



A NEW PARADIGM FOR LEARNING ENVIRONMENT

SCHOOL OF ARCHITECTURE & DESIGN FOR CHILDREN

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ABSTRACT

The majority of people in Hong Kong do not concern with the built environment due to the celebration of materialism and poor education system. Arts education has never been considered as a core subject by students, parents, teachers and the society. Worse still, there is no architecture and design training in primary school and limited coverage in secondary school. Lack of architecture and design training has resulted in lack of creativity, critical thinking skill, aestheticism, and awareness of our own living environment.

On the contrary, Finland leads the world in their education system and lately has devoted to developing an ideal learning environment. As an architect, I may not be able to change the education policy or curriculum, but I believe that architecture can act as a pedagogical tool to arouse the users' consciousness of spatial quality. This thesis aims to develop a paradigm of school that exemplifies the Finnish learning environment. Same as the learning of music or other art forms, it is better to start architecture and design education from early childhood. Thus this project attempts to design a school of architecture and design for children from the age of 6 to 18.

Educators and architects have been reviewing education system and learning environment for decades. On the basis of these studies, I will discuss what kinds of school environment can contribute to children's creativity and overall performance. Besides, environmental psychology, which is another important factor that affects learning outcomes, will be discussed. As a case study, Arkki - the school of architecture for children and youth in Helsinki was interviewed. The experience of Pihla Meskanen, the director of Arkki, on building learning environment for architecture training was shared; classes were visited to observe how children interact with space.

In addition, I will study the holistic solutions in the newly built schools in Finland. As Finland is seeking new visions of learning environment in future, competitions and ongoing future school projects will be analyzed to investigate the innovative approaches.

The above studies and researches are the grounds and framework to develop an effective learning environment in the urban context in Hong Kong. Mark Dudek stated that, "New learning environments should reflect the studios aspirations of pupils and teachers."^[1] My goal is to invent an inspiring space which is able to stimulate children's imagination, provoke personal identity and influence the young generations to appreciate the beauty of surroundings, respect the living environment and be responsible to preserve it.

1 DUDEK, M. (2000) *Architecture of Schools: The new learning environments*. Oxford: Architectural Press. p.xv.

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*"I never teach my pupils, I only attempt to provide
the conditions in which they can learn."*

- Albert Einstein

01 BACKGROUND

1.1 Deficiencies in the Hong Kong Education System

Social Value and Education Curriculum

Hong Kong is a materialist society where people merely concern with profitability. Education should develop children’s knowledge, moral, communication skill, and aestheticism, but our education system failed to achieve all of these. People do not care about sense of beauty and our living environment because they cannot be quantified. With regard to the built environment, city planners and developers ignore spatial quality. Their goal is maximizing the profit and meanwhile this is making our city worse.

Under the guideline of The Education Bureau, students in primary school are entitled to 10%-15% of total class time for arts lesson and this is reduced to 8%-10% between secondary 1 and secondary 3.^[1] Arts education is an elective subject in senior secondary school.^[2] Furthermore, except in the tertiary education, there is no architectural training for children and youth. Though there is a little coverage of architecture in the curriculum of visual arts in secondary school, it is an optional choice determined by teaching resources. Lacking architecture training, children pay no attention to their surrounding and are not able to appreciate it.

Learning Attitude

Same as many other countries, Hong Kong students suffer from a highly competitive education system. They start to compete with one another from infancy. The toddlers are sent to different after-school classes everyday not for their interests but for lengthening the “experiences” in their “resume” and “portfolio”. It is absurd that a 3-year-old kid needs a portfolio to get into a top-ranking kindergarten. They have to go through fierce competitions once every few years during the transition from primary school to secondary school and to university.

Under these circumstances, parents and teachers inevitably impose a lot of pressure on the children. Children are expected to spend most of their time to study for score. Their potential and interests are neglected, and their playtime is deprived. This distorted value of education is implanted in their minds and will probably be transferred to the next generations.

1 CURRICULUM DEVELOPMENT COUNCIL. (2002) *Arts Education: Key Learning Area Curriculum Guide (P1-S3)*. [Online] p.12. Available from: http://www.edb.gov.hk/attachment/en/curriculum-development/kla/arts-edu/references/con_eng.pdf. [Accessed: 5th March 2015].

2 CURRICULUM DEVELOPMENT COUNCIL. (2014) *Visual Arts Curriculum and Assessment Guide (Secondary 4-6)*. [Online] p.19. Available from: http://www.edb.gov.hk/attachment/en/curriculum-development/kla/arts-edu/references/VA%20C&A%20Guide_updated_e.pdf. [Accessed: 5th March 2015].

Learning Environment

In post-war Hong Kong, demand for school increased rapidly because of the rise of birth rate and immigrants from China. Government started to build public schools in each district. Standard “modelled school” has been existing since 1950s. Facilities and layouts were fixed, while playground and recreational space were limited. They fulfilled only the minimum needs without soul.

School design has been evolving, and the concept of “modelled school” has declined since the millennium. Nowadays schools enjoy more freedom in designing the campus regarding to the site context and the schools’ missions. However, when I studied the layouts of current schools, the changes are not satisfactory. There is little improvement in the public area such as green space and interactive atrium, but learning spaces are still as conventional as half a century ago. The classrooms are closed rectangular boxes that connect to nowhere, while corridors serve solely for circulation. Apart from the playground, most of the spaces are not appealing for social interaction.

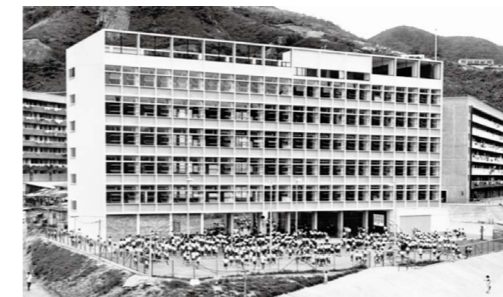


Figure 1.1.1 Government primary school in 1962



Figure 1.1.2 Standard primary school

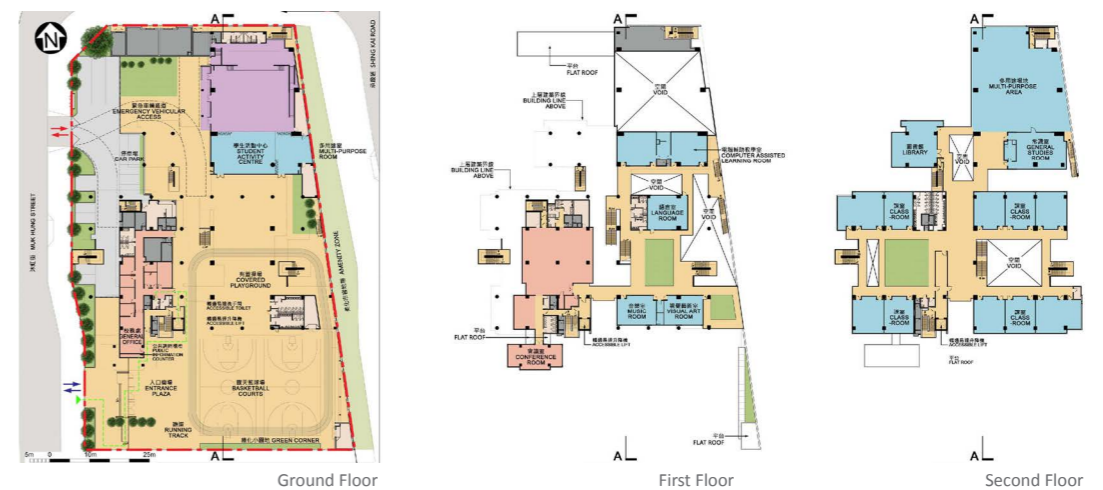


Figure 1.1.3 Floor plans of a primary school in 2015

1.2 Education System in Finland

Missions and Education Framework

The objective of Finnish Education is **providing equal opportunities for all citizens to high-quality education and training**. Every child in Finland should enjoy equal opportunity in education, regardless of family background, income or geographic location. Every individual's potential should be developed. Meanwhile, Finland promotes equality at the comprehensive school level. It puts effort to reduce differences between schools, so that there is almost no competition and pressure for kids and parents to select schools.

Education is free at all levels from pre-primary to higher education to ensure everyone has opportunity to study. In pre-primary and basic education, textbooks, daily meals and transportation for students who live far away from the school are free. The meal in higher education is subsidized by the state.

Education is compulsory from pre-primary stage at the age of 6. It prepares the children with basic skills and knowledge in the year preceding the start of basic education. Then every child will have 9 years of basic education from 7 to 16 years old. Basic education provides an opportunity for diversified growth, learning, and the development of a healthy sense of self-esteem, so that the pupils can obtain the knowledge and skills they need in life, and for further study. After completing the compulsory education, students are eligible to continue for general or vocational upper secondary education which is designed for 3 years. Students can opt for higher education provided either by universities or polytechnics if they pass the matriculation examination and entrance tests.

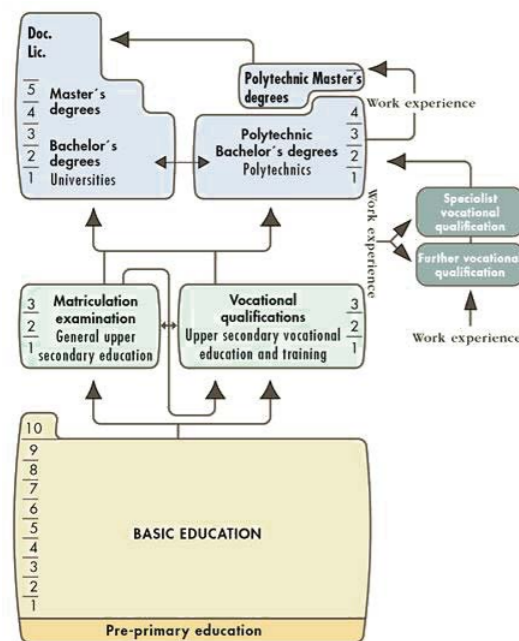


Figure 1.2.1 Education System in Finland

Learning is more important than testing, therefore there are no national tests in basic education. Instead, teachers are responsible for the assessment. The assessment is continuous during the course of studies, and it guides students in their learning process. The only national examination is held at the end of general upper secondary education.

In Finland, it is highly competitive to become a teacher and their quality is guaranteed. Only 10% of applicants will be admitted for the teacher education. Teachers are required to hold at least a Master's degree in basic and general upper secondary education. Teachers at polytechnics are required to have either a Master's or a post-graduate Licentiate's degree, and they must also complete pedagogical studies. University teachers are generally required to hold a Doctoral or other postgraduate degree. Besides, at most levels of education, teachers are required to participate in in-service training every year.

Current Reforms

The Finnish National Board of Education will launch a radical change on the new core curriculum for basic education in August 2016. The new curriculum is based on the learning conception that positive emotional experiences, collaborative working and interaction as well as creative activity enhance learning.

The content of each subject has been reduced, and the focus is on transversal competences and work across school subjects. The reform emphasizes on multi-disciplinary, phenomenon-based and project-based studies where several teachers may work with any given number of students simultaneously. For instance, pupils will be given a lesson about European Union, blending aspects of history, economics, language and geography. All schools have to provide at least one such learning module per school year for all students. Moreover, students will be involved in the planning process of these studies so that they can choose the topics they are interested in.

Arts and Architecture Education

Creativity, talent of different kinds and innovativeness should be built from early childhood, thus arts education is promoted via general education and leisure activity in Finland. In the core curriculum for basic education, arts subjects include music, visual arts and crafts. The allocation of lesson hours to arts in Finland is the second highest among 28 OECD countries according to the research done by OECD in 2010.^[1]

The core contents of visual arts include environmental aesthetics, architecture and design. They cover the whole range of built environment from single items and buildings to larger environmental entities. The course emphasizes the relationship and interaction between people, nature and built environment. Students are able to learn about building heritage and evaluate various environments from the aesthetic, ethical, ecological and planning perspectives. They have opportunities to examine, design and make objects, make environmental plans and construct miniature models. It aims to teach the children to respect and preserve the environment and its cultural and aesthetic values.

Apart from the formal arts education at school, there are several local architecture schools for children and youth such as Arkki in Helsinki and Lastu in Lapinlahti. They provide basic architecture education as after-school activities. The Finnish Association of Architects, The Museum of Finnish Architecture and Alvar Aalto Museum also take the role to promote architecture to both adults and kids.

¹ WINNER, E., GOLDSTEIN T. & VINCENT-LANCRIN S. (2013) *Art for Art's Sake? The Impact of Arts Education*. [Online] p.28. Available from: http://www.keepeek.com/Digital-Asset-Management/oecd/education/art-for-art-sake_9789264180789-en#page1. [Accessed: 5th March 2015].

1.3 The Benefits of Arts Education

Arts are Essential

Plenty of researches showed that arts education is an element for academic achievement. It improves math, reading, cognitive ability, critical thinking, verbal skill, motivation, concentration, confidence and teamwork. Charles Fowler¹ explicated that arts are important in comprehensive education because they can serve as a tool to facilitate other subjects' learning and ensure the student's engagement in the learning process. For instance, arts complement the sciences. Arts never teach you an absolute answer, while people are required to think and find out their own interpretation. Thus arts train up the abilities of critical thinking, analysis and judgement.

On the other hand, arts enhance people's insight and wisdom. They teach you to understand the world in humane way and being empathetic. It is also a vehicle to communicate with people across cultures and through the ages. One of the most important contributions is the cultivation of people's emotional and spiritual well-being. For instance, religious architectures, paintings, sculptures and musics are most people's spiritual salvation.

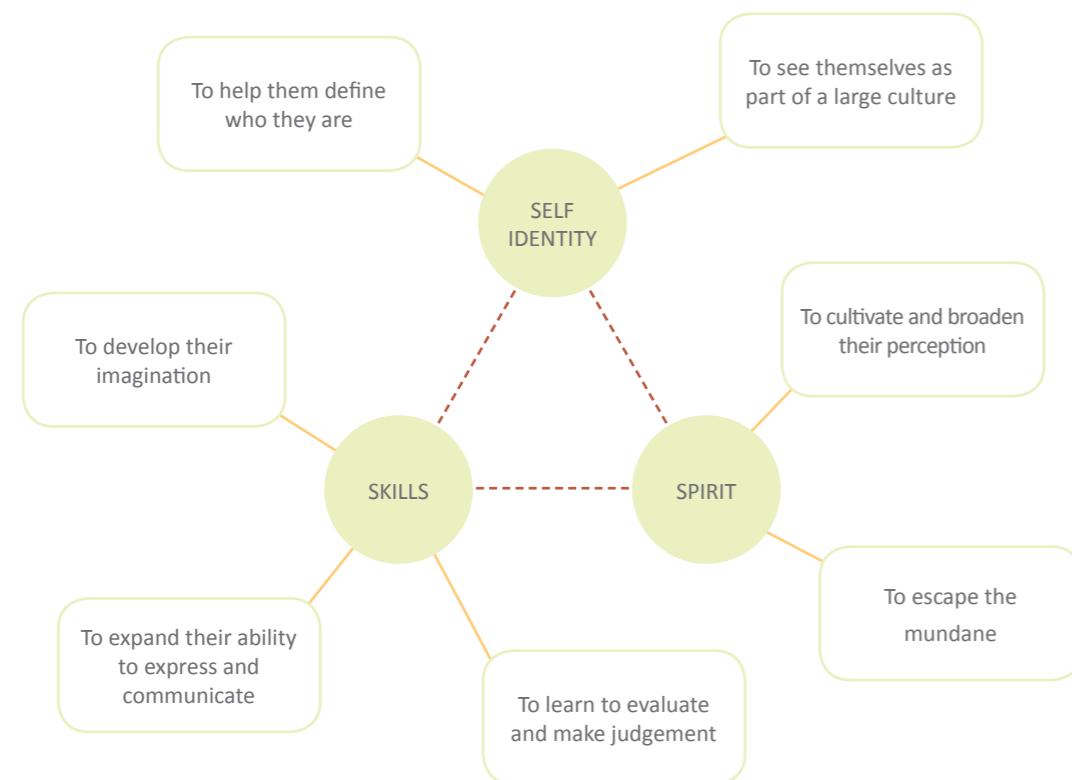


Figure 1.3.1 Reasons that child needs the arts

1 FOWLER, C. (1996) *Strong arts, strong schools: the promising potential and shortsighted disregard of the arts in American schooling*. New York: Oxford University Press. p.46-66.

The Role of Doing Arts in Classroom

School is a place providing opportunity for children to experience arts. Students should be encouraged to "make", "design" and "appreciate". As discussed before, arts can enhance their knowledge, perception, communication skill, abilities of problem solving, etc. In addition, for the pupils who are less academically inclined or with learning difficulties, art is an alternative for them to find success and confidence. Doing art works may induce their abilities or potential in other domain. There are lots of stories about genius in certain arts realm who is less capable of handling mainstream subjects.

Arts education can cultivate children in developing creativity and aestheticism. Therefore, in daily life, they are able to select furniture and furnishings, design and decorate their home with aesthetic sense, or even simply choose or make a pleasant greeting card. To develop the aesthetic understanding is not only for their own fulfillment; it is also beneficial to the society. How the city looks reflects how the children were educated. The experience the children gained will eventually evolve into a kind of responsibility to the society. Whether they become politicians, city planners, company directors, architects, designers or whatever professions, we can expect positive impacts on environmental quality in the future.

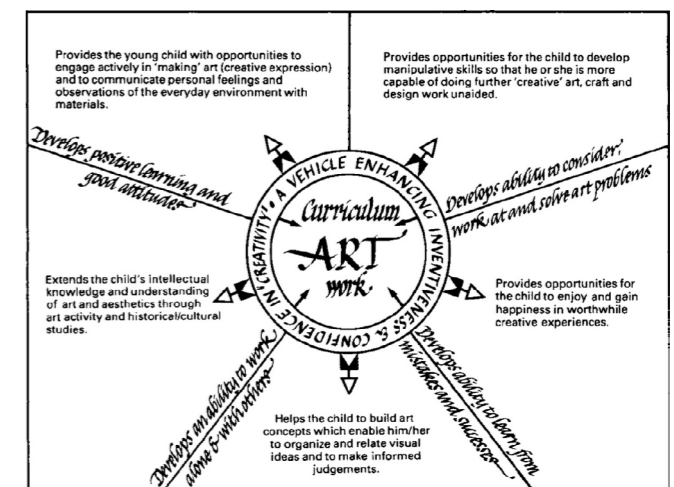


Figure 1.3.2 Curriculum art work increases a child's aesthetic understanding and capabilities

"The arts humanize the curriculum while affirming the interconnectedness of all forms of knowing. They are a powerful means to improve general education."

- Charles Fowler, *Strong arts, strong schools*

1.4 Aim and Objective

***“Develop A Paradigm of School
that
Exemplifies
Finnish Learning Environment.”***

As an architect, I may not be able to change the education policy or curriculum, but I believed that architecture can act as a pedagogical instrument to improve learning results and arouse consciousness of spatial quality. Barrett, Zhang, Moffatt and Kobbacy^[1] explored the impacts of school building design on the learning progression of pupils. The result showed that a quality learning environment scaled at a 25% contribution on average. Nuikkinen^[2] also emphasized that to experience the environment with all senses and the body has significant effect in the subconsciousness. Therefore a high quality living and learning environment will definitely have a profound influence on the children.

This thesis aims to develop a paradigm of school that exemplifies the Finnish learning environment. An all-round school specialized in architecture and design will be designed for students from the age of 6 to 18. With the aid of architectural training, students will develop a variety of abilities and raise the awareness of built environment. My goal is to invent an inspiring space which is able to stimulate children’s imagination, provoke personal identity and influence the young generations to appreciate the beauty of surroundings, respect the living environment and be responsible to preserve it.

- 1 BARRETT, P. et al. (2012) A holistic, multi-level analysis identifying the impact of classroom design on pupils’ learning. *Building and Environment*. [Online] 59 (2013) 678-689. Available from: <http://ecadmin.wdfiles.com/local--files/facilities/Impact%20of%20Classroom%20Design%20on%20Learning.pdf>. [Accessed: 18th August 2015].
- 2 FINNISH NATIONAL BOARD OF EDUCATION. KUUSKORPI, M. (2014) *Perspectives from Finland - Towards new learning environments*. [Online] p.80. Available from: http://www.oph.fi/download/154594_perspectives_from_finland.pdf. [Accessed: 24th April 2015].

Figure 1.4.1 Children in art class



02 LEARNING ENVIRONMENT

2.1 Educational Reform and Open Classroom

History and Development

The existence of the earliest schools can be dated back to more than 2000 years ago in Greece, Rome, India and China. However modern educational reforms did not draw much attention until the widespread of public education in the 18th century. During the Industrial Revolution, education became popular and the demand for public school rose massively. At that time, the aim of schooling was to provide basic grammar knowledge at low cost to prepare the children for a life in factory. By early 19th century, most of the schools did not have prerequisite separated classrooms. Instead, a huge single hall housed 300 students attending the same class was commonly found in Britain. In the 1870s, Robson, an architect who was appointed by the London School Board to direct the expansion of public school, proposed to break down a school into several smaller classrooms with 40 to 60 students in each. Five rows of double desks filled up a classroom with a teacher speaking in front of the class.^[1] His idea was widely implemented throughout the country and the classroom layout is still prevalent in today's schools.

In early 1900s, John Dewey advocated experiential education that enabled children to learn by experience. He then set up an experimental school with new ways of teaching to fulfill children's true potential. He believed that the knowledge learned at school should reflect the reality of life in the society. Thus, laboratories, workshops, a gymnasium and drawing studios were introduced to broaden the skills of the pupils.^[2]

In the post-war period, new types of large-institutional buildings with multi-functional spaces were needed for the complex social and academic aspirations. Schools were regarded as "cities of childhood"^[3], they were connected with garden spaces and encouraged social interaction among peers. Although the educational curriculum and school building forms evolved persistently, classroom itself has remained unchanged. The rigid box shape with desks lined up in rows was akin to the factory setting inherited from the Industrial Revolution.

Open classroom and open education have become popular in Europe and the United States since 1960s. It was an era full of political and social movements: counterculture, anti-war, civil rights, feminism... Young people revolted against the conservative norms and sought for alternatives of learning, therefore "child-centered" approach became mainstream and replaced traditional teacher-dominated classroom. Children were encouraged to explore, work with peers, share their ideas and solve problems actively. The change reflected the social shift from collective values to individualism.

In less than two decades, "child-centered" learning approach was criticized in consequence of the change of political climate. Open classroom was retreated and traditional schools sprang up again. In the 21st century, ways of learning have become more diversified partially due to the rapid development of information and communications technology. Knowledge acquisition is no longer limited by the place and time, while learning and teaching means are completely different from those of the previous generations. In order to adapt to the future changes, school building design tends to be more open and flexible. Open planning is once again discussed and considered as one of the solutions to embody the new educational philosophy.

