and which encourages students to believe that they can learn to do anything;

- identify, develop and share a wide variety of projects, based on a wide range of tools and materials that are linked to the interests of students both inside and outside the school;

- foster the development of a philosophy based on collaboration between students, teachers and the community;

- develop educational contexts that link the practice of doing with formal concepts and theories, to support discovery and exploration, introducing new design tools and new ways of thinking about the creation of objects;

- promote in every student the full capacity, creativity and trust to become agents of change in their personal life and in their own community.

These spaces can also arise from collaboration between the school and a local association, a modality that often guarantees its success and represents a cost-saving strategy. Highly specialised equipment goes quickly out of date and teaching staff will not be able to effectively teach the use of equipment without extensive and expensive training.

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[26] Libow Martinez, S., Stager, G. S. (2019). *Invent To Learn: Making, Tinkering, and Engineering in the Classroom (second edition):* Constructing Modern Knowledge Press. See also: http://cmkpress.com/

[27] M*akerspace Playbook School Edition*, (2013) Retrieved from: https://makered.org/wp-content/uploads/2014/09/Makerspace-Playbook-Feb-2013.pdf

*The Future Classroom Lab (FCL).* The FCL represents an example of better use of the available "shared" spaces. Created in 2012 by European Schoolnet, it is an inspirational learning environment in Brussels originally designed to introduce different stakeholders to new teaching and learning approaches that incorporate innovative use of ICTs and challenges them to rethink their current pedagogical practice within a flexible and reconfigurable space. Through six learning zones, visitors can explore the essential elements in delivering 21st century learning: students' and teachers' skills and roles, learning styles, learning environment design, current and emerging technology, and societal trends affecting education[28].

The FCL represents another example of better use of the available "shared" spaces. In the European context they have several aims: (i) to host innovative learning and learning activities that incorporate new visions on pedagogy, 21st century skills and technology-enhanced learning; (ii) they are places both to promote student learning activities and teacher professional development, including meetings and discussions about education, (iii) they involve and connect different stakeholders, creating a dialogue between teachers, school leaders, policy-makers, commercial partners, students, parents etc.; (iv) they help to develop an open culture. For example, teachers can observe each other's lessons and provide mentoring; students can use the learning lab to take part in extra-curricular projects. A learning lab can be an inspirational lighthouse for innovation in teaching and learning outside the boundaries of the official programmes.

European Schoolnet FCL is not a prescriptive "blueprint": labs must not to be identical. On the contrary, such spaces must be adapted to the local context and local needs[29].

The FCL can represent a first step in a more comprehensive change management process that will require teachers and school leaders to adapt classrooms and other potential learning spaces throughout the whole school.

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28  Future Classroom Lab by European Schoolnet: http://fcl.eun.org
29  Ayre, J., "The European Schoolnet Future Classroom Lab (FCL)" in Borri, S. (2018) *The classroom has broken. Changing School Architecture in Europe and Across the World.* Cava de' Tirreni: Ediguida.

# Annex 6    Schedule of Meetings

### Monday 11 March

Morning        9h30: Meeting in Bobigny, Seine-Saint-Denis
              Technical and Education presentations by the respective Directorates
              Direction de l'Éducation et de la Jeunesse
              Bâtiment Européen 2

Lunch          With officials at their premises
Afternoon      Continued Meetings in Bobigny, Seine-Saint-Denis

### Tuesday 12 March

Morning        9h30: School visit - Collège Gustave Courbet Pierrefitte-sur-Seine

Lunch          At school - Collège Gustave Courbet
Afternoon      14h00 - School visit - Collège Dora Maar in Saint-Denis/Saint-Ouen

### Wednesday 13 March

Morning        9h30: School visit - Collège Germaine Tillion in Livry-Gargan

### Thursday 14 March

Morning        9h30: School Visit - Collège Cesaria Evora in Montreuil

Lunch          At school: Collège Cesaria Evora
Afternoon      14h00: School visit - Collège Pablo Neruda in Aulnay-sous-Bois

### Friday 15 March

Afternoon      14h00: Presentation - key findings
              Bobigny, Seine-Saint-Denis