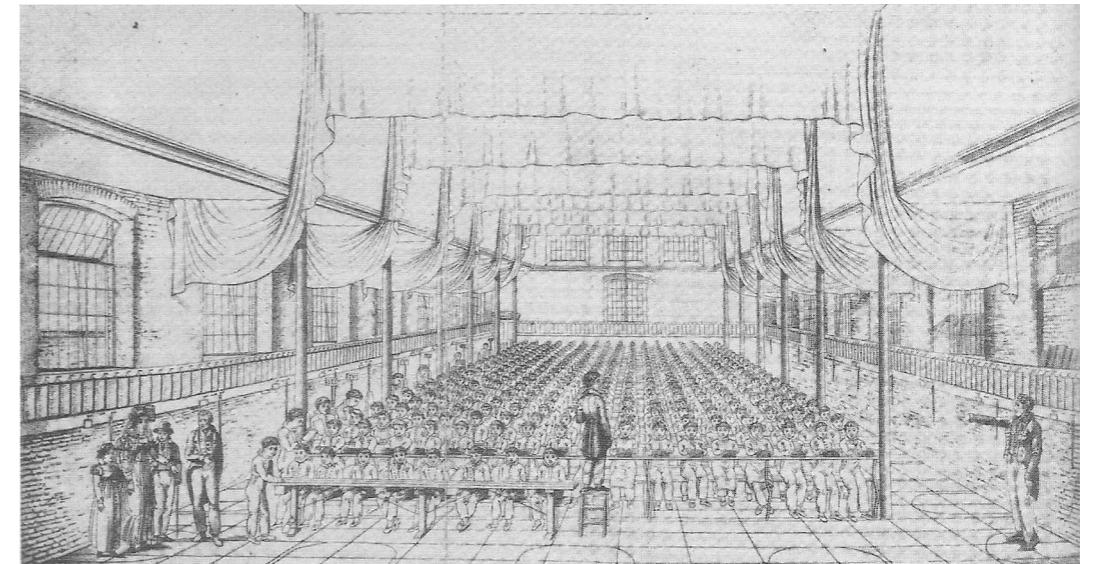
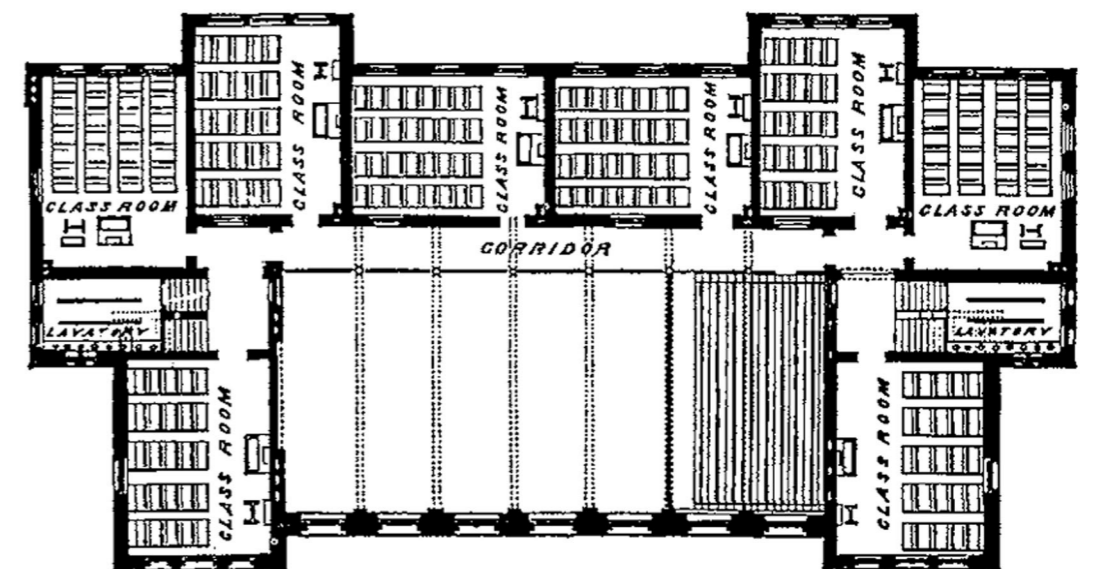


Figure 2.1.1 A class at Southwark Central School in early 19th century



207.—PLAN OF SECOND FLOOR.

Figure 2.1.2 Typical Robson School

1 DUDEK, M. (2000) *Architecture of Schools: The new learning environments*. Oxford: Architectural Press. p.12-13
2 DUDEK, M. (2000) *Architecture of Schools: The new learning environments*. Oxford: Architectural Press. p.18-19
3 DUDEK, M. (2000) *Architecture of Schools: The new learning environments*. Oxford: Architectural Press. p.25

Open Classroom

Mark Dudek^[1] stated that special rooms for special functions have little or no possibility for the form to be interpreted imaginatively. Thus a mono-functional space may have negative effect on the personal development of children.

Flexible space is necessary to cope with the ever-changing teaching and learning scenarios. Different types of learning may happen in the same space simultaneously, while different space layouts can fulfill various study purposes. For instance, arithmetics can best be taught within the context of a small group of six pupils within a dedicated quiet space; speaking and listening requires the opportunities for children to talk within the class setting; drama and media education in larger spaces have a useful role to play in language development. A space that can be reconfigured easily by the users according to the learning condition will engage different kinds of learners and teachers. Diversity of learning environments allows students to choose their favourable ways to learn.

“A thing exclusively made for one purpose, suppresses the individual because it tells him exactly how it is to be used. If the object provokes a person to determine in what way he wants to use it, it will strengthen his self identity. Merely the act of discovery elicits greater awareness. Therefore a form must be interpretable - in the sense that it must be conditioned to play a changing role.”

- Herman Hertzberger, Harvard Educational Review

Open classroom or open education is a concept to overthrow the conventional whole-class lessons and standardized examination system. The abilities of each student should be evaluated to fit them into different study agenda but no grade levels would be assigned. Subjects are integrated to ensure the knowledge they learn reflects the real life. Students direct their own learning and learn at their own pace; the role of teachers is more like coaches or facilitators to give guidance and assistance for their learning.

Walls between classrooms are removed; instead, furniture and movable partitions are used to create an informal learning environment. Without walls, teachers and pupils are encouraged to move freely across class areas. Thus pupils can explore from one interesting spot to another to come across knowledge and the peers while teachers can work collaboratively with one another to instruct various learning activities.

Open education also means opening up to the community and the world. Nowadays, most of the schools are enclosed by high walls or fences to protect the children. Nevertheless, school should not be isolated from the outside world; the knowledge and experiences children acquired should be relevant to the reality. Besides, breaking down the walls provides educational opportunities for the adults to promote life-long education.

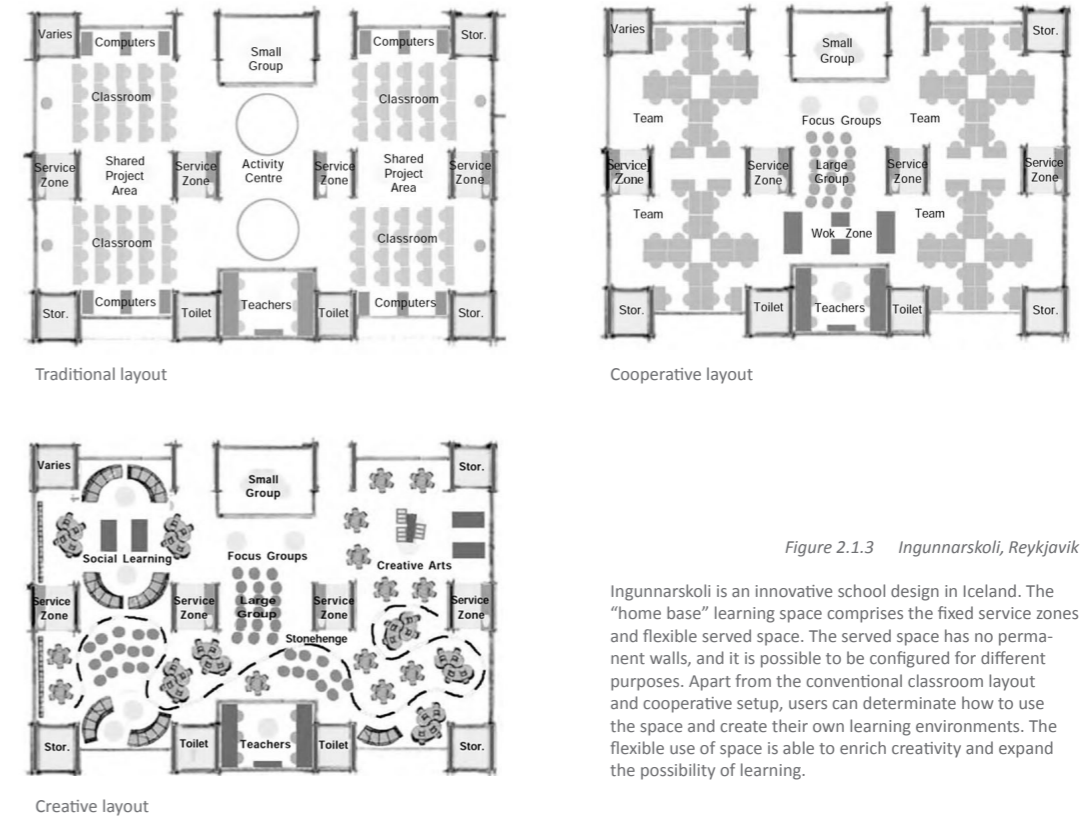


Figure 2.1.3 Ingunnarskoli, Reykjavik

Ingunnarskoli is an innovative school design in Iceland. The “home base” learning space comprises the fixed service zones and flexible served space. The served space has no permanent walls, and it is possible to be configured for different purposes. Apart from the conventional classroom layout and cooperative setup, users can determine how to use the space and create their own learning environments. The flexible use of space is able to enrich creativity and expand the possibility of learning.

Challenges to Open Classroom

Though open classroom has plenty of advantages, there is a wide gap between the ideality and the actual practice. Integrated curriculum has no detailed guideline which may throw the teachers into confusion, especially when most of the existing teachers have never been trained to deal with open education. As a result, conventional teachers prefer to resume the traditional teaching method and block off the open classrooms. Moreover, the major drawbacks of open classroom are noise level and visual distraction. Obviously, when several class bases are having different classes at the same time in an open plan, students are easily distracted. Such distraction would give negative effects to students’ attentiveness, concentration and memory.

Open classrooms are more effective than the conventional didactic teaching method in the modern society. However there are still some challenges waiting to be solved. Governments and educators ought to join hands to compile proper curriculum and provide adequate training for the new and existing teachers to cope with future education situations. On the other hand, architects are responsible for the design of physical learning environment and overcome the potential issues.

1 DUDEK, M. (2000) *Architecture of Schools: The new learning environments*. Oxford: Architectural Press. p.1.



Figure 2.1.4 Vittra Telefonplan, Stockholm

Telefonplan gets rid of the conventional classrooms, preset subjects and grades. Students tailor-make their own study plan with the aid of teachers. They decide how to study according to their preference and progress: studying individually, work in group with other students or attend one of the pre-designated group sessions.

The school is divided into 5 parts to provide a variety of learning environment: "The Cave" is for individual project; "The Lab" is for conducting experiments; "The Camp Fire" is for group works; "The Show Off" is for strutting their talents; "The Watering Hole" is for fun activities. Each learning space is connected with one another without boundary. The open learning environment is flexible and allows pupils to determine how to use space by themselves.

2.2 Physical Environments

Classroom

Students spend most of their day time at school, so a comfortable, healthy and safe classroom is very important. Natural light and ventilation are conducive to concentration and learning. In addition, natural materials for carpet, ceiling, wall finishing are recommended to prevent the emission of toxic substance.

Nowadays, a teacher speaking in front of the whole class is not the only learning way. Four types of classroom organizations are commonly used: whole class, group work, one-to-one and work-alone. Therefore, classrooms should be flexible enough for the reconfigurations from whole class to small learning groups. James Dyck then suggested a short fat L-shaped form which allowed the formation of different learning sizes while providing a sense of separation to avoid distractions from one another.^[1]

Enough storage area for children to put their clothes, shoes, school bags, rain gears, paperworks, art materials and other personal belongings makes school like a second home, and children would be easier to enjoy school life under the informal atmosphere. Apart from the general teaching area, designated area such as quiet zones for reading and practical area for wet activities can be infilled in the classroom. Quiet zone should be closed off to form a private space. Wet area equipped with sinks and hanging space for drying and exhibiting painting is suitable for arts class. In summer, the classroom can be opened onto a terrace and the teaching activities can be moved to outdoor. To make the classroom more casual, equip some domestic features such as pantry can be equipped, and carpets can be placed for gathering time.

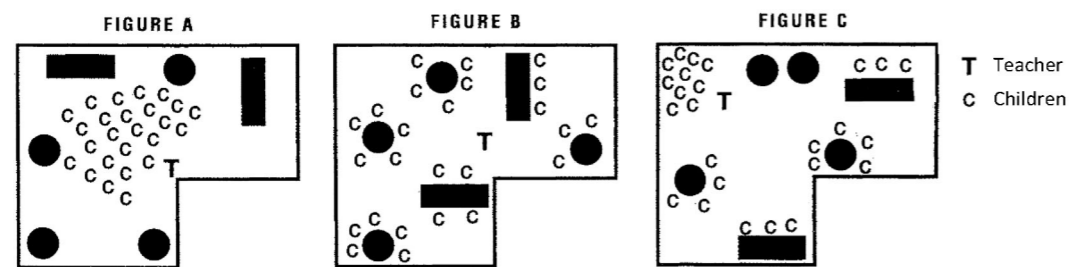


Figure 2.2.1 L-shaped classroom by James A. Dyck

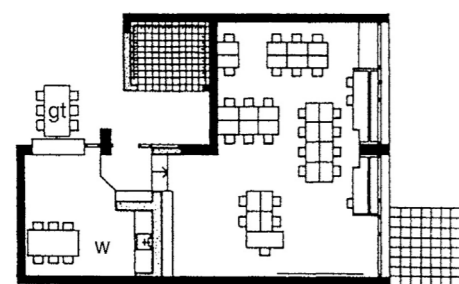


Figure 2.2.2 Montessori Primary School, Delft

A short fat L-shaped form was conceived by James Dyck as an ideal classroom layout because it can be easily organized to support a variety of learning environment. In figure 2.2.1, figure A shows a whole class lesson that children are gathering in front of a teacher; figure B shows that the class is divided into small groups to work; figure C shows 2 different activities happening simultaneously: some of the children are gathering in front of a teacher while others are working in groups.

Montessori Primary School (figure 2.2.2), designed by Herman Hertzberger, shared the same L-shaped idea but had more spatial considerations. The classroom has an openable "hatch" to the communal corridor which accommodates a group table (gt) and a wet area (w) in order to extend the classroom zone.

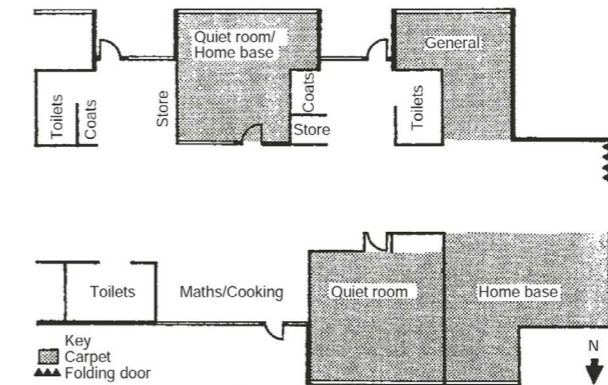


Figure 2.2.3 Typical open-plan classroom showing quiet rooms

Quiet room is enclosed space for the purpose of small class teaching, individual reading or noisy activities so that the distractions can be cut off from the rest of the teaching area.

Carpet is used in quiet room or some other places is marked off for shared activities. Pupils can move around and sit on the carpet for whole class instruction or they read alone, creating various lesson scenes.

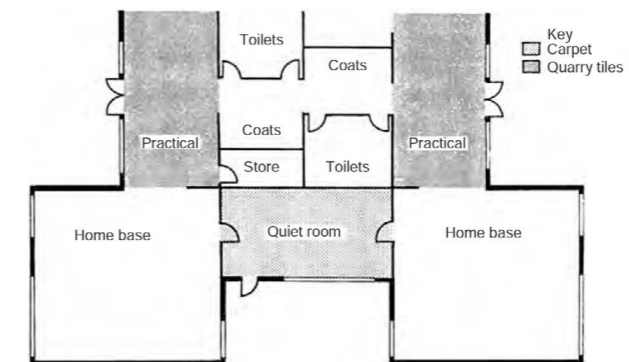


Figure 2.2.4 Typical open-plan classroom showing practical areas

Practice area is suitable for wet activities so the floor finishes may be quarry tiles and vinyl tiles. It is used more frequently than the quiet room, thus the location of practical area is important. A wider access areas with adequate work space and storage for materials is preferable.

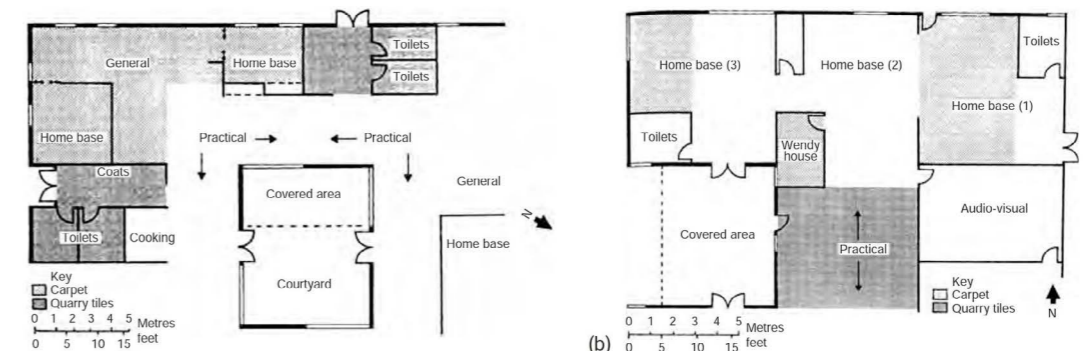


Figure 2.2.5 Typical open-plan classroom showing location of practical areas

¹ DUDEK, M. (2000) *Architecture of Schools: The new learning environments*. Oxford: Architectural Press. p.56.

Circulation Space

A narrow and dark corridor produces strained relationship and sometimes causes confrontation. A sole window or door at one end of the corridor also adds the experience of narrowness and restriction. Letting sunlight and natural ventilation penetrate into the corridor can encourage people to stay because a wider and well-lit space generates positive emotions. It may also reduce behavioural problems such as running, shouting or altercations in the corridor^[1].

Instead of just being a circulation path, creative solutions can infill additional functions to the corridor. It can be utilized as part of learning space when connected to the classrooms, theater, nature center and assembly area. Besides, it can be used for accessing information and displaying student's works, turned into an interactive and playful area, or simply to be decorated as dedicated leisure area. Consequently, corridor becomes another social spot or learning center.

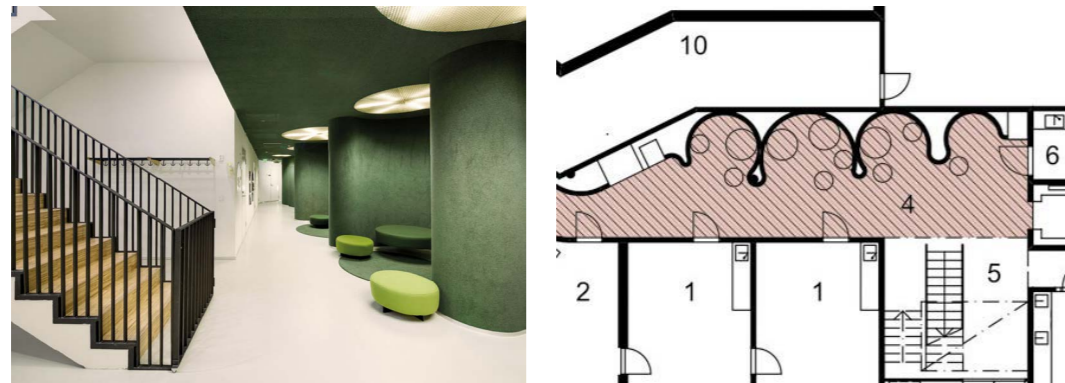


Figure 2.2.6 Saunalahti Children's House



Figure 2.2.7 Learning corridor



Figure 2.2.8 Corridor as social space

Exhibition Space

As a school for learning architecture and design, showcase for project demonstration and exhibition is important. A central hall or a grand staircase for presentation or galleries in various sizes to exhibit students' projects periodically are typical approaches. However, children's artworks should be appreciated not only at specific spots but also around the school. The products to be exhibited affect the image of a school. When they are displayed in the lobby, corridor and cafeteria, all students, teachers, parents and other visitors are able to see them when they walk through the school. This gives the school its own identity. As the pupils' efforts are admired, they will at the same time build up their sense of belonging to the place and be proud of it.

Apart from the locations of exhibition, tools and lighting should be taken into account. Both permanent and temporary exhibition areas are necessary. A handy displaying system which is easy to install and move around is one of the solutions.

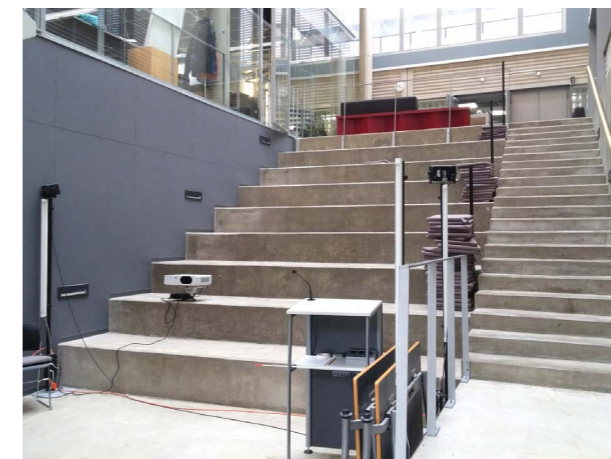


Figure 2.2.9 School of Architecture, TUT

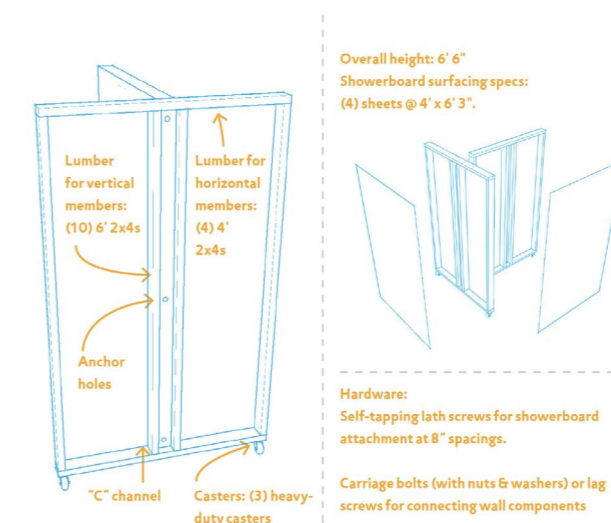


Figure 2.2.10 T-Walls system

Doorley Scott and Witthoft Scott^[1] suggested a "T-Walls" system for multiple uses. The unit consists of two nearly identical walls which are constructed by wood frames, writable shower boards and heavy duty casters.

The system can be configured for different events: individual T-Wall is easily allocated around the campus to display students' works, or groups of T-Walls are installed for special exhibition.

¹ WOOLNER, P. (2010) *Future Schools: Design of Learning Spaces*. London: Continuum International Publishing. p.100.

¹ SCOTT, D. & SCOTT, W. (2012) *Make Space: How to set the stage for creative collaboration*. New Jersey: John Wiley & Sons, Inc. p. 130-131.

Social Space

School is not only a place for studying; it should also facilitate people's relationship with each other as a micro-society. Though students have high demand for social interaction, classroom, however, is a place for learning that is not appropriate for social activities. Outside classroom, school plays the role to encourage interaction and communication among students, teachers and the community.

For instance, a vast lobby with high headroom would be an anchor point to meet. An atrium with skylight enhances both vertical visual connection and natural lighting. Such an atrium is appealing for people to stay and hang out with fellows. The space should be multi-functional to serve various needs such as social, working, recreational and relaxational. Putting more seats here and there can make the place comfortable and welcoming. Allow students to define and use the space in their own ways; different activities will then intertwine with one another in the school.

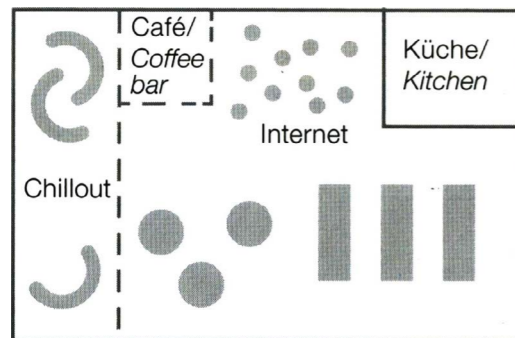


Figure 2.2.11 Refectory as meeting place and recreation area



Figure 2.2.12 Lobby of Saunalahti School, Finland

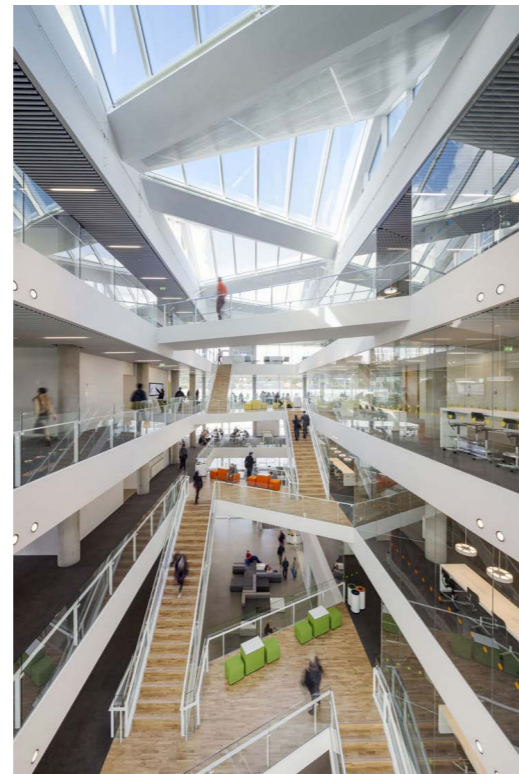


Figure 2.2.13 Atrium of VUC Syd, Denmark

[Play]Grounds

Playground, as named, is a place for playing. However Anne Taylor¹ stated that the underutilized playgrounds ought to be transformed into an integrated learning landscape. Learning landscape offers outdoor spaces for learning math, science, history, art, ecology and stewardship. They are learning tools that go beyond playing and relaxation to act as organic, three-dimensional textbooks. The "playground", therefore, should include natural, cultural, multi-sensory, agricultural and transitional elements.

Play is a natural tool for learning; children acquire enjoyment, spontaneity, involvement, persistence and concentration through playing. It also develops children's physical, mental and emotional strength. Outdoor play is better than indoor play as children may find a greater freedom to talk, to develop dramatic scenarios, to organize cooperative play and to engage in vigorous physical activities without inhibition.

Replace the asphaltic ground with nature. Let children walk on the grass, smell the flowers, touch the soil, listen to the birds sing; they will become more sensitive to the surroundings. Sensory experiences are essential material for compiling an understanding of oneself and the world. An environment rich in sensory experiences helps students to retain and retrieve what they learn.

Move classroom to outdoor areas and teach students all kinds of knowledge by experience. Participation in growing plants, taking care of animals, and maintaining school grounds can encourage sedentary students to go outside and get moving. They will also gain the experience in stewardship and pride in the school.



Figure 2.2.14 Playground

Clambering builds kids' motor skills, teaches them how to overcome fear and gain self-confidence.



Figure 2.2.15 Playground in McCarthy Teszler School, Spartanburg, South Carolina

1 TAYLOR, A. (2009) *Linking Architecture and Education: Sustainable Design of Learning Environments*. Albuquerque: University of New Mexico Press. p.326.

2.3 Psychological Factors

Light

Bright area induces positive emotions. Illuminating the space with different light sources of a variety of color and temperatures can create different atmosphere. Daylight has positive effect on academic scores. A research^[1] showed that students in classrooms with the most daylighting were found to have 7% to 18% higher scores than those with the least.

Color

Color can delineate areas and activities. Soft and cool tones create calm atmosphere while bright and warm colors make the space cheerful. Designating colors to different zones or classrooms can create the sense of identity to the specific spaces and help the children to orient themselves.

Sound

“Interiors are like large instruments, collecting sound, amplifying it, transmitting it elsewhere.”^[2] Peter Zumthor stated that the shape of the room and the surface materials affect the sound induced. Children are very sensitive, different functional space should be well-designed for different sound effect: auditorium, lecture room, quiet area, etc. Moreover, students are easy to be distracted. Proper sound insulation can prevent unwanted noise when a class is engaged in critical listening activities.

Smell

Smell of nature is able to soothe children’s emotion. Placing gardens around classrooms, the class will be enchanted by the scents of soil, grass and flowers. Use fragrant materials such as cedar wood or rosewood for the interior and keep the chemical paints and plastics away as they may release unpleasant smell and toxic substance.



Figure 2.3.1 Light



Figure 2.3.2 Color



Figure 2.3.3 Sound



Figure 2.3.4 Smell

1 HESCHONG MAHONE GROUP. (1999) *Daylighting in Schools - PG&E 1999*. [Online] Available from: <http://h-m-g.com/projects/daylighting/summaries%20on%20daylighting.htm#Re-Analysis>. [Accessed: 13th March 2015].

2 ZUMTHOR, P. (2006) *Atmospheres: Architectural Environments - Surrounding Objects*. Berlin: Birkhäuser. p.29.

Material & Texture

Material and texture can define spatial differentiation. Floor finishings prescribe different functions: tile floor is for wet areas, carpet represents casual and relaxing spots, and wood makes you feel warm and cozy. High-contrast textures or materials such as smooth and rough, wet and dry, opaque, translucent and transparent surfaces can stimulate children's senses. Wood, stone, bricks, concrete, and steel have their own features, displaying the construction details can be a learning tool to explain the built environment to the children.

Density

Degree of density is one of the factors to evaluate the quality of space. In crowded environment, people tend to be stressful which may bring more annoyance to children and cause conflict easily. Spatial density may also affect academic achievement and social behavior. Thus maintaining certain personal distance can balance the negative effect.

Privacy

Social interaction is an essential part of learning at school; nevertheless privacy is sometimes necessary. It brings along the sense of solitude, intimacy, anonymity and reserve which develop self-recognition, self-evaluation, and adjust emotions. Prepare some hiding places in the nooks so that students can respite from the collaborative environment and stay beyond teachers' monitoring. A tiny, cozy, laid back space with good smell acts like a sanctuary to provide relaxing and comfortable moment.

Security

Younger pupils who first leave home and adapt to the school life, are anxious. They need time to get along the unfamiliar environment before moving outwards. A less-feasible and well-defined space is more appropriate to put them at ease. Their smallness also make them vulnerable and insecure. So small-scale furniture and equipment, small cubbies, and low-level windows give them sense of security because everything seems under their control.



Figure 2.3.5 Material and Texture



Figure 2.3.6 Density

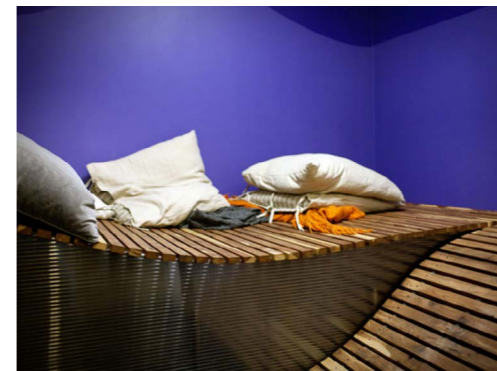


Figure 2.3.7 Privacy



Figure 2.3.8 Security

2.4 Finland's Perspective

Towards New Learning Environments

Apart from the education system and the curriculum, learning environment is also an important research topic in Finland. In the digital and globalized era, the traditional concept of schooling is being questioned nowadays. The learning pattern has been evolving since 19th century, and the future change is unforeseeable because of the rapid development of social structure and technology advancements. Therefore, how the current physical and virtual learning environments can be transformed to accommodate the new changes and support the future learning activities is widely discussed.

School is not only a place for daily lessons for children; it represents the ethos, aesthetic sensibilities and technical expertise of the local area in their era. Finnish educators and architects believe that an inspiring, aesthetically pleasing learning environment enhances the well-being of the users. Additionally, the building provides a venue for after-school clubs, night school, and various sports and recreational activities for the entire community. The flexibility on the function adaptation and considerations on the building lifespan as well as maintenance ensure the ecological, cultural, social and economical sustainability.

The seven criteria for high-quality school building written by Nuikkinen^[1] summarize the perspective of Finnish learning environment. It states that a high-quality school:

1. functions flexibly and diversely, leaving room for versatile ways of working and interaction situations;
2. functions as a versatile center of action and culture for its environment;
3. is an inspiring, concrete learning aid which induces creativity and progressive inquiry and supports situational learning;
4. is aesthetically pleasing, and improves physical and social wellbeing;
5. fosters sustainable development;
6. is functionally dimensioned;
7. increases physical health and safety.

¹ FINNISH NATIONAL BOARD OF EDUCATION. KUUSKORPI, M. (2014) *Perspectives from Finland - Towards new learning environments*. [Online] p.82. Available from: http://www.oph.fi/download/154594_perspectives_from_finland.pdf. [Accessed: 15th March 2015].

Learning Space Configurations

Classrooms are the fundamental units of learning environment. Instead of being rigid confined spaces, they should offer a range of versatile space solutions to facilitate different learning processes. Open classroom with movable partition is the mainstream in current school design in Finland. It allows the learning spaces to be connected or separated to fulfill a variety of learning methods, such as the newly developed "combination of subjects" teaching approach. Flexibility is not constrained in the level of classroom cluster; equipment and furniture configurations should be modifiable to enhance accessibility and interaction. Kuuskorpi and Cabellos González^[1] suggested to equip modular workstations and comfortable seating in the learning environment. Moreover, information technology tools and wireless terminals should be easily moved to support all users.

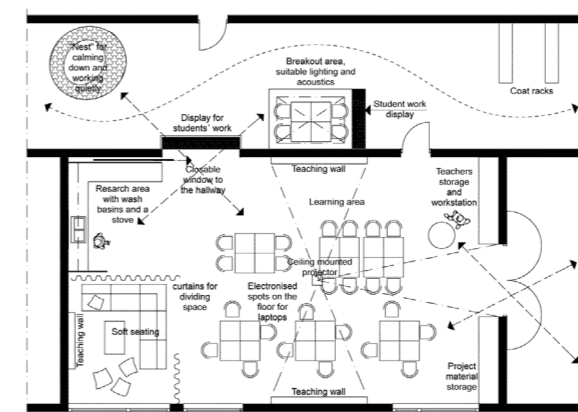


Figure 2.4.1 School of the Future Project

Classroom consists of a wide variety of furniture and equipment such as wet area and seating area to facilitate different learning ways. Furniture are easily re-configured for group or individual activities.



Figure 2.4.2 Classroom consists of a variety of learning modes

¹ FINNISH NATIONAL BOARD OF EDUCATION. KUUSKORPI, M. (2014) *Perspectives from Finland - Towards new learning environments*. [Online] p.74. Available from: http://www.oph.fi/download/154594_perspectives_from_finland.pdf. [Accessed: 15th March 2015].

Integration of Technology

In the 21st century, educational technology is regarded as pivotal artifacts in supporting creative and collaborative learning. With the aid of internet and social media, learning is no longer restricted inside classroom. Formal and informal learning processes interplay to form a more dynamic learning environment. The article written by Kumpulainen and Mikkola^[1] illuminated on how technology extends the learning practices across space and time. They carried out an empirical study to observe how technological tools and devices fostered the collaboration in creating a school musical among 21 students. The result showed that students were deeply engaged in these technology-mediated creative learning practices. The new form of educational space-time configurations resonate with students' learning lives in and outside school.



Figure 2.4.3 Working with technology devices in public area

Pohjankartano School participated in the "School of the Future" project to examine how technology could be used in future learning environment. The school was equipped with various technological learning tools such as tablets and education games to facilitate e-learning. Lobby was designed for group work with laptops; study materials were easily shared through wireless connection. Large screens were installed in the public space to display students' works and release news and information.



Figure 2.4.4 A variety of technologies are applied in the class

1 FINNISH NATIONAL BOARD OF EDUCATION. KUUSKORPI, M. (2014) *Perspectives from Finland - Towards new learning environments*. [Online] p.10. Available from: http://www.opi.fi/download/154594_perspectives_from_finland.pdf. [Accessed: 15th March 2015].

Contribution to the Community

"The school as a central provider of educational services was conceived as a platform responsible for the creation of a natural institutional service, as well as a facilitator of health, wellbeing and sustainable environment services all delivered by qualified experts".^[1] Therefore school facilities are not solely for education purpose in Finland. Libraries, gymnasium, health center, youth facilities are possible to be opened to the public after school hour. It can maximize resources utilization and connect the school to their neighbourhood, which is beneficial to all parties.

In the case of Saunalahti School in Espoo, the school building is in use almost around the clock. The library is open to the public in the evening, meanwhile it provides daycare and youth services. The school becomes the focal point in the community and welcome all the citizen to visit and use their facilities.



Figure 2.4.5 Saunalahti School library is open in the evening to serve the public

1 FINNISH NATIONAL BOARD OF EDUCATION. KUUSKORPI, M. (2014) *Perspectives from Finland - Towards new learning environments*. [Online] p.69. Available from: http://www.opi.fi/download/154594_perspectives_from_finland.pdf. [Accessed: 15th March 2015].

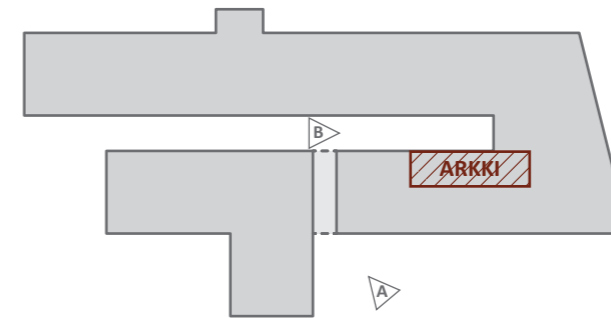
2.5 Learning from Arkki

Arkki is the first architecture school for children and youth in Finland. It provides architecture and environmental education to children from 4 to 17 years old as an after-school activity. Arkki also creates educational curriculum for schools, museums and after-school art and architecture clubs. I have visited Arkki and did an interview with Pihla Meskanen, the Director of Arkki. Classes were also attended to observe the interactions between the children and the space, facilities and teachers.

Philosophy and Aims

Arkki emphasizes three-dimensional working methods, which have been proved to be effective to understand the built environment. By building miniature models and those also in 1:1 scale, children are guided to make discoveries by themselves instead of being given answers by adults. Children are also encouraged to use all their senses in experiencing architecture. The interplay of imagination and intelligence, theory and experimentation are encouraged in project work. One of the effective means applied is learning through playing, a playful approach enables children to use their inborn imagination and natural spontaneity.

The aim of Arkki is to promote architecture education in Finland in order to help children and youths to discover and enjoy their built environment and architecture, understand the impact and meaning of architecture to man and understand everybody's joint responsibility to the environment. Through different activities, Arkki wishes to light a spark in young people's minds so that they will influence and participate in the development of the built environment in the future, whatever their occupation is.



The main campus of Arkki is located in a renovated factory cluster in the west of Helsinki. The building mainly accommodates artist studios, galleries, workshops and architecture firms. The enclosed U-shaped setting is good for encounters among different artists.

Figure 2.5.1 Arkki Location

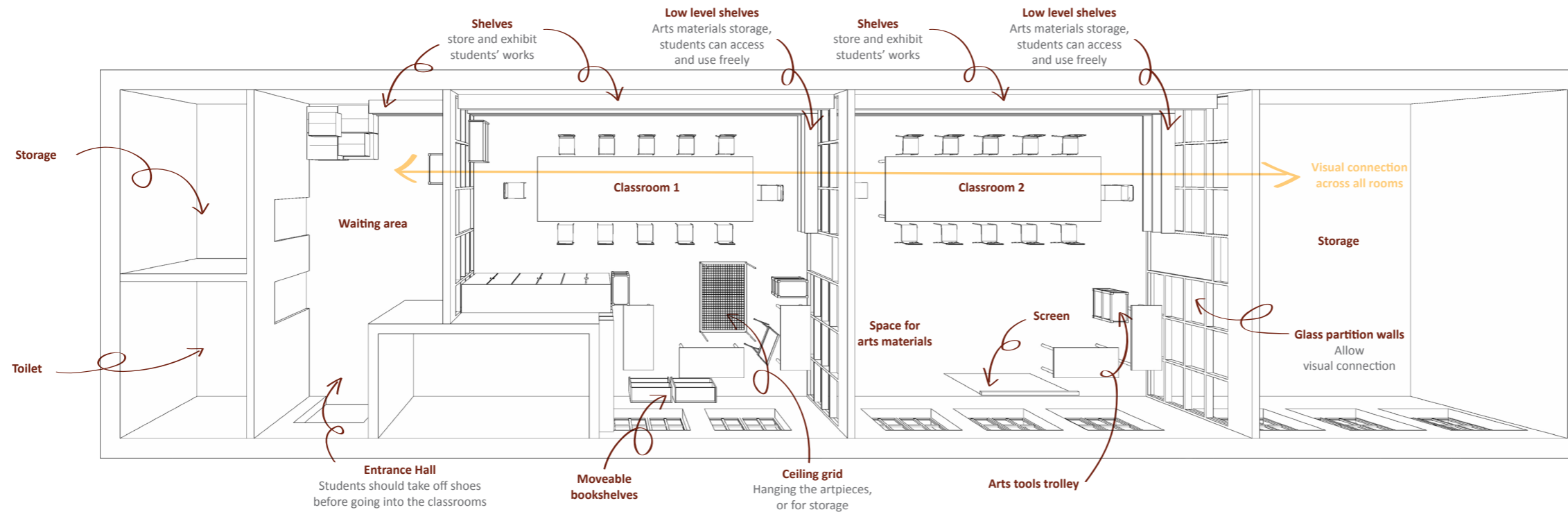
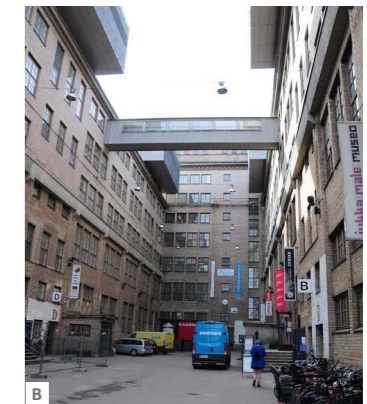


Figure 2.5.2 Illustration of Arkki Floor Plan (Not in scale)

In arts and architecture school, storage space for materials, tools, unfinished artworks, and space for exhibition are in great demand. For some large scale projects, teachers might need to rent the warehouse nearby or move the class to outdoor in summer. Inside the classrooms, the materials are well categorized and placed at appropriated height for the kids to explore and use freely, while the tools are managed by the tutors carefully. The classrooms are separated by glass partition walls to enhance visual connection; it also allows parents to know the learning process from the waiting area. The corridors on the same level are used to exhibit students' art pieces. These exhibits are accessible to both the users of the building and the public.

Program

As Arkki is the first architecture school for children in Finland, there is no precedent for reference when designing the curriculum. The professional pedagogues considered the capabilities of each age group and decided what they need to teach, how they need to teach and what should be taught first. Each group has their own designated projects to work on. The children are encouraged to use all kinds of materials to draw, paint and build the works. They can explore the structure, shapes, scale, rhythm, color, light and shade in the learning process. Arkki also arranges visit to various exhibitions and museums to provide diversified learning platforms.

The pupils are between 4 and 17 years old, they are divided into different age groups and each age group has different levels. The course is basically designed on a long-term basis; if a kid starts at 4 years old, he can continue the program with 300 projects. However, if a kid starts at 7 years old, the course will be adjusted to fit his knowledge and abilities. For instance, a 7-year-old boy in level 1 is in a separate group from those 4-year-old kids in level 1 or 7-year-old kids in level 3. So the program matrix is quite complicated and tailor-made for each student.

As the curriculum is approved by the Finnish National Board of Education, it will not overlap with the curriculum at school. Instead, Arkki provides wider scope of architecture education as a complement to the formal arts education at school.

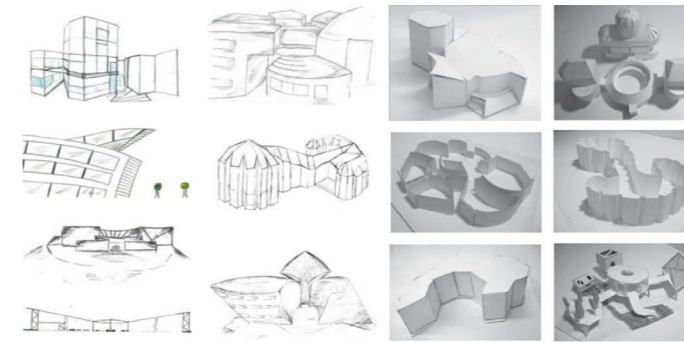
Connection with community

Arkki has close connection with schools, museums, after-school clubs and the community. It has collaborated with the Museum of Finnish Architecture to hold some workshops and exhibitions to the residents. In 2014 summer, Arkki organized a 3-day event “Creating the Future - international conference on architecture education” in Helsinki. The programs included open conference, exhibitions, workshops and city tours.

In addition, the children have opportunities to participate in the city planning project. The Helsinki City Planning Department invited Arkki to submit a proposal about the new masterplan of residential area in Herneasaari area of southern Helsinki. All the students aged from 4 to 17 years old were involved in this project. In September 2007, all the entries including Arkki were invited to present in Helsinki and discussed among citizens. After considering different solutions and hearing to the opinions from the public, Helsinki City Planning Office announced the final masterplan in 2012, in which some ideas of Arkki’s proposal such as the sea front park, canals and horseshoe-shaped harbour, were incorporated.

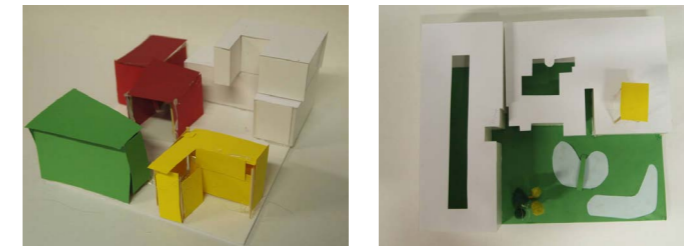
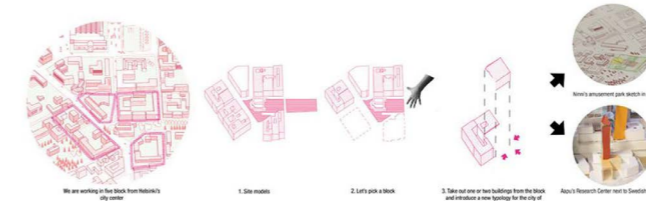


Figure 2.5.3 Herneasaari Masterplan by Arkki



Sini Meskanen developed the concept of future school in collaboration with the pupils in Arkki. In 2007 fall, she arranged 9 workshops to examine the visions of future school. The result is integrated with the literature reviews and actual demands of the users.

Figure 2.5.4 Future School, cooperated with Sini Meskanen



Juan Del Barrio Batista worked with the children on the project of “Building Blocks” in January 2014. They picked some blocks in Helsinki city center and re-designed the typology for the city.

Figure 2.5.5 Building Blocks, cooperated with Juan Batista



Children were making their ideal “Green Building” for the spring exhibition in 2015. The aim of the project is to examine the relationship between architecture and the nature.

Figure 2.5.6 Arkki Class

03 PRECEDENTS

3.1 Saunalahti School

Architect Verstas Architects
Client City of Espoo
Completion Date Aug 2012
Program A day care center, a comprehensive school, an upper secondary school, an upper secondary school for adults, and adult education center, a library and a youth center
Gross Floor area 10 500 m²



Figure 3.1.1 Site Plan of Saunalahti School

Saunalahti school is a multi-purpose building for education and culture. The openness and the sense of community were key elements in the concept, and special emphasis is put on art and physical education. In evenings and weekends, the school is opened for different parties to organize clubs and activities. The library and gymnastics premises are in communal use and the local residents actively use the sport fields and playgrounds of the school yards. It is the focal point of the residential area of Saunalahti for learning, culture and communality.

The school yards are divided by the building into areas with favourable conditions for children of different ages. The youngest children with shorter school days enjoy sunlight in the morning and midday hours on their cozy yard. The yard for the older kids is more closely connected to the square and continues receiving sunlight over the lower workshop wing until late in the afternoon.



Figure 3.1.2 Exterior and interior views



1. Primary School
2. Dining Hall
3. Auditorium
4. Library
5. Wood & Metal workshop
6. Visual Arts room
7. Textile workshop
8. Home Economics room
9. Gallery
10. Day care center and preschool

Figure 3.1.3 Ground Floor Plan

The multipurpose dining hall is the heart of the school which is located near to the main entrance. It is integrated with the terraced front yard to form an outdoor theatre. In the interior, a stage opens to the dining hall which also serves as the festival hall. Additionally, the auditorium is situated next to the hall; all these features create a large performing platform to connect the school and the community.

Wood and metal workshop, visual arts room, textile workshop, home economics room are displayed to the street through the glazed wall in the south-west side of the school. Meanwhile, student gallery next to the workshops is opened up to the school yard. Both arrangements create the interaction between interior and exterior.

Day care center is located in the basement, in which a separate entrance and courtyard face to the east to ensure enough morning sunlight for the younger pupils.

Different zones are colored with unique color schemes. The strong colors stimulate children's senses and also make it easy to orient oneself.



Figure 3.1.4 Basement Floor Plan

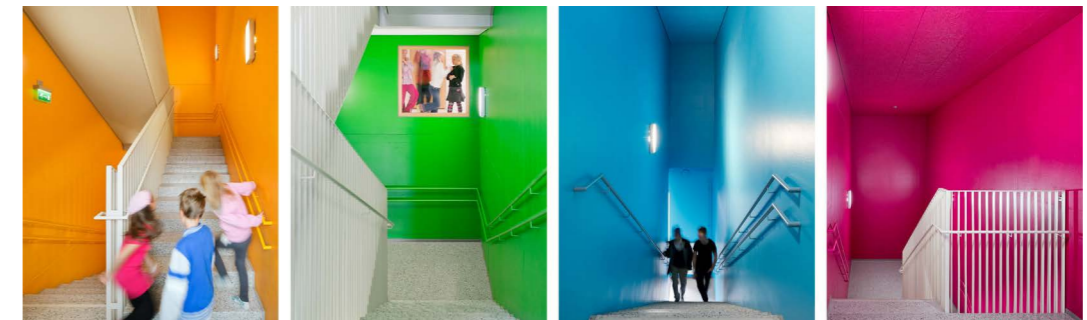


Figure 3.1.5 Strong color scheme

3.2 Kastelli School and Community Center

Architect Arkkitehtitoimisto Lahdelma & Mahlamäki
Client City of Oulu
Completion Date May 2014
Program A day care center, a comprehensive school, a preschool, a youth center, and a library
Gross Floor area 24 600 m²



The Kastelli community center is an educational, leisure and culture center for the residents of the nearby areas and the entire City of Oulu. It is a versatile learning environment that adapts to learners' needs and changing requirements over time. The structural solutions are designed to be sustainable, energy efficient, and durable to ensure long life-cycle.

The premise is divided into four sections to fit human-scale: primary school and day care center, secondary school, and the other two sections are used for sports facilities and supportive services. They are connected by the central hall for social activities.

Figure 3.2.1 Site Plan of Kastelli School and Community Center

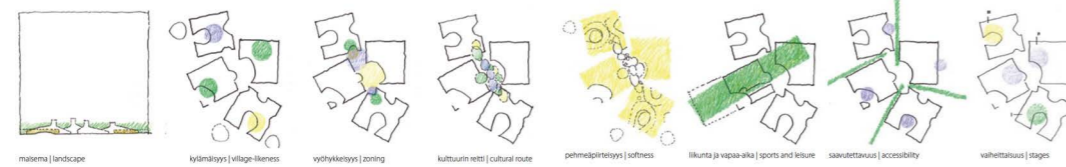


Figure 3.2.2 Concept Diagrams



Figure 3.2.3 Exterior and interior views



Courtyards are enclosed by the classrooms in the primary and secondary school sections. Some of the walls between the classrooms can be removed to enlarge the spaces. Central hall accommodates canteen and library on the ground floor, and connects different parts by a bridge on the first floor.

Figure 3.2.4 Floor Plans

3.3 School Competition : Opinmäki

Opinmäki School in Suurpelto, Espoo (2012)

Winner Esa Ruskeepää and Thomas Miyauchi
Client City of Espoo
Program Finnish-language kindergarten, pre-school and lower secondary school, Espoo International school, English-language kindergarten, regional sports hall, adult education center, youth facilities and residents' park
Gross Floor area 16 000 m² (1st phase) + 5 710 m² (2nd phase)



Figure 3.3.1 Illustration of future Suurpelto area

Suurpelto is a new city district located in Espoo. It will become an innovative area with residential, commercial and education services in ten years. Opinmäki learning and recreational center is planned to serve the community as a lifelong-learning hub.

The competition aims to reveal a sliver of the future and give concrete expression to the learning environment of tomorrow within context of Finland, Espoo and Suurpelto. The building, facilities and surrounding yards will be the tools to inspire locality-based learning and offer support in constructing knowledge through experience. In addition, sustainable development will be part of the operational culture of the new building, the use of the premises, as well as maintenance and repairs.



Figure 3.3.2 Massing Model



Figure 3.3.3 Concept Diagrams

The design concept comprises the community, fields for activities and learning. The school building acts as an anchor point for the entire community. People can enjoy the outdoor spaces for leisure and access to the building for learning.

The building mass is the composition of different sized cubes which blends in with the surrounding urban context and makes it interesting to experience the interior. The space is functional, playful and communal.

Corridors are widened to provide multi-functional spaces that encourage social interaction in the entire school. Classrooms are able to be opened up to the corridors or to one another, so that the space is feasible to be reconfigured for a variety of functions.

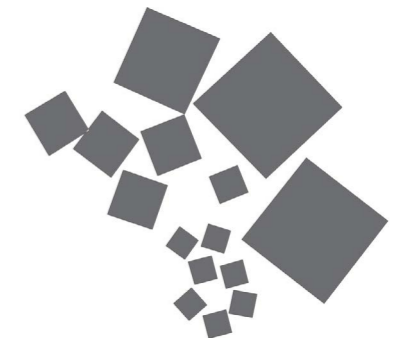


Figure 3.3.4 Building Mass



Figure 3.3.5 Ground Floor Plan

3.4 School Competition : Aurinkokivi

Aurinkokivi School in Vantaa (2013)

Winner	Playa Architects
Client	City of Vantaa
Program	Comprehensive school, kindergarten and a maternal and child health care center
Gross Floor area	7 900 m ² (1st phase) + 4 500 m ² (2nd phase)



Figure 3.4.1 Site Plan of Aurinkokivi School

The development plan of Kivistö began in 2007 in accordance with the vision of “home town, art town and sustainable town”. The Aurinkokivi service building will comprise a school and a kindergarten, as well as a maternity clinic, facilities for arts and music education, and residents’ communal spaces. The city of Vantaa has a desire for the building to establish active contact with the streetscape and the everyday life of the residents.

The building varies in height from the one-storey day-care wing in the west to the three-storey school in the east. A large courtyard is enclosed by the building mass and connects naturally to the beautiful park in the north-west. Meanwhile, the school and the yards are shielded from traffic and noise in the south-east. The main entrance opens to a public square which is inviting to the community.



Figure 3.4.3 Ground Floor Plan



Figure 3.4.2 Entrance Plaza & Lobby

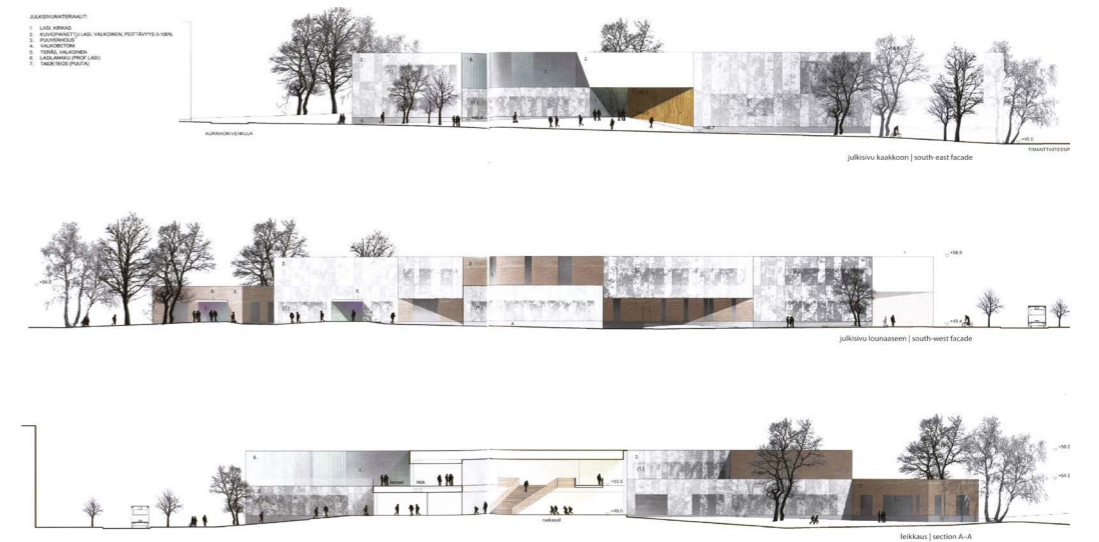


Figure 3.4.4 Elevations and Section

04 SITE ANALYSIS

4.1 Location and Background

After the Kai Tak International Airport moved to Chak Lap Kok in 1998, the Hong Kong Planning Department started to carry out various studies on the development plan and has undergone several modifications. The finalized outline zoning plan was approved in 2012. The Kai Tak Development Area comprises former airport site and parts of the adjoining districts include To Kwa Wan, Kowloon City, Kowloon Bay and Kwun Tong. The total planning area is 323 hectares and the estimated population is 89,800. The overall project are expected to be completed by 2023.

The site is proposed to be developed as the “Heritage, Green, Sports and Tourism Hub of Hong Kong”. The main planning themes are sports-oriented, people-oriented, sustainable, environment friendly, and distinguished and attractive urban form. A multi-purpose sports complex will be an anchor of the site, complemented by a comprehensive network of green open spaces, indoor recreational centers, extensive cycle tracks and jogging trails along the waterfront promenade. And with the mix of residential, office, retail, hotel and an international cruise terminal, the area will be vibrancy in different time of the day.



Figure 4.1.1 Location Map



Figure 4.1.2 Aerial photo of the master planning



Figure 4.1.3 Old Kai Tak airport



Figure 4.1.4 Kai Tak in 2010



Figure 4.1.5 Future impression of Kai Tak

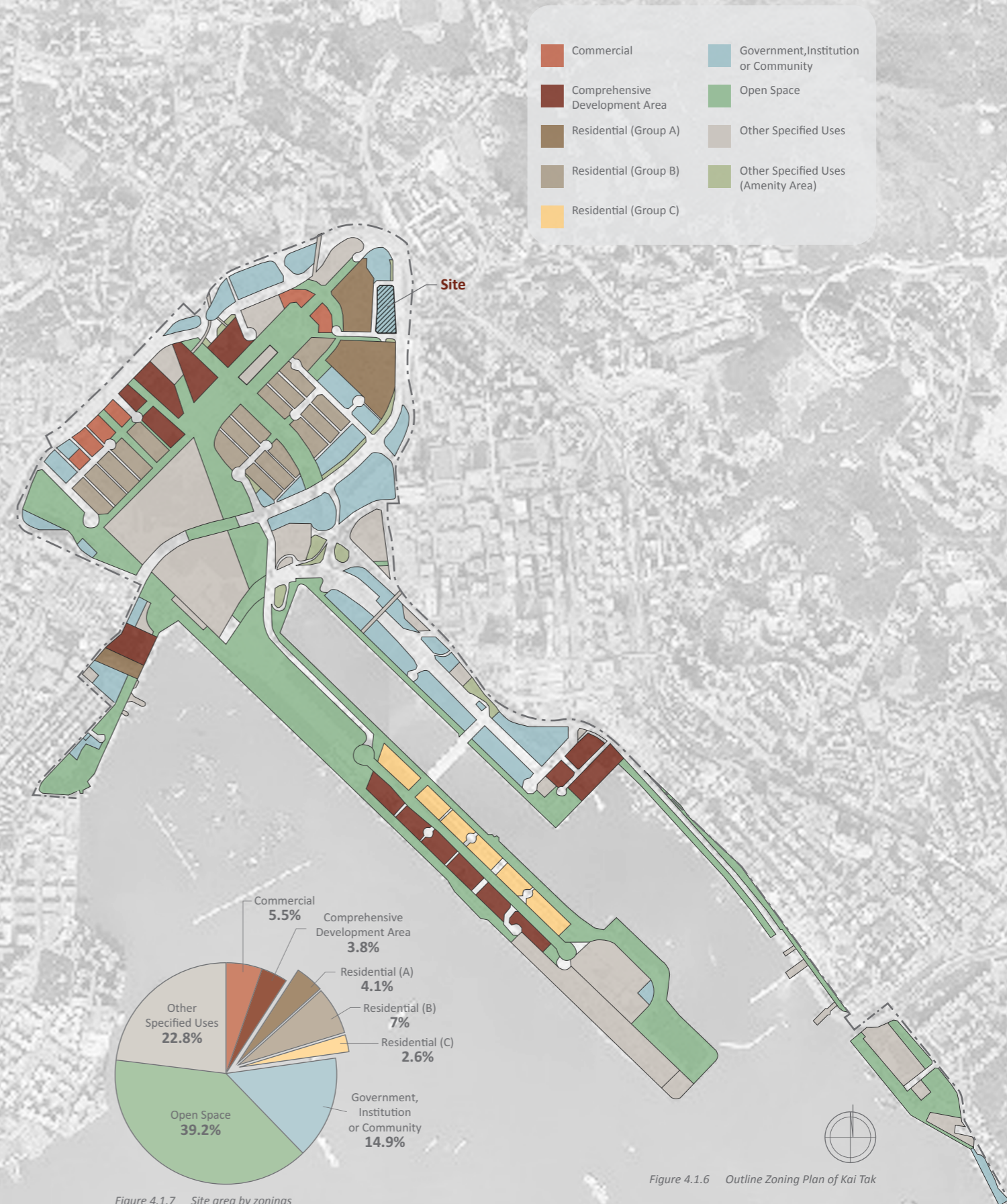


Figure 4.1.7 Site area by zonings

Figure 4.1.6 Outline Zoning Plan of Kai Tak

Site Information:

Zoning : Government, Institution or Community
 Site Area : 13 277m²
 Site Level : +5.4m
 Max. Bldg Height : 24m



Figure 4.1.8 Site Plan 1:5 000

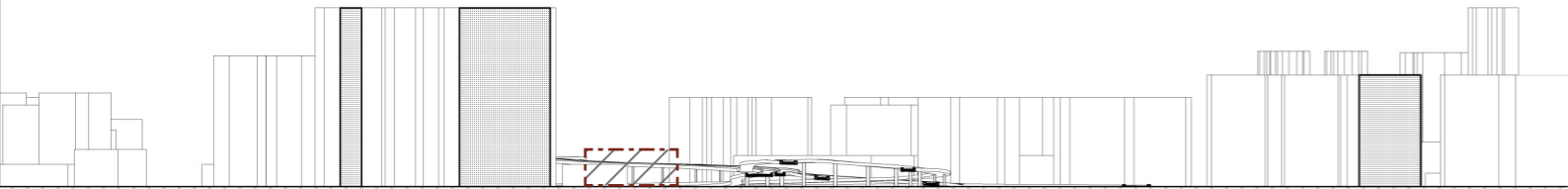


Figure 4.1.9 Site Section A 1:5 000

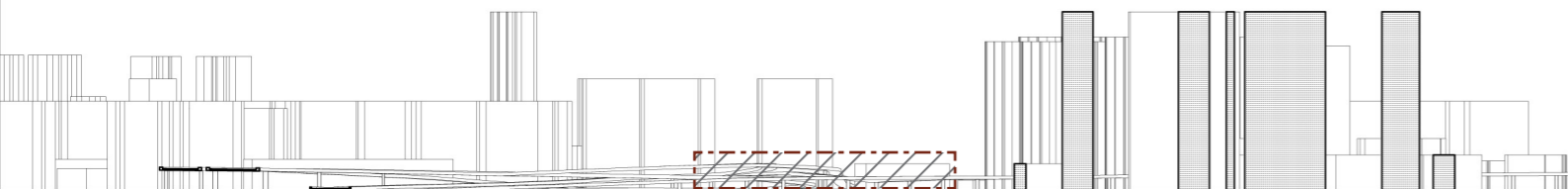


Figure 4.1.10 Site Section B 1:5 000



4.2 Site Analysis



Figure 4.2.1 Building Use

Building Use

The site is located in the new residential area. Industrial buildings can be found to the north-west of this area. Commercial centers are built around the residential blocks and plenty of schools are planned in the area to serve the community.

Sports facilities are mainly located in the north now, but a large scale stadium complex will be built in the south-west where will become sports hub in the future.

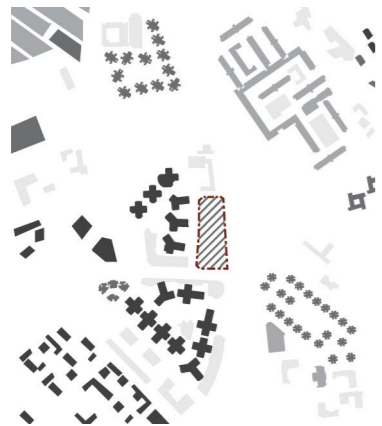
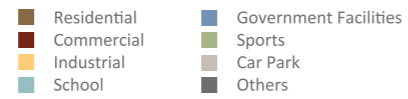


Figure 4.2.2 Building Height

Building Height

The residential blocks next to the site are high-rise towers with 40 storeys. The high buildings are mainly located in the west and south. The west towers help to shade the strong evening sun in the summer time.

The higher buildings are residential towers while the lower ones are commercial centers and schools.

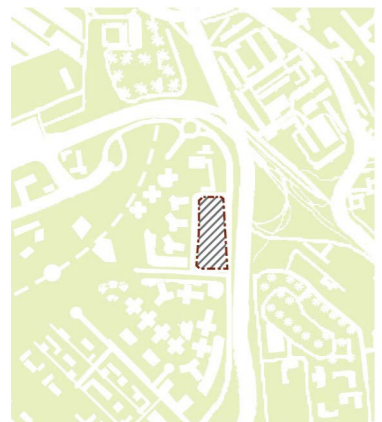
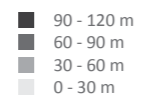


Figure 4.2.3 Open Space

Open Space

To the south of the site, about 30% of Kai Tak Development Area is planned as open space. It will become comprehensive green network to create natural environment.



Figure 4.2.4 Granulation Map 1:20 000



Figure 4.2.5 Vehicular Circulation

Vehicular Circulation

Kai Tak Development Area aims to reduce vehicle usage, there are minimum numbers of vehicular circulation and most of the major roads are planned as tunnels and depressed roads.

The closest metro station is 600m away and a new metro station next to the site will be built in the near future. Public transportation network is well-developed around the site to connect to all parts of the city.

- Existing Metro Station
- Future Metro Station
- Bus Stop



Figure 4.2.6 Pedestrian Access

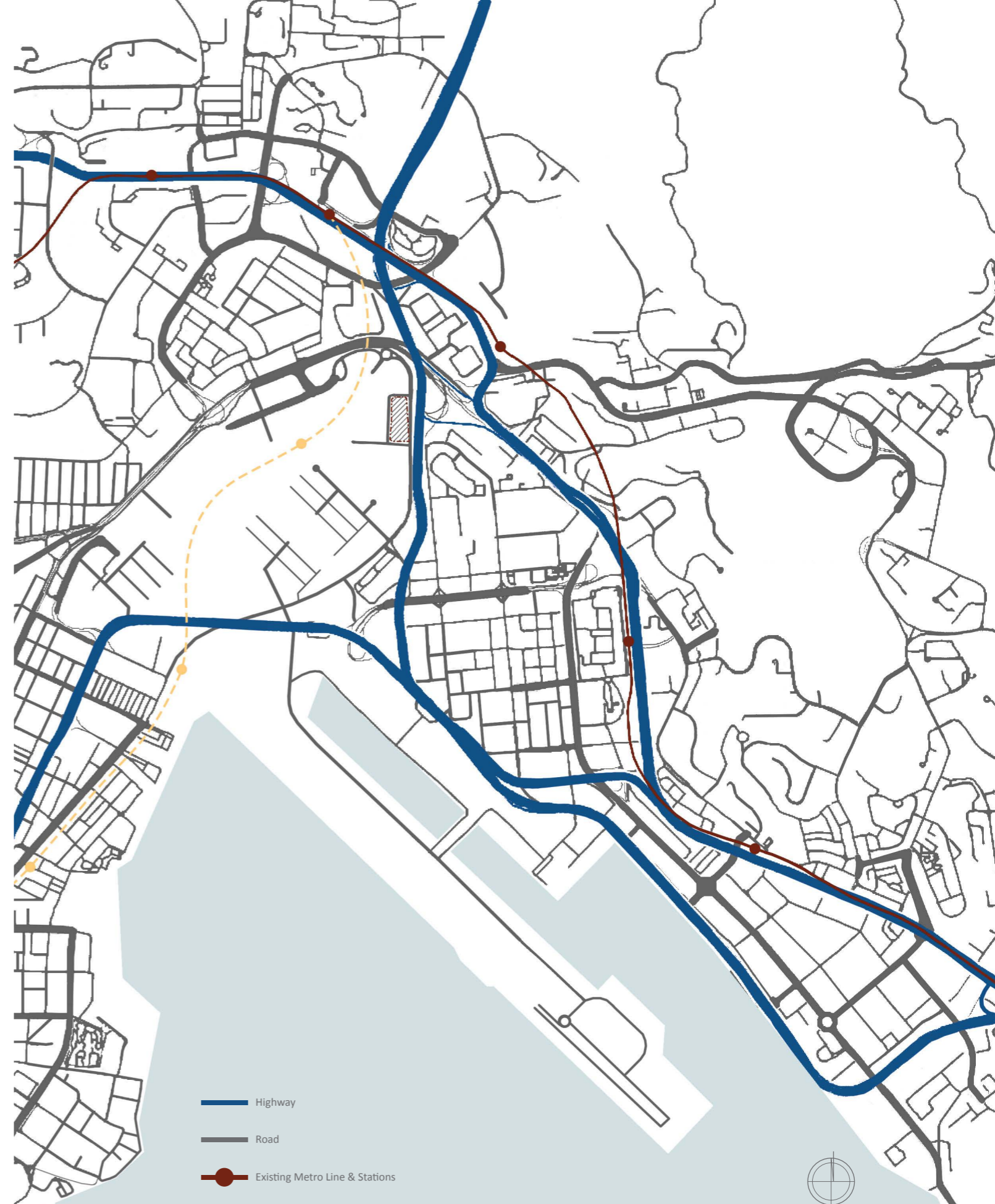
Pedestrian Access

The highway acts like a boundary to separate the site from the north and east. A footbridge in the north and a subway in the east connect the site to San Po Kong and Choi Hung respectively. The southern part is Kai Tak Development Area where is pedestrian friendly zone.

- Pedestrian Street
- Footbridge / Subway



Figure 4.2.7 Photos of pedestrian access



- Highway
- Road
- Existing Metro Line & Stations
- Future Metro Line & Stations



Figure 4.2.8 Transportation Network 1:20 000

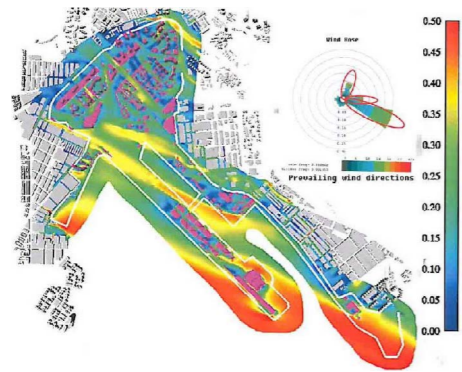


Figure 4.2.9 Prevailing Wind in Kai Tak

Air Ventilation Strategies in Kai Tak

The major prevailing annual wind comes from the south-east quadrant, and the prevailing summer wind mainly comes from the south-east and south-west quadrants. The Kai Tak Development Area has incorporated a number of major air paths for penetration of wind which are aligned approximately in south-east to north-west direction. They include the interconnected major open spaces or open areas covering Kwun Tong Typhoon Shelter, Kai Tak Approach Channel, To Kwa Wan Typhoon Shelter, Kai Tak River, Metro Park and Sung Wong Toi Park and open space adjoining the Stadium site. These unobstructed air paths allow the prevailing winds to penetrate into Kai Tak Development Area as well as into Kowloon City and San Po Kong.

To further enhance penetration of prevailing wind, pedestrian streets are aligned in south-east to north-west direction. Podium-free design is adopted to improve wind penetration at pedestrian street level.

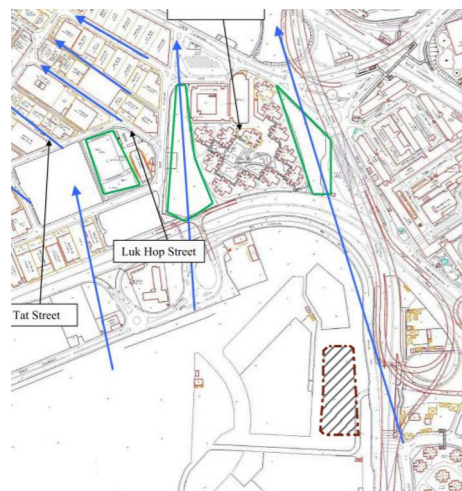


Figure 4.2.10 Wind Condition near the site

Wind Conditions of the Site

The potential air path is from the south and south-east of the site. As east part is separated by highway, high-rise building blocks are kept away from the site that ensures the penetration of prevailing wind.

Pedestrian level wind speeds are moderated by the extent and massing of buildings ranging from the south-east to the south-west of the area. Annual overall wind velocity ratio is 0.13 to 0.18, while summer overall wind velocity ratio is 0.1 to 0.17 (up to 0.28 and 0.25 near waterfront).

← Potential Air Path

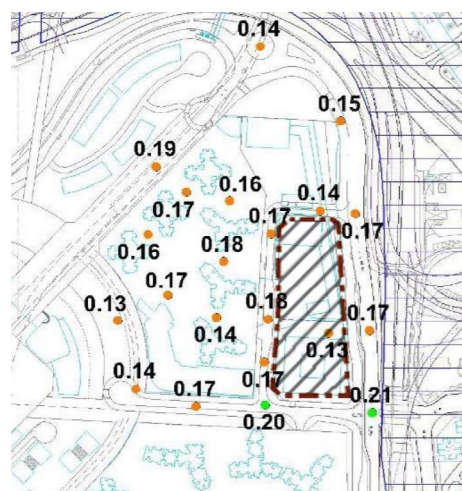


Figure 4.2.11 Annual Overall Wind Velocity Ratio

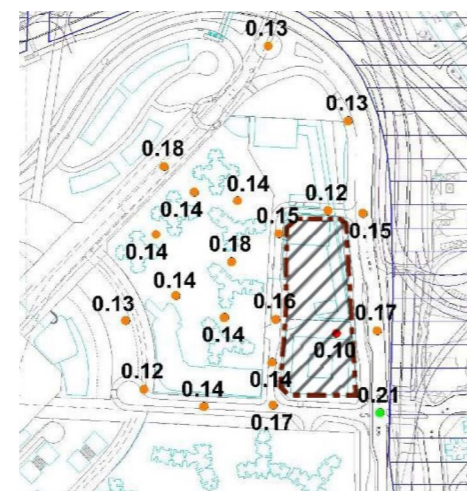


Figure 4.2.12 Summer Overall Wind Velocity Ratio

Sustainable Features

1. Green Roofs and Green Walls

Apply the green roof technology and vertical greening strategy on government buildings.



Figure 4.2.13 Green Roofs and Green Walls

2. Kai Tak River

Kai Tak River is a primary drainage channel in East Kowloon to accommodate the storm water. It passes through the Station Square and running into the residential neighbourhood. Blending into the landscape network, it enhances visual quality and provides cooling effect.



Figure 4.2.14 Kai Tak River

3. District Cooling System

The large-scale centralized cooling system serves non-domestic buildings with sea water. It enhances energy efficiency by 35% and 20% compared to the conventional air-conditioning system and water-cooled air-conditioning system respectively. The estimated reduction CO₂ emission per annum is 59 500 tonnes, and maximum annual saving in electricity consumption is 85 million kWh.

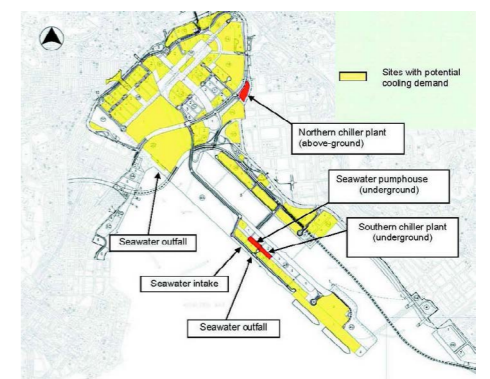


Figure 4.2.15 District Cooling System

4.3 Justification

The proposed site is located in the new development area which will provide 13 300 public housing and 17 000 private housing with total 89 000 residents in future. Therefore, demand of school is foreseeable. The school will share the facilities and services to the community to maximize resources utilization. As it situates at the heart of residential area, it is easily accessed by walking and appealing to the neighbourhood to use the library and sports facilities. In addition, the well-developed public transportation network connects to almost every district in Hong Kong, it encourages pupils live in other area to join the school.

Since the planning of Kai Tak Development Area is sustainable and environmental friendly, it provides healthy and safe environment for students. Less cars and more open space will reduce exhaust gas and allow daylight and natural ventilation penetrate into the area. The green features can become learning tools to teach the students to be responsible to the environment.

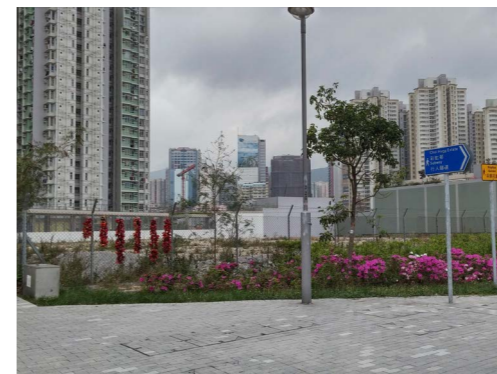


Figure 4.3.1 Site Photos

05 DESIGN

5.1 Programs

The primitive function of a school is knowledge transmission, which includes 4 types of places: a place of learning, a place of doing, a place of information, and a place of encountering.^[1] Some places can manifest the features of several space types. For instance craft room is a place for both learning and doing. Apart from the learning places, there are places for teachers and administration (a place for staff), and places of support facilities and services (a place of service). In the design process, I define the programs into these 6 categories of places.

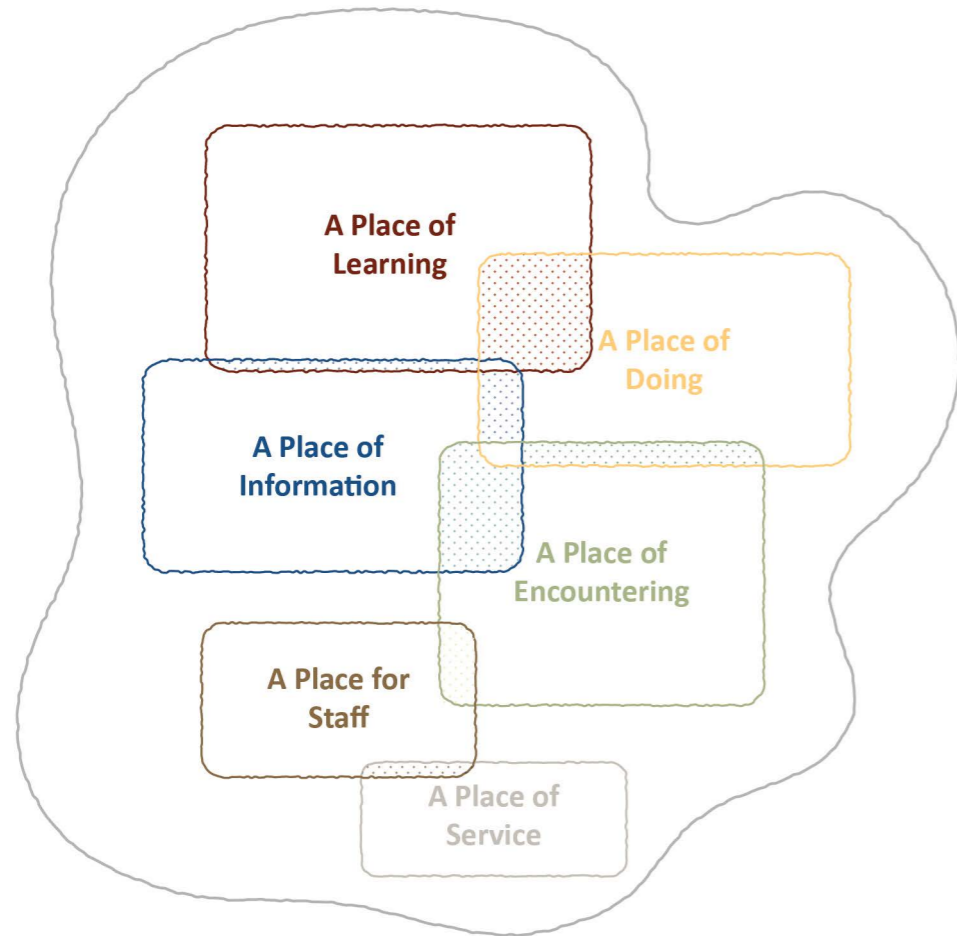


Figure 5.1.1 6 Types of Places

¹ FINNISH NATIONAL BOARD OF EDUCATION. KUUSKORPI, M. (2014) *Perspectives from Finland - Towards new learning environments*. [Online] p.89. Available from: http://www.oph.fi/download/154594_perspectives_from_finland.pdf. [Accessed: 15th March 2015].

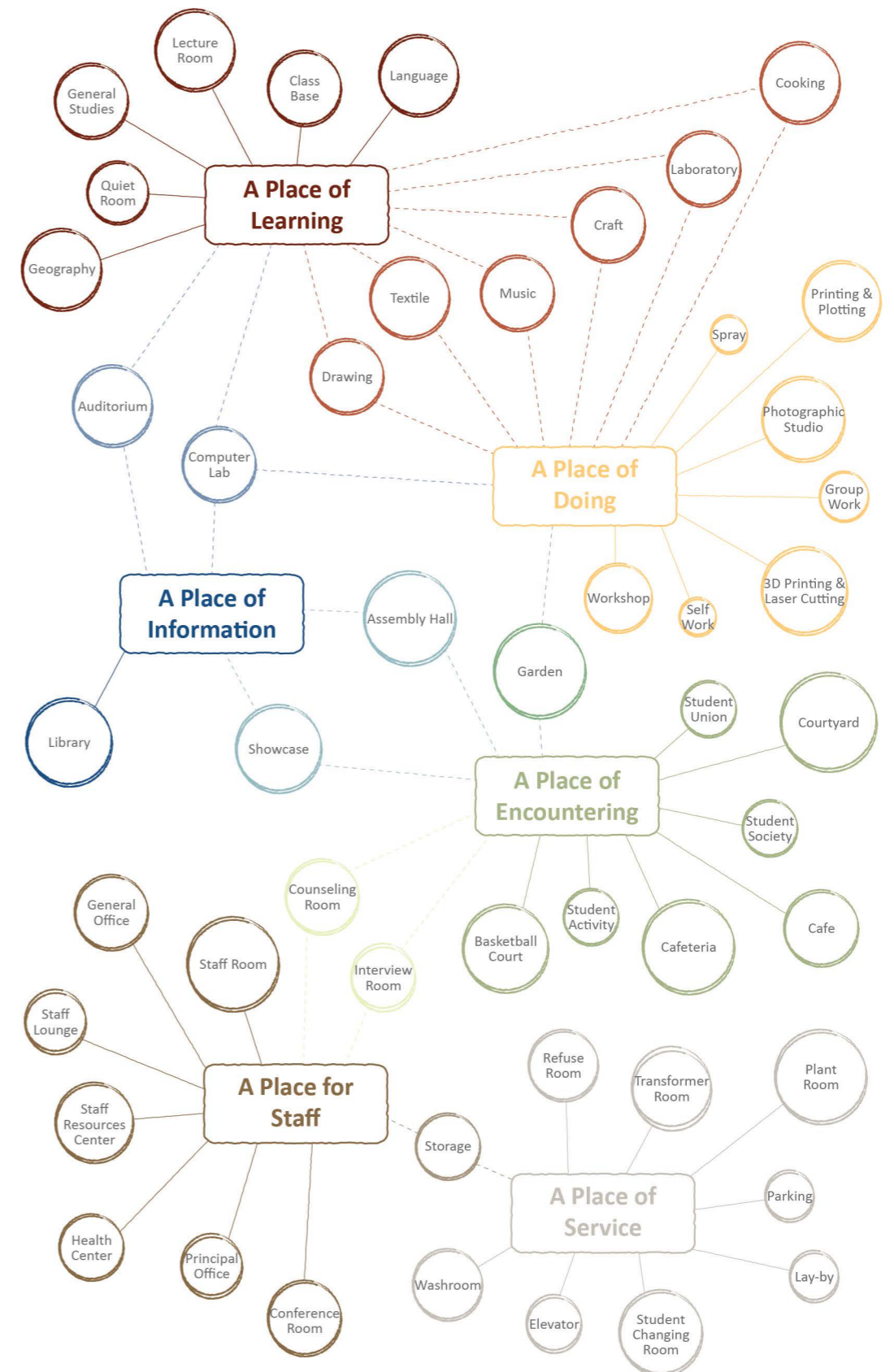


Figure 5.1.2 Programs by Types of Places

5.2 Schedule of Accommodation

Proposed School Population

Pupil

Grade 1-12
5 classes per each grade
20 pupil per each class

Total pupils: 1,200

Teacher & Staff

Teachers: 100
Other Staff: 20

Total Staff: 120

PROGRAM	QUANTITY	AREA	TOTAL AREA	GFA
A PLACE OF LEARNING				
Class Base (Grade 1-12)	60	70	4 200	4 200
Quiet Room	18	25	450	450
Lecture Room	2	80	160	160
Language Study Space	2	60	120	120
Geography Study Space	1	80	80	80
General Studies Space	1	100	100	100
Laboratory (Physics, Biology, Chemistry, Integrated Science)	4	100	400	400
Drawing Space	2	100	200	200
Craft Space	2	100	200	200
Cooking Room	1	100	100	100
Textile Workshop	1	120	120	120
Music Room	2	120	240	240
Computer Laboratory	3	80	240	240
A PLACE OF DOING				
Wood Workshop	1	150	150	150
Metal Working Workshop	1	150	150	150
Photographic Studio	1	20	20	20
Spray Room	2	6	12	12
Printing & Plotting Room	1	50	50	50
3D Printing & Laser Cutting Room	1	50	50	50
Self Working Station	100	1	100	100
Group Work Space	2	150	300	300
Group Work Room	12	15	180	180
A PLACE OF INFORMATION				
Library	1	500	500	500
Assembly Hall	1	900	900	900
Auditorium	1	300	300	300

PROGRAM	QUANTITY	AREA	TOTAL AREA	GFA
A PLACE OF ENCOUNTERING				
Lobby Showcase	3	100	300	300
Cafeteria & Kitchen	1	400	400	400
Cafe	1	150	150	150
Student Union Room	1	25	25	25
Student Society Space	1	100	100	100
Student Activity Room	4	25	100	100
Basketball Court	2	375	750	-
Courtyard	3	150	450	-
Student Farm	1	450	450	-
Terrace Garden	2	200	400	-
Roof Garden	1	3 000	3 000	-
A PLACE FOR STAFF				
Principal Office	1	15	15	15
General Office	1	80	80	80
Staff Room	2	200	400	400
Staff Lounge	3	50	150	150
Staff Resources Center	1	60	60	60
Conference Room	4	40	160	160
Counseling Room	2	20	40	40
Interview Room	2	10	20	20
Health Center	1	30	30	30
A PLACE OF SERVICE				
Staff Washroom	4	10	40	40
Student Washroom	24	20	480	480
Student Changing Room	2	60	120	120
Disabled Toilets	14	4	56	56
Elevator	3	5	15	15
Storage				
P.E. Storage	1	35	35	35
Teacher Storage	2	15	30	30
General Office Storage	1	25	25	25
Others	-	350	350	350
Plant Rooms				
Transformer Room	1	80	80	80
Water Tank & Pump Room	1	120	120	120
A/C Plant	1	40	40	40
Switch Room	1	40	40	40
Others	-	100	100	100
Refuse Storage	1	30	30	30
Parking	13	12.5	162.5	-
Lay-by	3	42	126	-

Total Gross Floor Area (GFA)	12 913.0
Circulation (25%)	3 228.25
Grand Total GFA	16 141.25

5.3 Design Intent

After 2 years living and studying in Finland, I understand the importance of nature to Finns' daily life. Forest and lakes are almost everywhere, urban is surrounded by nature and blends in with it. Thus Finn is used to introduce natural elements into built environment. Because of the long dark winter, daylight is precious and it is reflected in most of the Finnish architecture. Large windows and skylights ensure adequate sunlight penetration, while diffused light is percolated into churches and other public buildings to create the sacred atmosphere. The interplay of dramatic light and shadow effect is one of the distinctive features in Nordic countries. On the other hand, the construction material is also extracted from the nature. Pallasmaa^[1] stated that natural materials allow our vision to penetrate their surfaces and enable us to become convinced of the veracity of matter. Natural materials convey their age and history, it connects us with the world in the dimension of time. In Finland, timber is widely applied in the structure and skin. Due to the abundant forest and proper resources management, timber is an economic and sustainable construction materials. Apart from materials, Finnish architecture also considers building's life span and maintenance issues. A longer life span building is more environmental friendly and is more appreciated. Sustainability is a principal criteria of designing a building nowadays.

In school architecture, sense of community becomes more and more important. Open school premise to the community to share the resources can enhance communication among students, teachers, parents and the neighbourhood. In the modern learning environment, enclosed campus is not an efficiency way of studying. The interactions among all parties are able to induce versatile knowledge and experience adoption. Openness is also interpreted in the national curriculum and learning spaces. Finland has devoted to exploring innovative learning methods and physical learning environment. Open classroom has been experimented in most of the newly built schools. The flexibility of space reconfiguration is deemed an appropriated mean to meet future changes in learning needs.

On the basis of the literature studies and inspiration from the design of Finnish schools, four approaches are extracted and infused into my design: **openness, nature, sustainability and community.**

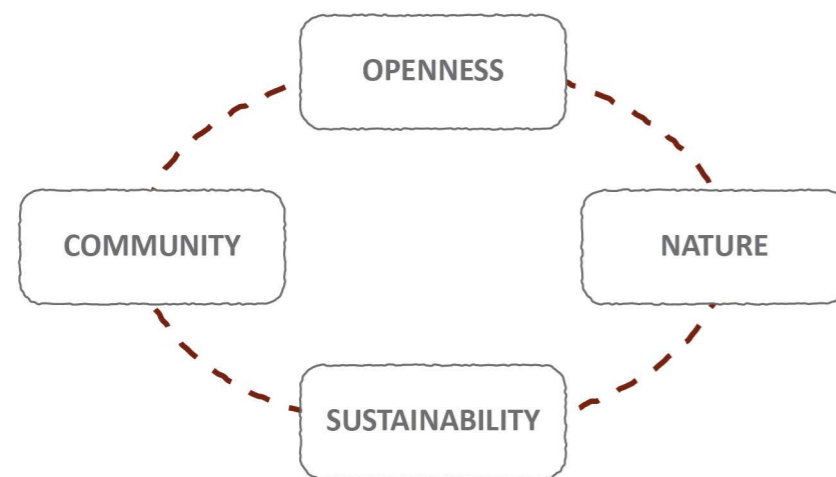


Figure 5.3.1 Design Approaches

1 PALLASMAA, J. (2005) *The Eyes of the Skin: Architecture and the Senses*. Great Britain: Wiley-Academy. p.31.

Openness

School building can be a learning tool to teach students through experience. Instead of being an inorganic object, it is rather a learning organism which keeps changing to fulfill different learning needs. The approach of "openness" aims to create an unobstructed learning environment through the removal of traditional classrooms. The learning spaces are no longer bound by rigid walls, they can be joined or separated according to the needs. Extend the class to the common area and open terrace, or divide it into smaller groups are able to create dynamic learning scenarios. The flexibility also encourages students to pursue knowledge actively at their pace.

In the absence of permanent walls between classrooms, boundary of different functional spaces becomes intangible. Removable partitions and furniture are the alternatives to define space. In addition, color, texture, typologies of furniture are designated to different spaces so that children can easily orient themselves.

Nature

Natural elements will be brought into the campus. Daylight and natural ventilation are essential for healthy learning condition, integrated solution of lighting and ventilation system are applied as a complement. On the other hand, green zones such as courtyards, student farm, terrace and roof garden are infilled around the school. In order to reproduce the natural landscape, floor slabs undulate up and down gently, plants are scattered all over the indoor space. The holistic greenery design will stimulate people's senses when they walk through it. Furthermore, the plants and level difference helps to define the space as if in the nature.

Sustainability

Sustainable features are introduced to promote sustainable living quality. Skylight is conducive to facilitate natural ventilation and daylight; terrace gardens and roof garden act as natural insulation to absorb heat and noise. In the student farm, grey water recycling system is applied for irrigation. Students grow vegetables and supply to the cafeteria. Once children are involved in the process, it will influence their habit and values subconsciously.

Community

School is isolated from the community in Hong Kong. However facilities such as library, classrooms, sports facilities are underutilized after school hour and in the weekend. In this project, the school is opened up to reinforce the connection between school and the community after school hour and in the weekend. The school building will not be enclosed by peripheral fence but a public passage passes through the building; while greenery extends from the school site to the street to blur the boundary. Periodical exhibitions will be opened to the public along the passage and in the lobby showcases. Public facilities are housed on ground floor for neighbourhood's access in designated hours.

The above 4 approaches will interplay with one another in this project to embody an effective learning environment. The design concept is to create a **Continuous Learning Landscape** which simulates the nature and provides an unobstructed condition to encourage spontaneity of learning and evoke the senses of space.



Figure 5.3.2 Concept Image: Continuous Learning Landscape

Differences in the construction conditions between Finland and Hong Kong

Due to the urban context, cultural and climatic differences between Finland and Hong Kong, the requirements of functions and construction details are different.

Hong Kong is located in subtropical region which is relatively hot and humid. We have long summer and the weather is mild in winter. As a result, insulation layer is not necessary on the wall; and only about 40mm is applied on the roof. Thus wall and roof are much thinner compare to Finland. On the other hand, as the summer is long and hot, building setting is opposite from Finland. West facing window is avoided to prevent the strong afternoon sun from heating up the interior. The sun rises from the south-east in winter, thus opening on the east or southeast is preferable. It is also suitable for school building which is mainly occupied in daytime. As winter's weather is mild, outdoor activities are not limited. Playground, courtyards and garden are accessible all year round.

Hong Kong is popular in its density. The government guideline states that minimum floor area required for 612 persons at the age of 6 to 11 is 4 700m²; while for 1 200 persons at the age of 12 to 17 is 6 950m².^[1] Therefore average school building height is 24m or 6 storeys. Public transportation network is well-developed. Metro, bus and mini bus are the most popular way of travel; bike is not commonly used in Hong Kong.

In Hong Kong, people do not take off or change shoes when they get into the indoor space. Cloak room is not necessary for the thick winter coats. Students bring along their jackets to the classroom and put on their seat. There is no teacher changing room, changing rooms are normally used by student for P.E. class. The operation of cafeteria is also different, people place the order in the cashier counter and wait for their meal in another line. Food is prepared in the kitchen but not served in the buffer counter as in Finland.

¹ HONG KONG PLANNING DEPARTMENT. *Hong Kong Planning Standards and Guidelines - A Summary*. [Online] Available from: http://www.pland.gov.hk/pland_en/tech_doc/hkpsg/sum/ch3/ch3_sum.htm. [Accessed: 25th September 2015].

5.4 Spatial Strategies

“Openness” is the starting point of my design intent. Nevertheless, how to arrange an open space systemically is a challenge. Every single functional space is considered as an important element to constitute the overall dynamic learning environment. They are not fragments of an entity, each independent element joins the next to form an indeterminate whole. Thus we have to understand the internal relationships of the elements and the sequences of events happen within them. It is a bottom-up process to generate the form through the prescribed spatial strategies.

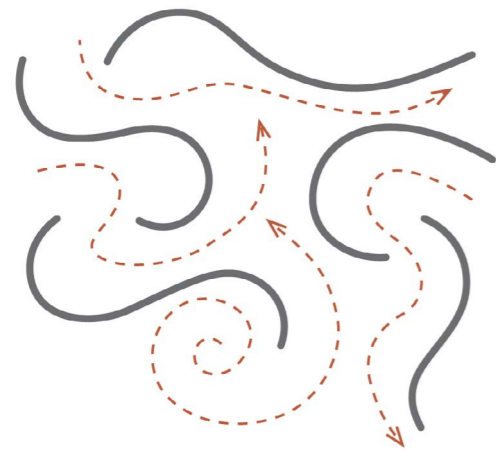


Figure 5.4.1 Fluid Movement

Fluid Movement

Replaced the confined classrooms with temporary partitions such as removable furniture, plants and curtains. The openness allows free flow among different spaces to facilitate learning accessibility. Circulation is not limited by a single route but from all directions.



Figure 5.4.2 Towada Community Plaza, Kengo Kuma

Undulating Landform

Undulating ground provides continuous space to connect different levels which are generated by the needs of various classrooms to ensure smooth movement on the entire school building. In addition, the up and down man-made terrain creates interesting spatial experience like a huge playground.



Figure 5.4.3 Rolex Learning Center, SANAA

“The artist establishes the conditions within which the material will be deployed, and then proceeds to direct its flows.”

- Stan Allen, *Field Conditions*

“Amoeba-like” Learning Spaces

Amoeba alters their shape by extending and retracting their pseudopods for movement and feeding. In school building, although every single space has been assigned primary function, the configuration of the space and the combination of space are changeable as amoeba motions. Learning space is an organism, it interacts with the juxtaposed spaces and free to convert the shape to fulfill different study scenarios. Stan Allen claimed that, “local relationships are more important than overall form, time and process become decisive variables in making the work. The generation of form is through sequences of events.”¹ Human movement is complex and unpredictable, how humans use the space determine its form. Therefore, shaping the learning space is a fluid bottom-up process as a result of incremental growth according to the actual needs but not confined by a matchbox.

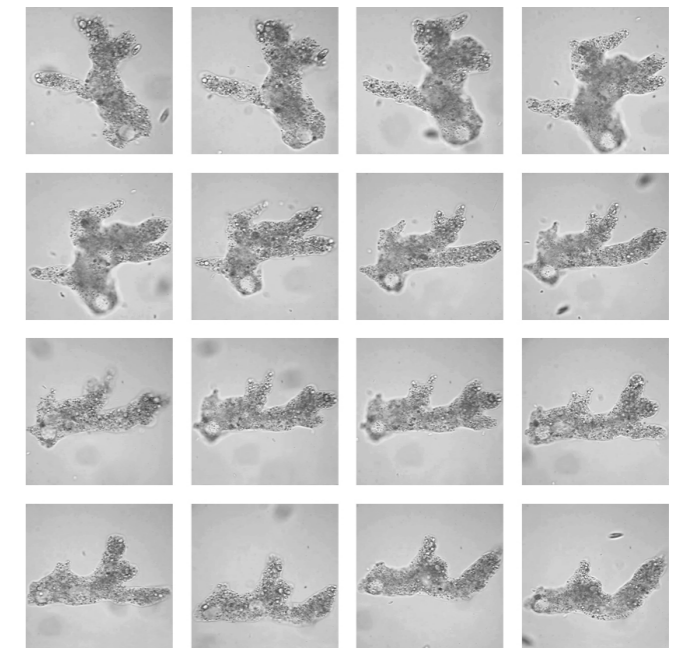


Figure 5.4.4 Analogy between changes of learning spaces and amoeba movements

¹ ALLEN, S. (2009) From Object to Field: Field Conditions in Architecture and Urbanism. In: *Practice: Architecture, Technique and Representation*. London: Routledge. p. 128.

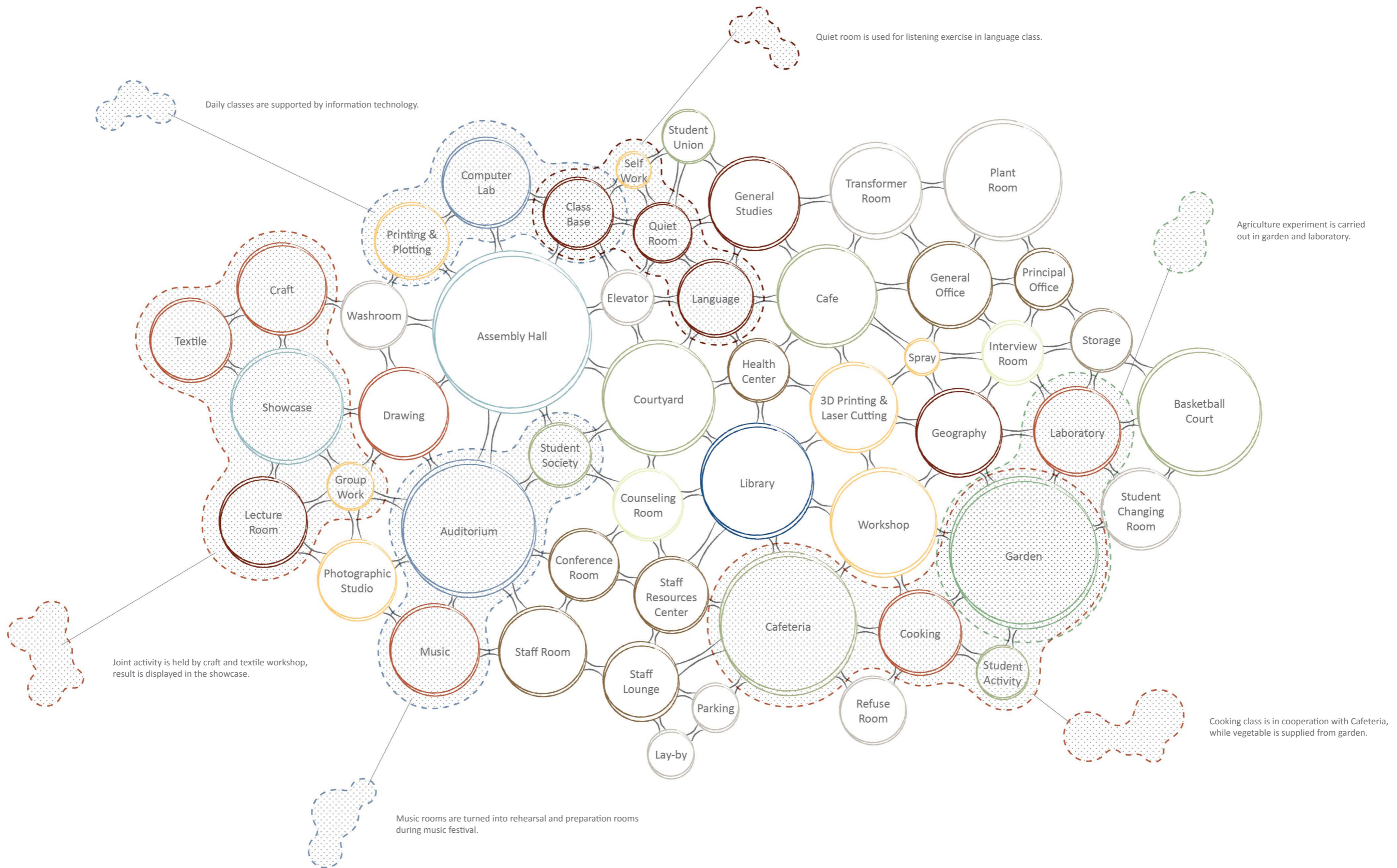


Figure 5.4.5 Programs intertwine with one another to form diversified learning scenarios.

5.5 Design Development

Growing of Space

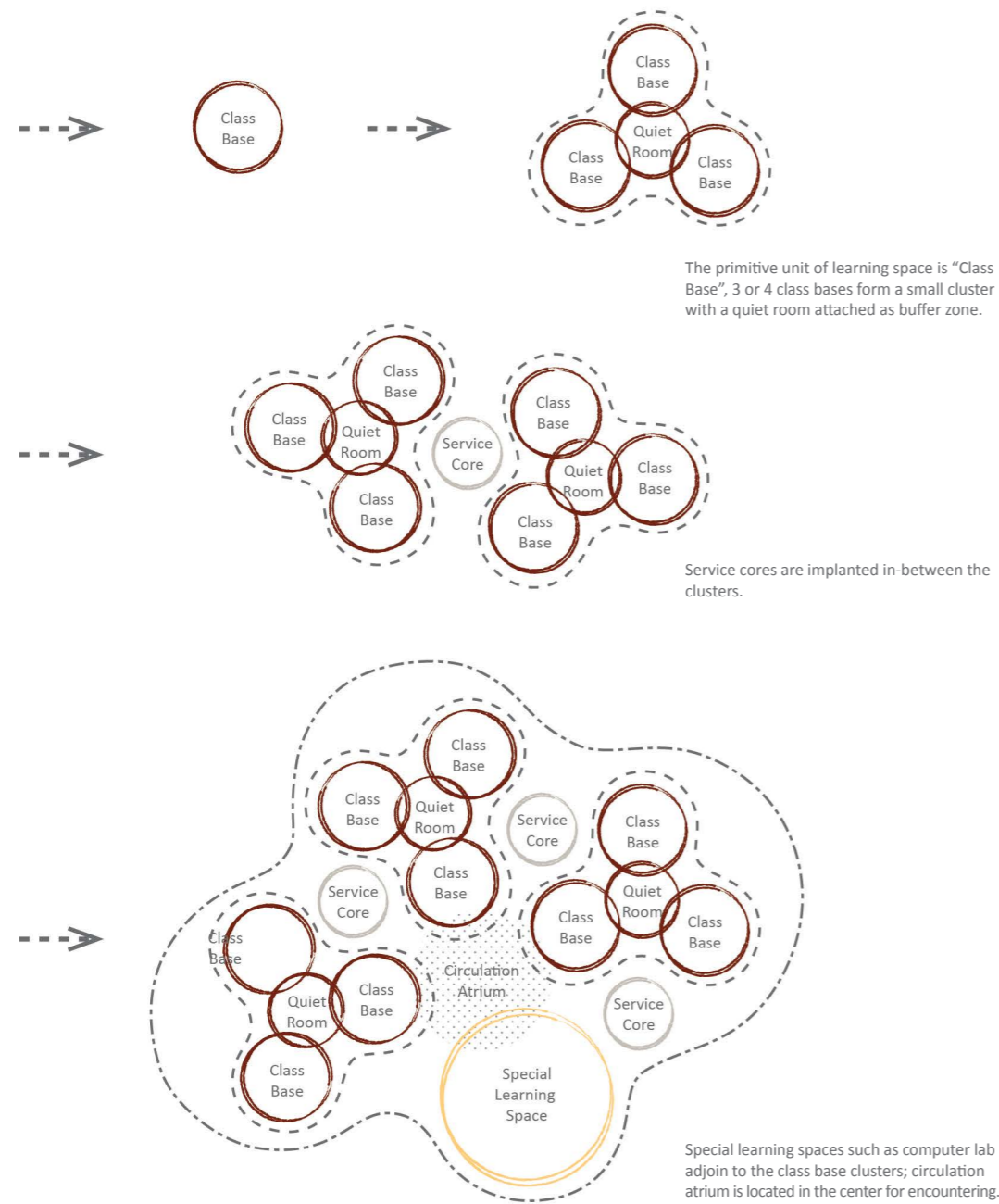


Figure 5.5.1 Growing of Space

Programs Arrangement

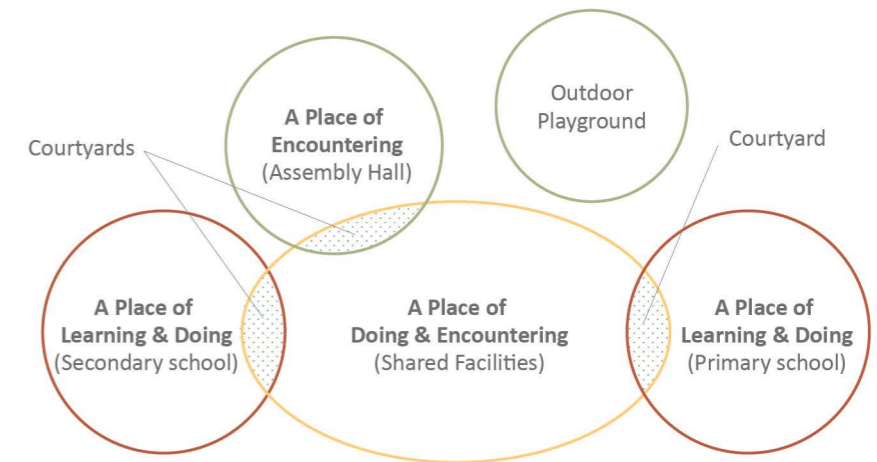


Figure 5.5.2 Programs arrangement on plan

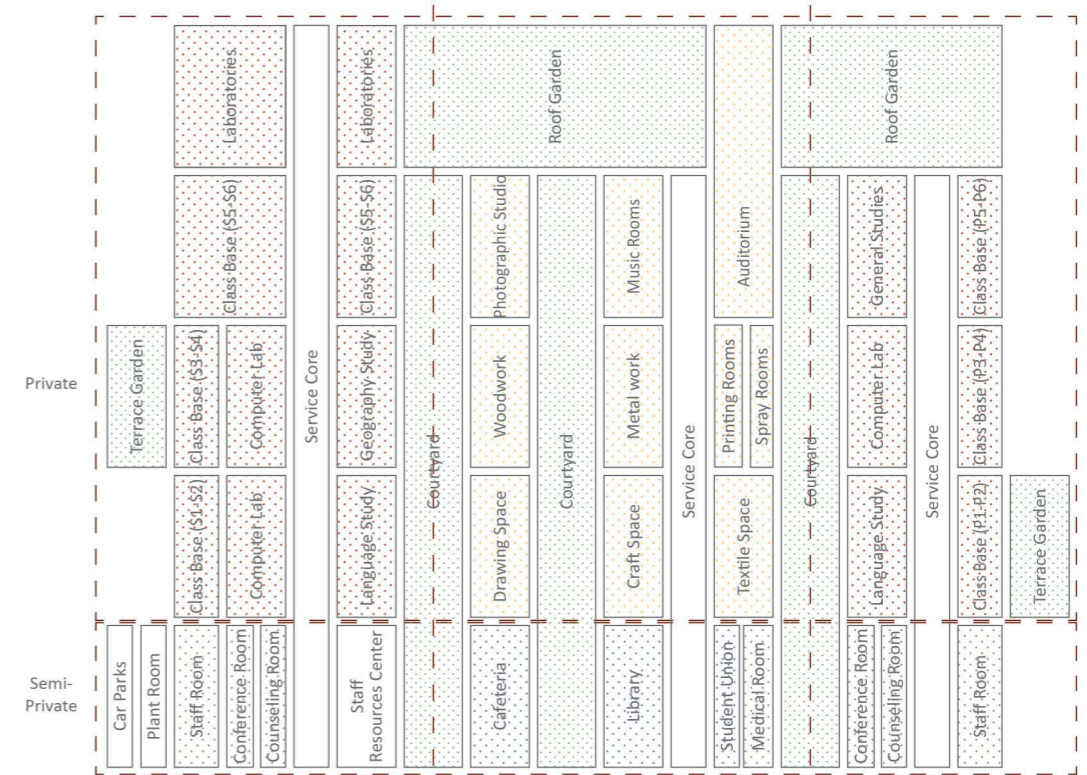
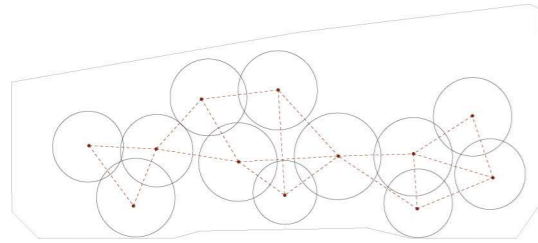
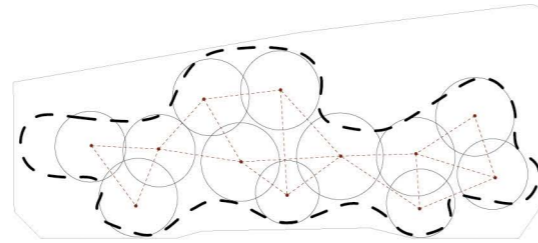


Figure 5.5.3 Vertical program arrangement

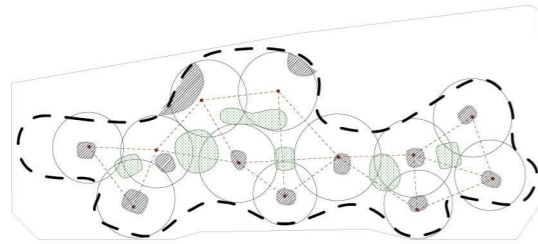
Learning Landscape



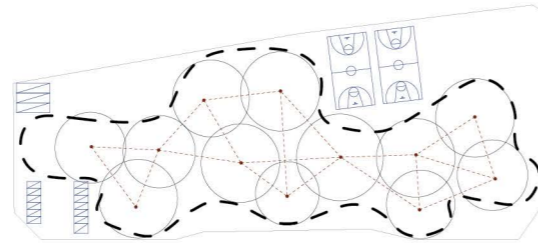
Programs are inter-connected with one another in one open space to facilitate free movement from all directions.



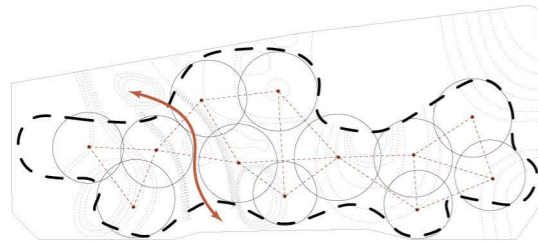
Growing of the space shapes the building in organic form.



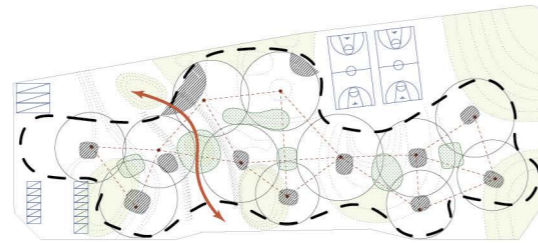
Service cores are implanted in each small learning cluster. While courtyards and circulation atria are infilled to bring in greenery, daylight and natural ventilation.



Parking and school bus lay-by are placed in the north while basketball courts are placed in the south-east to enjoy daylight.



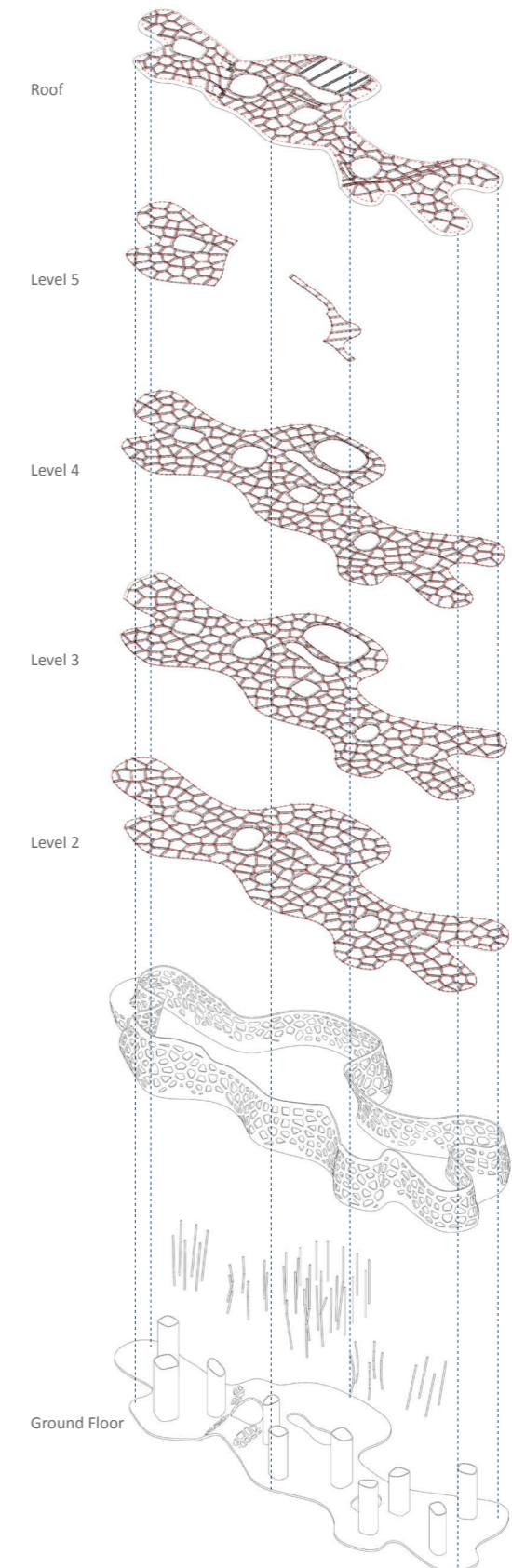
Man-made terrain is created to enhance sensory experience. The undulating landscape extends into the interior to eliminate the boundary between indoor and outdoor. A public passage passes through the courtyard on the ground floor to connect the school with the community.



The learning landscape introduces natural elements into the built environment and provides a holistic solution to evoke children's senses.

Figure 5.5.4 Learning Landscape

Structural System



Slabs are mainly supported by beams except in the assembly hall where truss structure is applied for the wide span space.

Facade is constructed by fair-faced concrete as supportive structure on the skin.

Service cores perform the primary structure and is supplemented by columns to support the periphery of the atria.

Figure 5.5.5 Structural System

Sustainability

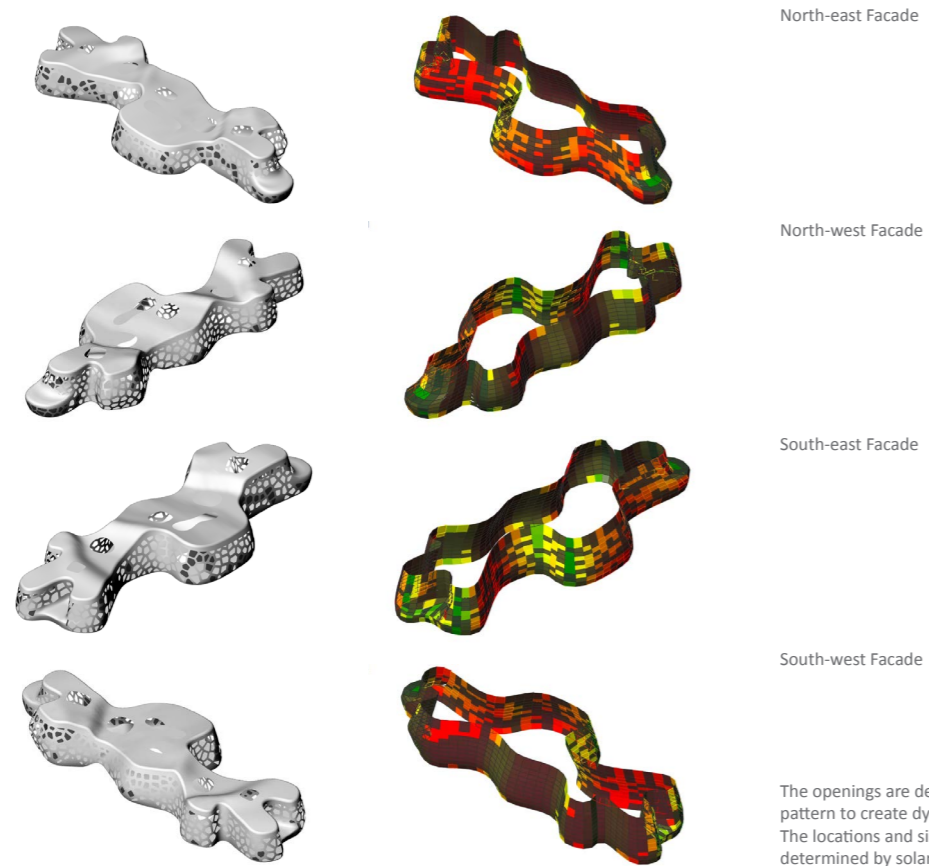


Figure 5.5.6 Solar Analysis

North-east Facade

North-west Facade

South-east Facade

South-west Facade

The openings are designed in voronoi pattern to create dynamic and vibrant skin. The locations and sizes of the openings are determined by solar path. Smaller openings can avoid strong sun in summer.

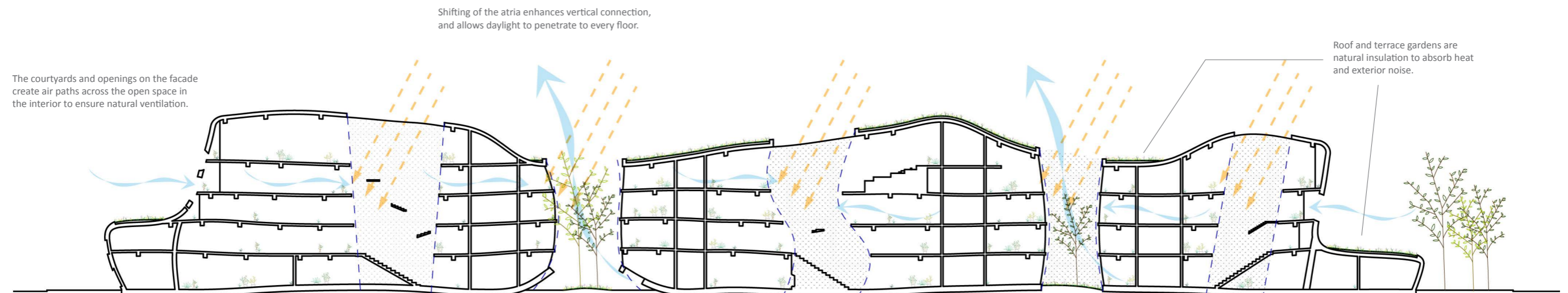
Acoustic Solutions

Noise is a critical issue in open plan school. In order to minimize the noise disturbance between class bases, following noise control measures will be taken:

- 1. Setting** : Smaller class group (20 students per class) is recommended in this school, less than 4 class bases are placed side by side to control occupant density and noise in the same area.
- 2. Quiet room** : Quiet room is the buffer zone to separate the class bases, it also provides quiet environment for critical listening exercises.
- 3. Temporary partition** : Removable partition walls and furniture such as cabinets and student lockers are installed with sound insulation layer to enhance acoustic effect. The height of the partitions can cut off the line of sight to reduce visual disturbance.
- 4. Enclose the noisy spaces** : Music rooms and workshops are shut down by removable partitions and glass wall respectively.
- 5. Soundproof curtain** : Curtain can reduce both auditory and visual distractions. It encloses the entire space to ensure the privacy.
- 6. Ceiling acoustic system** : Sound absorption panels are suspended from the ceiling to reduce noise as it is effective to shorten reverberation time and also control reverberant noise build up and noise transmission to the adjacent spaces. In addition, they can act as false ceiling to cover the services running above it.
- 7. Carpet** : Carpeted flooring can control the footfalls and other impact noise such as furniture movement and falling of objects.



Figure 5.5.8 Sound absorption suspended panels



The courtyards and openings on the facade create air paths across the open space in the interior to ensure natural ventilation.

Shifting of the atria enhances vertical connection, and allows daylight to penetrate to every floor.

Roof and terrace gardens are natural insulation to absorb heat and exterior noise.

Figure 5.5.7 Nature is extended to the interior

5.6 Design Outcome



Figure 5.6.3 Site Plan 1:2 000



Figure 5.6.1 Site Section A 1:2 000

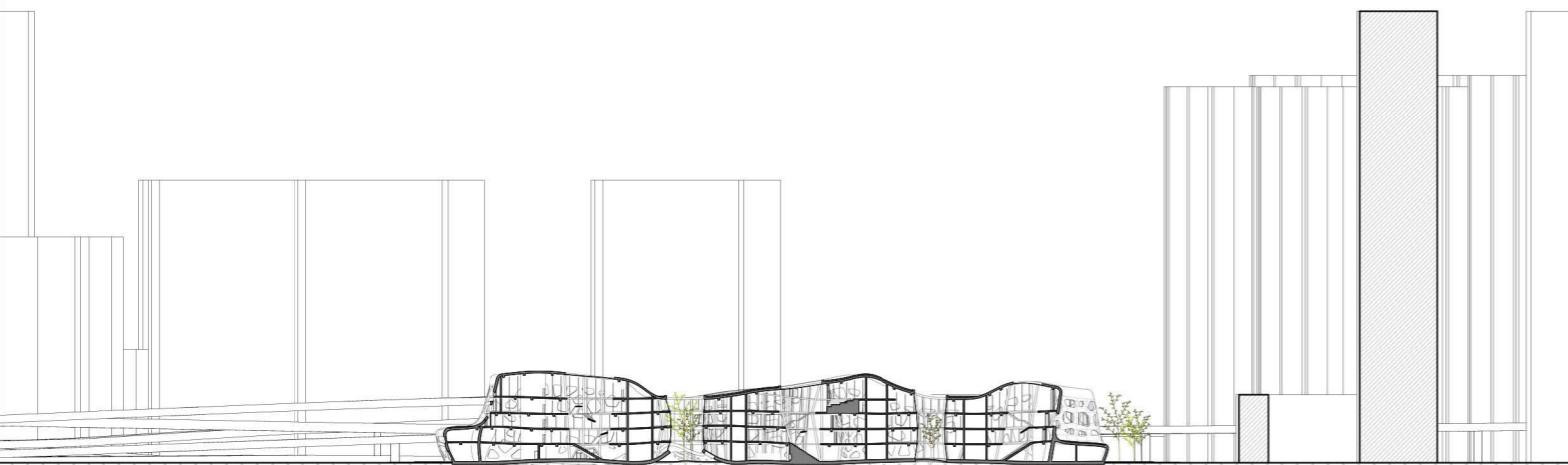


Figure 5.6.2 Site Section B 1:2 000



- 1. School-Bus Lay-by
- 2. Plaza
- 3. Transformer Room
- 4. Plant Room
- 5. Parking
- 6. Staff Room
- 7. Staff Lounge
- 8. Storage
- 9. Counseling Room
- 10. Interview Room
- 11. Staff Resources Center
- 12. Conference Room
- 13. Lobby Showcase
- 14. Student Activity Room
- 15. Refuse Storage
- 16. Cafeteria Kitchen
- 17. Cooking Room
- 18. Cafeteria
- 19. Cafeteria Staff Room
- 20. Cafe
- 21. Courtyard
- 22. Library
- 23. Student Union
- 24. Student Societies
- 25. Health Center
- 26. General Office
- 27. Principal Office
- 28. Student Farm
- 29. P.E. Storage
- 30. Student Changing Room

SHING KAI ROAD

+5.5



Figure 5.6.4 Ground Floor Plan 1:500

- 1. Lecture Room
- 2. Class Base
- 3. Quiet Room
- 4. Computer Laboratory
- 5. Group Work Room
- 6. Self Working Station
- 7. Language Study Space
- 8. Storage
- 9. Preparation Room
- 10. Assembly Hall
- 11. Drawing Space
- 12. Textile Workshop
- 13. Student Pantry
- 14. Craft Space
- 15. Terrace Garden



Figure 5.6.5 Level 2 Floor Plan 1:500

- 1. Terrace Garden
- 2. Class Base
- 3. Quiet Room
- 4. Computer Laboratory
- 5. Group Work Room
- 6. Self Working Station
- 7. Geography Study
- 8. Storage
- 9. Group Work Space
- 10. Printing & Plotting Room
- 11. Spray Room
- 12. 3D Printing & Laser Cutting Room
- 13. Student Pantry
- 14. Metal Working Workshop
- 15. Wood Workshop
- 16. Computer Laboratory

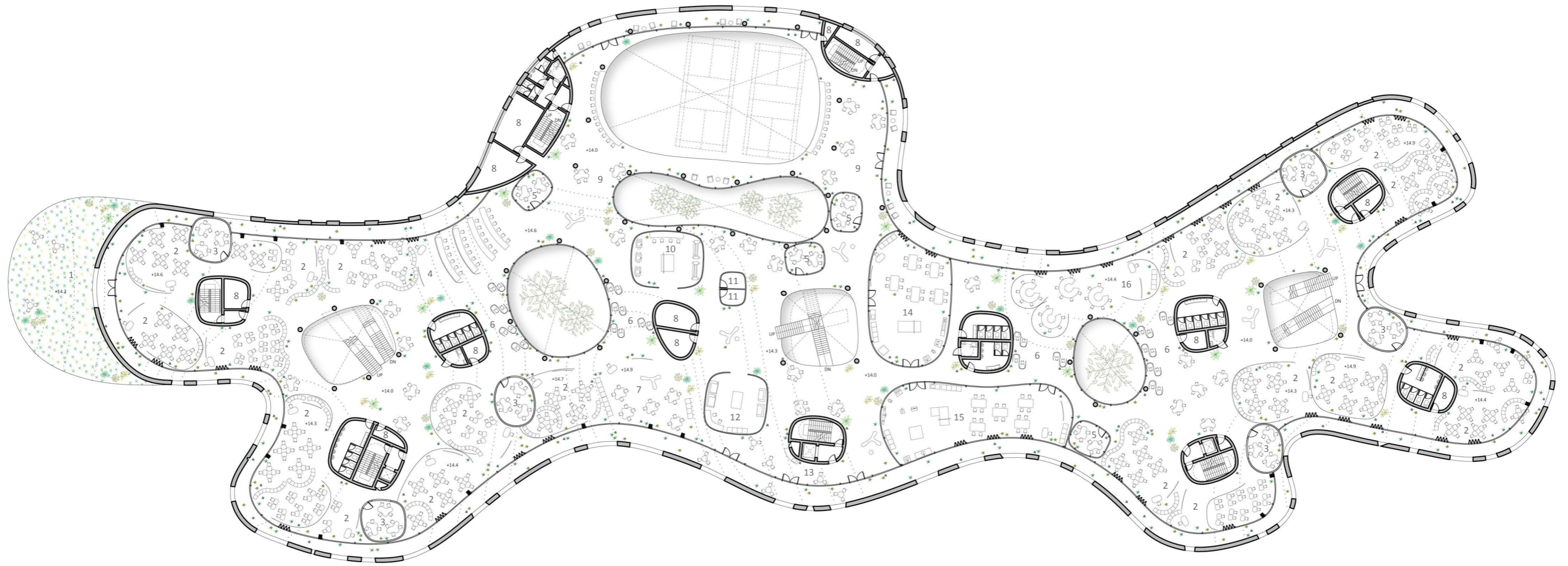


Figure 5.6.6 Level 3 Floor Plan 1:500

- 1. Music Room
- 2. Class Base
- 3. Quiet Room
- 4. Auditorium
- 5. Group Work Room
- 6. Self Working Station
- 7. Photographic Studio
- 8. Group Work Space
- 9. General Studies Space

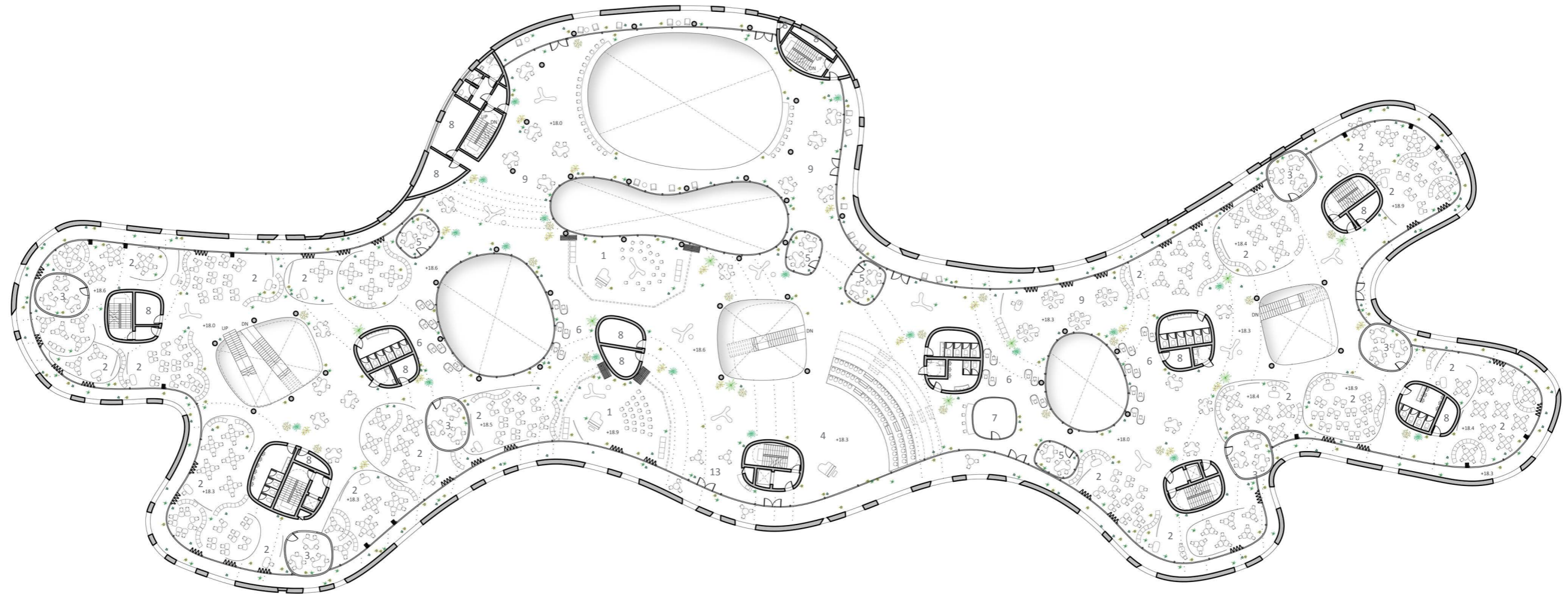


Figure 5.6.7 Level 4 Floor Plan 1:500

- 1. Laboratory
- 2. Storage
- 3. Roof Garden
- 4. Ramp to Roof Garden
- 5. Auditorium

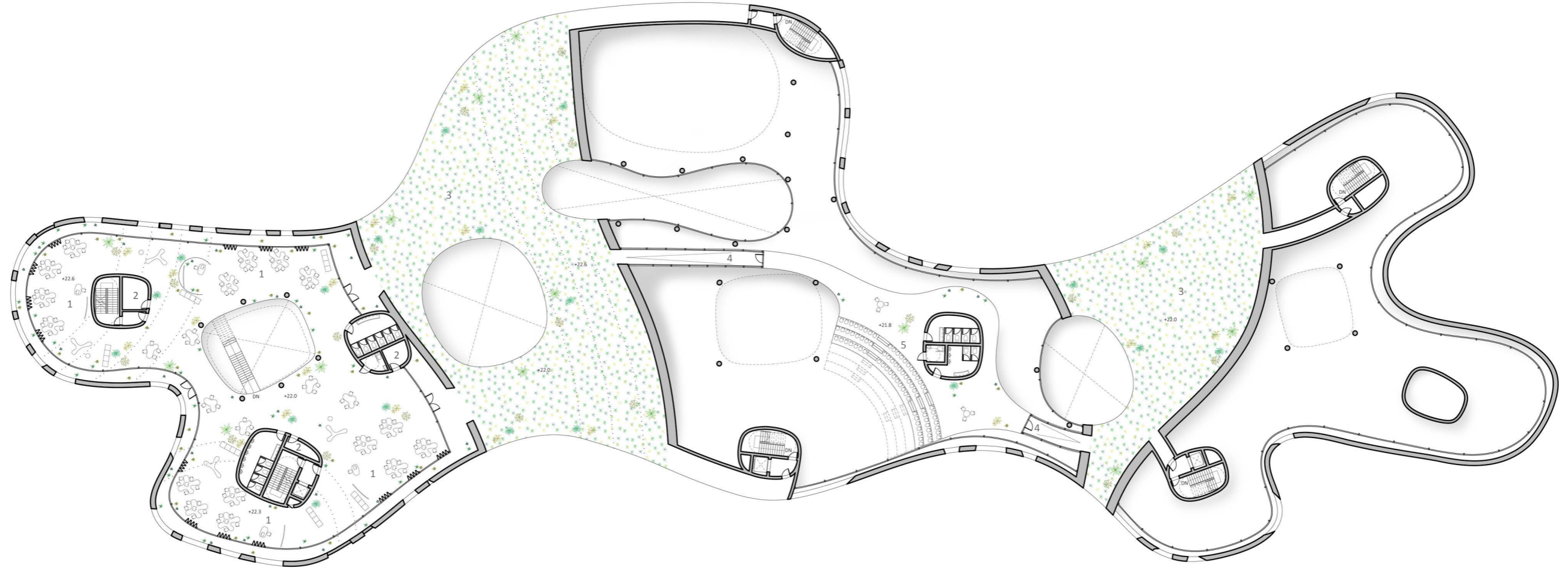


Figure 5.6.8 Level 5 Floor Plan 1:500

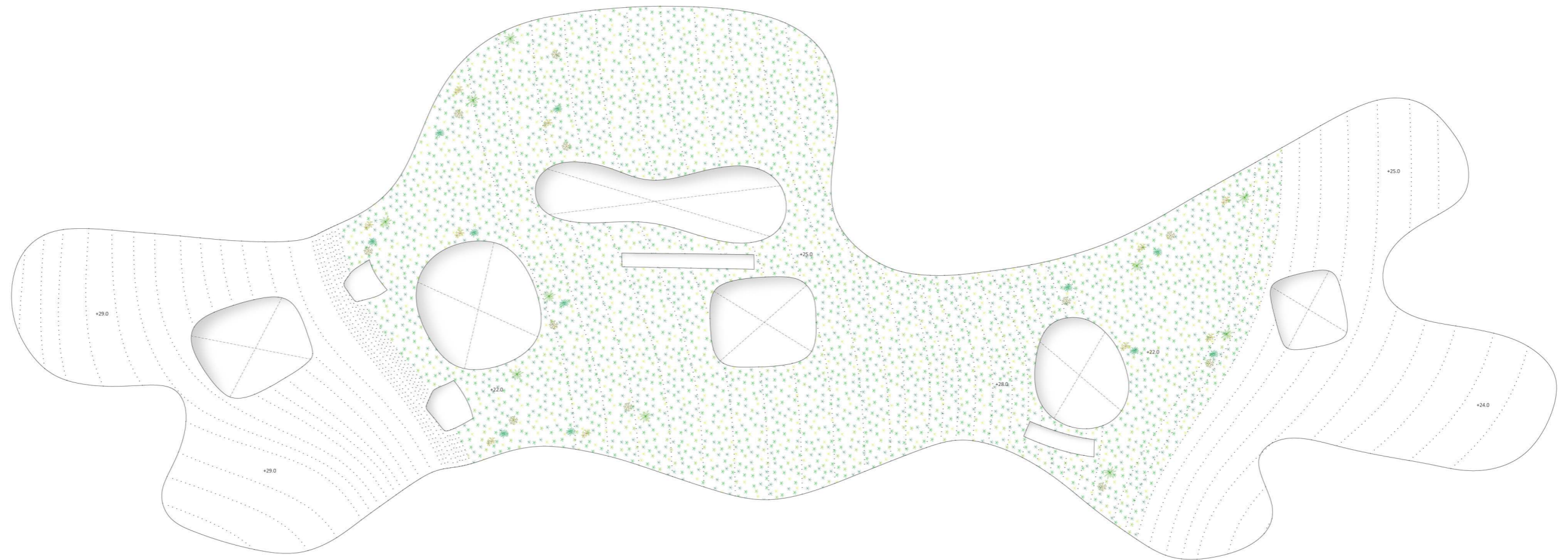
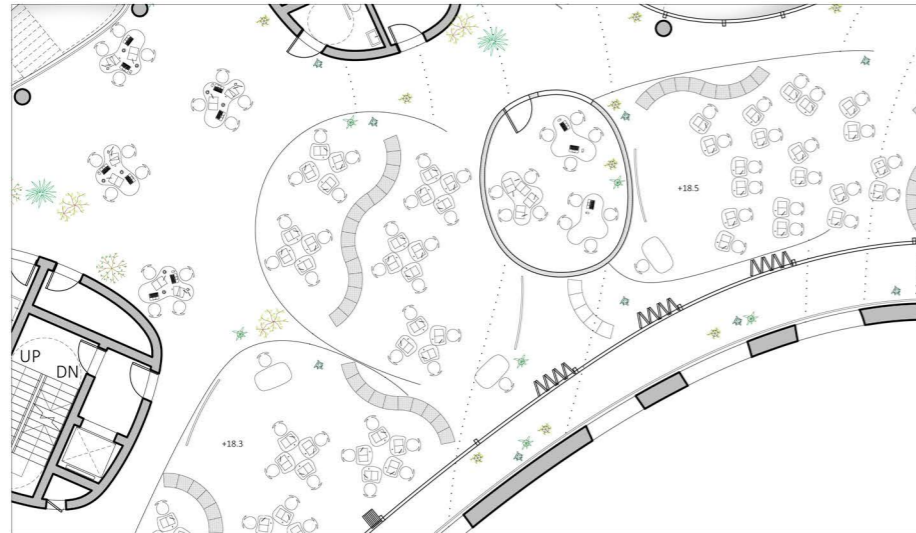
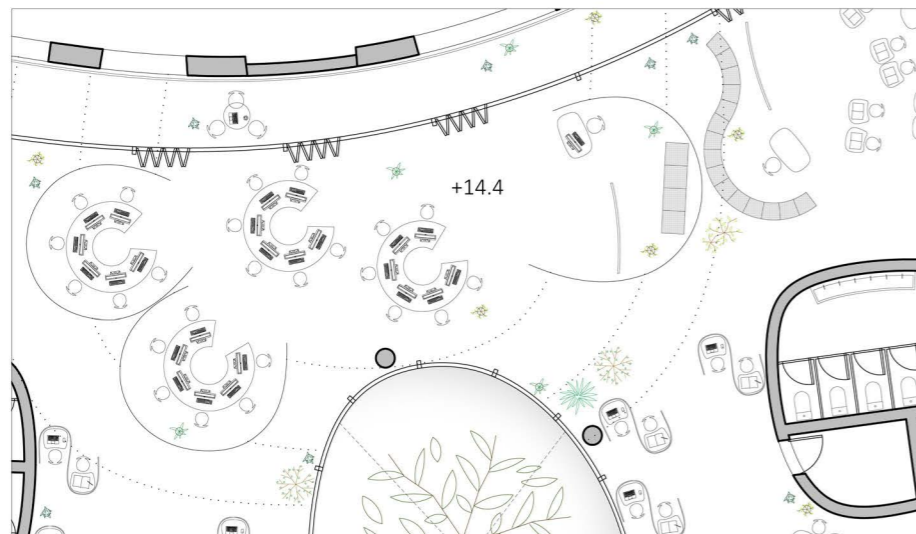


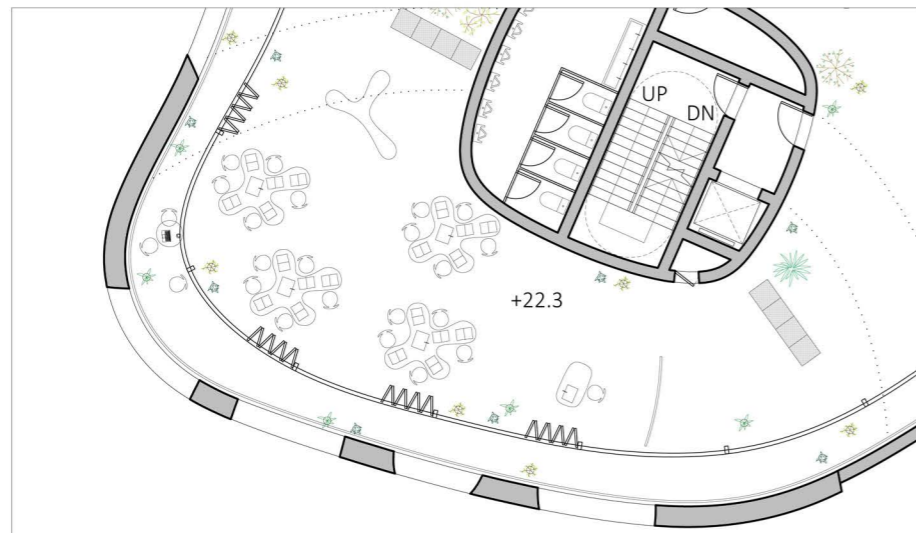
Figure 5.6.9 Roof Plan 1:500



Class Bases



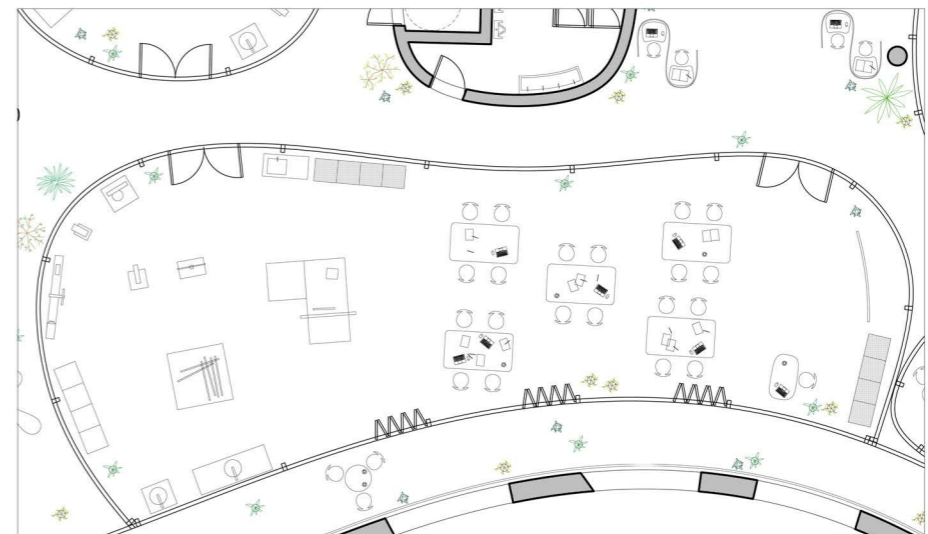
Computer Laboratory



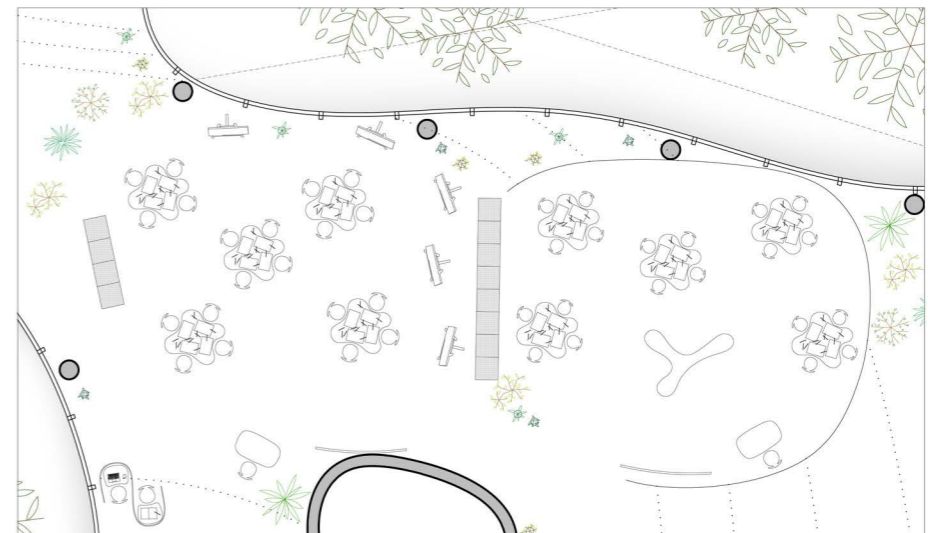
Laboratory



Music Room is separated by removable soundproof partitions



Wood Workshop enclosed by glass wall



Drawing Spaces

Figure 5.6.10 Typologies of Basic Learning Spaces 1:200

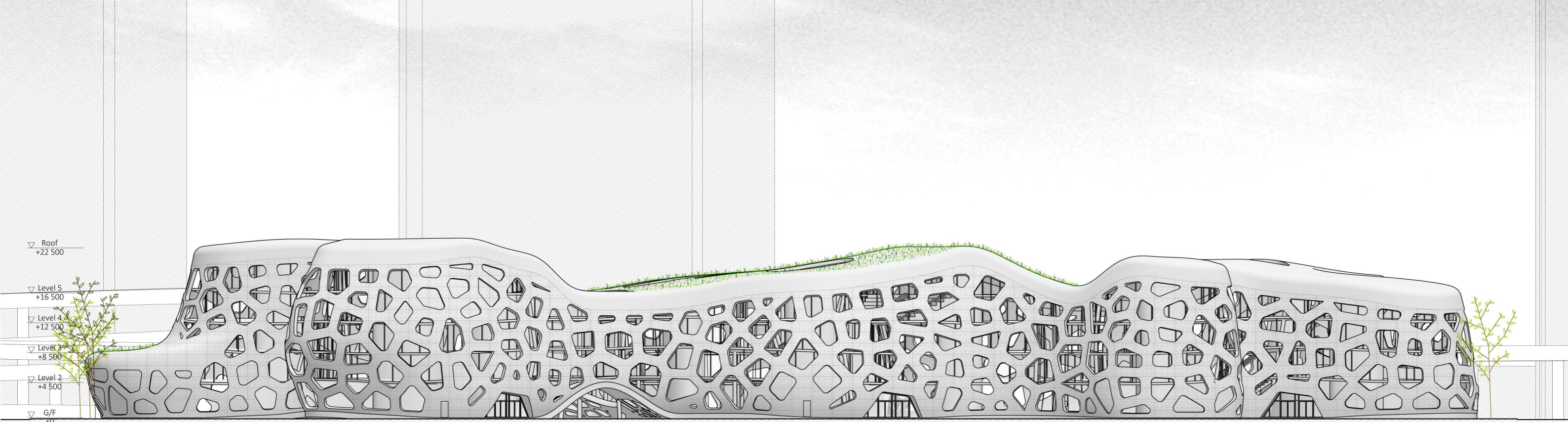


Figure 5.6.11 West Elevation 1:500

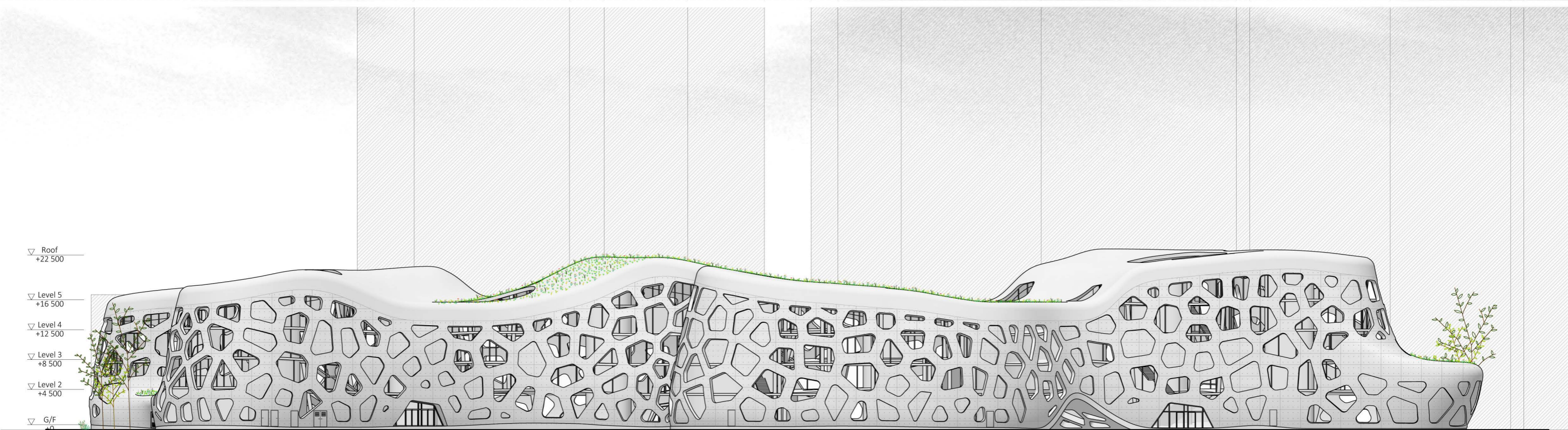


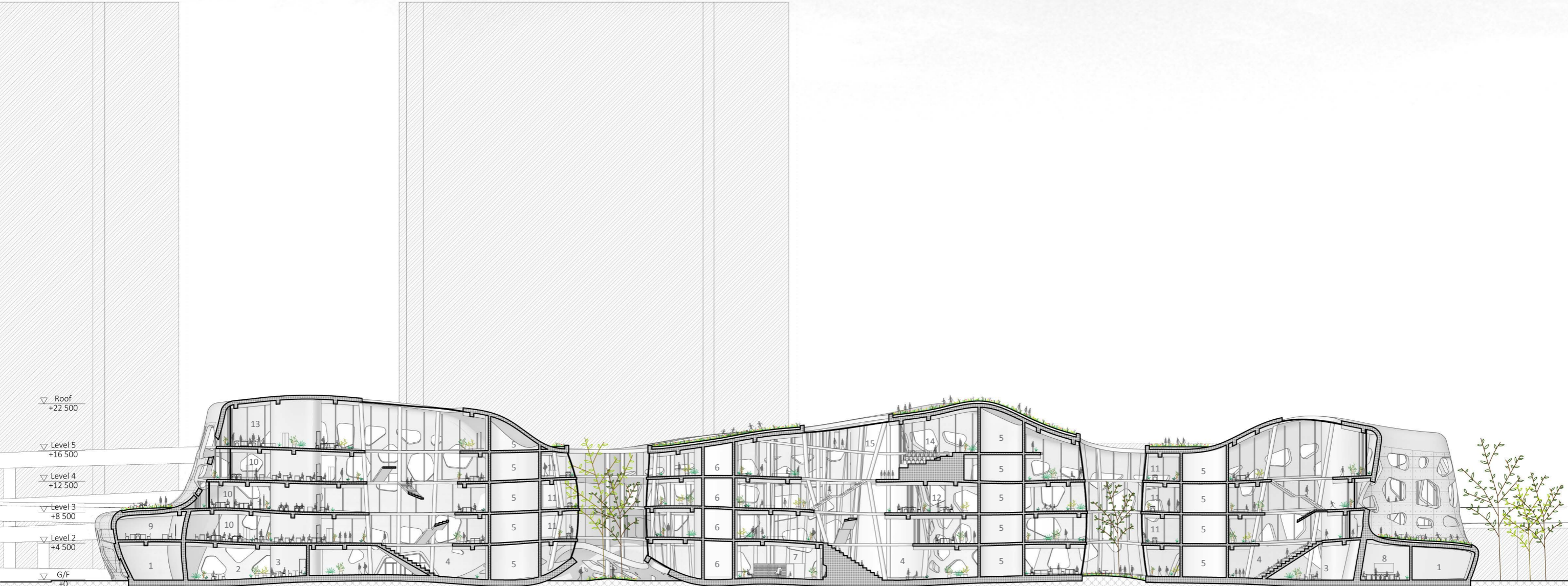
Figure 5.6.12 East Elevation 1:500



Figure 5.6.13 South Elevation 1:500



Figure 5.6.14 North Elevation 1:500



- 1. Plant Room
- 2. Staff Room
- 3. Staff Lounge
- 4. Lobby & Gallery
- 5. Washroom
- 6. Storage
- 7. Library
- 8. Conference Room
- 9. Lecture Room
- 10. Class Base
- 11. Self Working Station
- 12. Metal Working Workshop
- 13. Laboratory
- 14. Auditorium
- 15. Ramp to Roof Garden

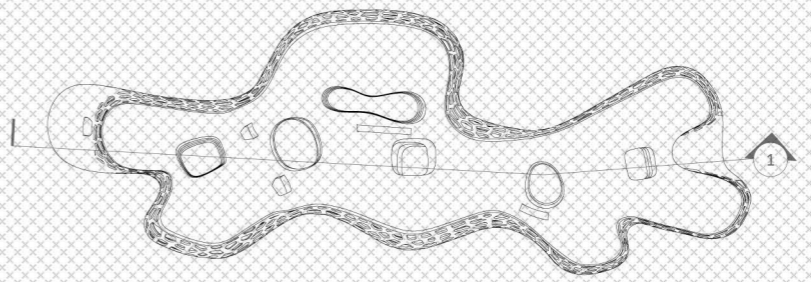


Figure S.6.15 Section 1 - 1:500

▽ Roof
+22 500

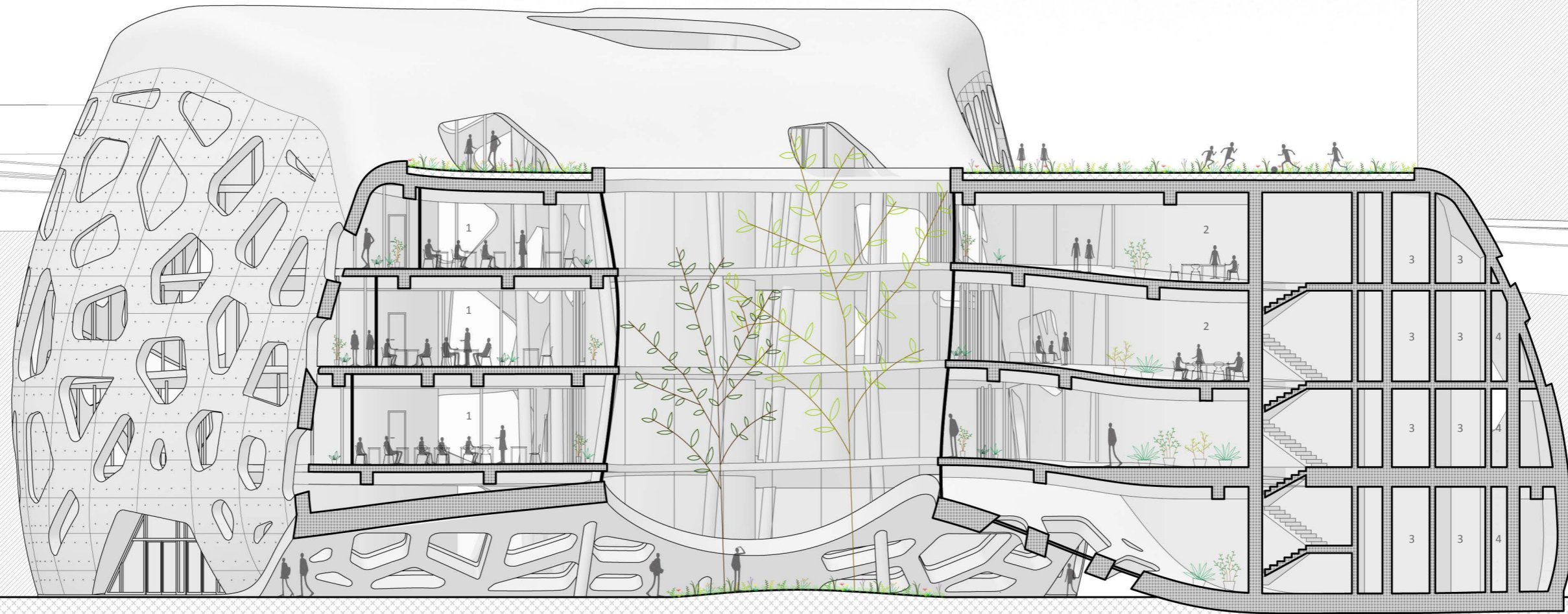
▽ Level 5
+16 500

▽ Level 4
+12 500

▽ Level 3
+8 500

▽ Level 2
+4 500

▽ G/F
0



- 1. Class Base
- 2. Group Work Space
- 3. Washroom
- 4. Storage

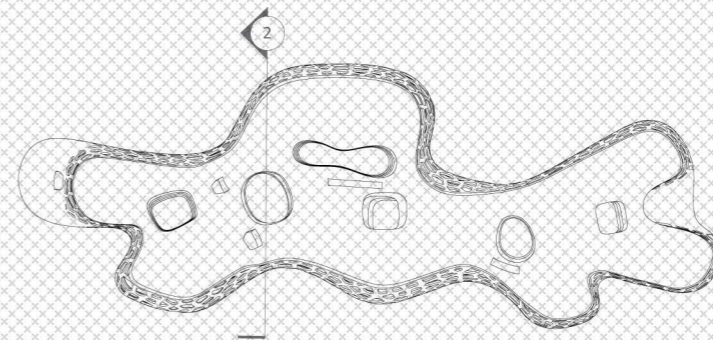


Figure 5.6.16 Section 2 - 1:200

▽ Roof
+22 500

▽ Level 5
+16 500

▽ Level 4
+12 500

▽ Level 3
+8 500

▽ Level 2
+4 500

▽ G/F
0

1. Library Study Room
2. Stair Core
3. Library
4. Cafeteria
5. Student Pantry
6. Group Work Room
7. Assembly Hall
8. Exit to Roof Garden

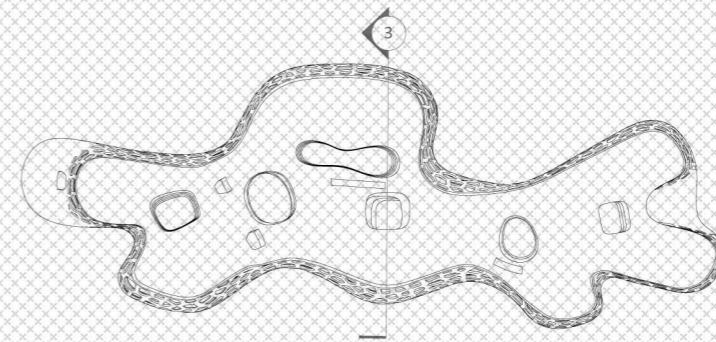


Figure 5.6.17. Section 3 - 1:200

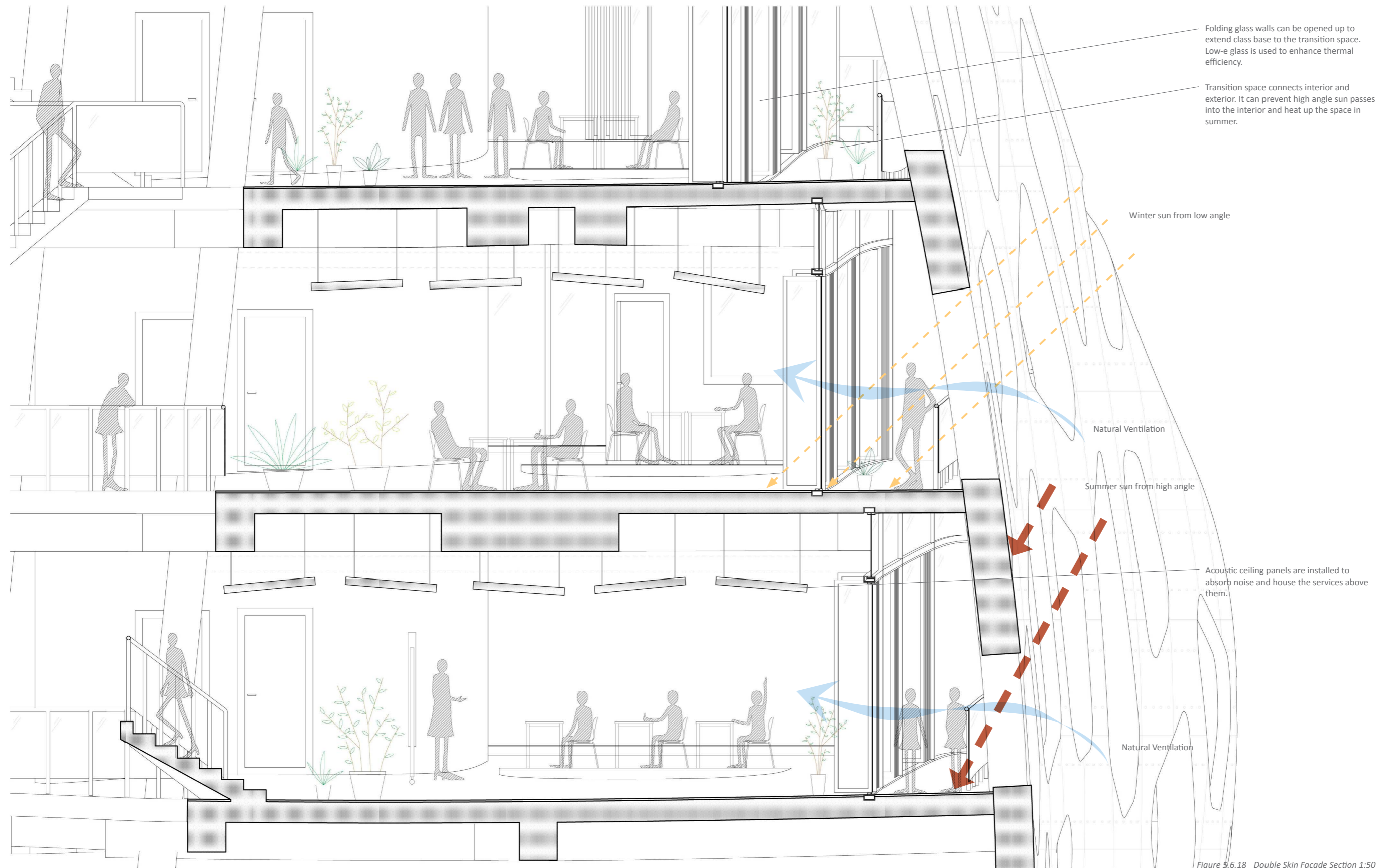


Figure 5.6.18 Double Skin Facade Section 1:50

Figure 5.6.19 Exterior View

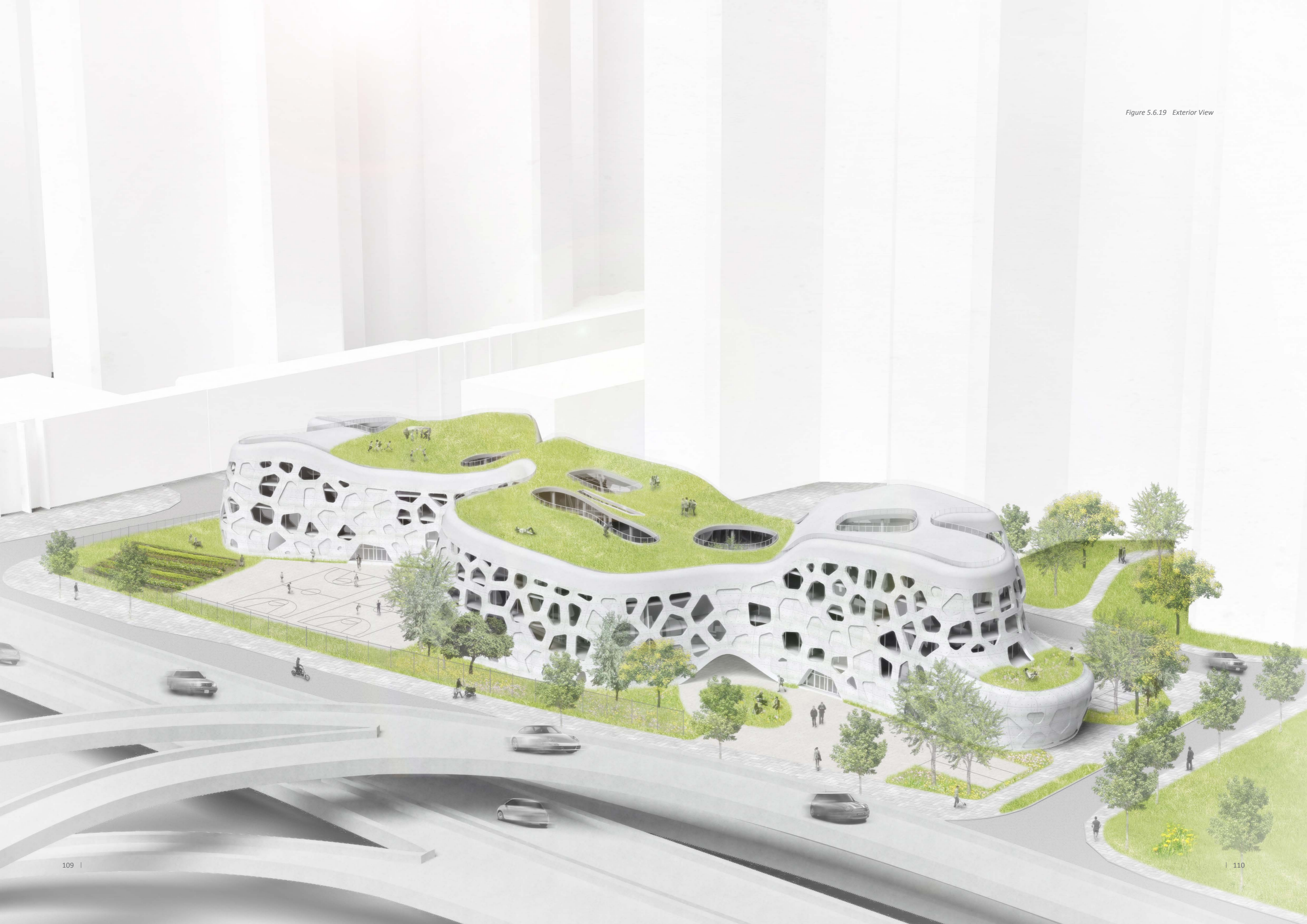


Figure 5.6.20 West Entrances



Figure 5.6.21 Lobby and Gallery



Figure 5.6.22 Courtyard



Figure 5.6.23 Library



Figure 5.6.24 Class Base

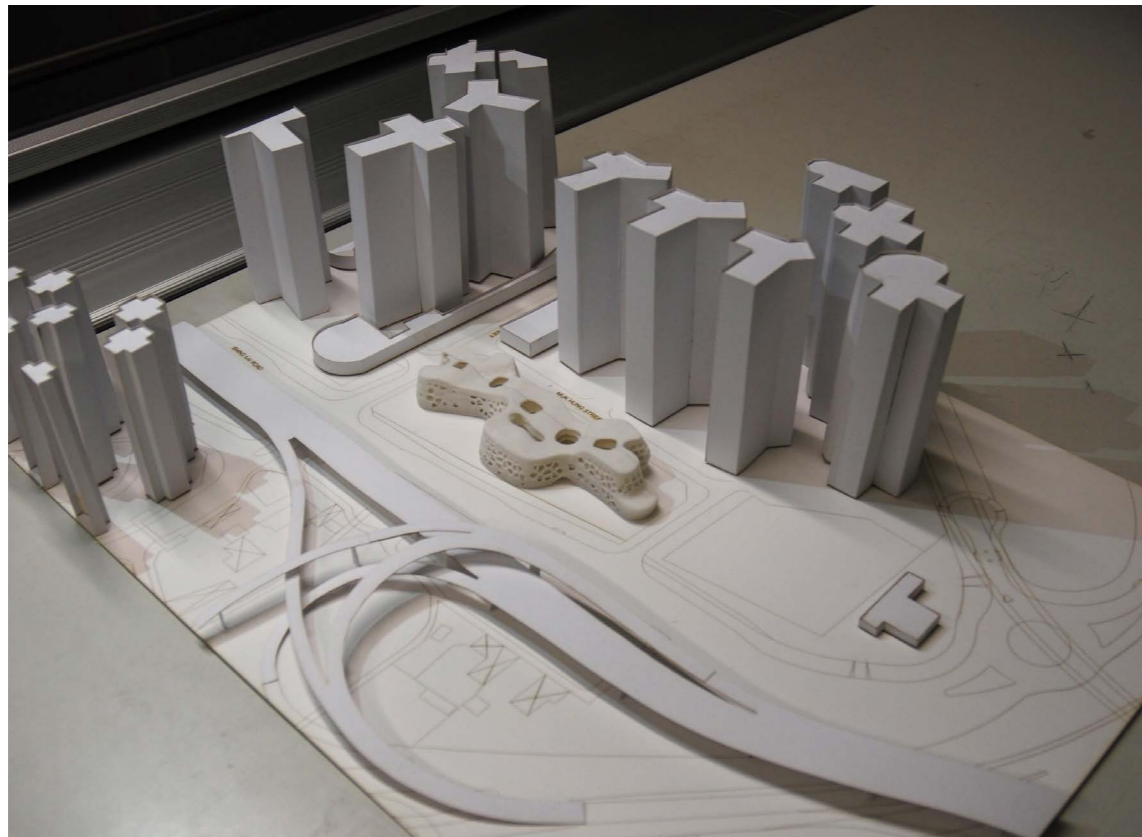


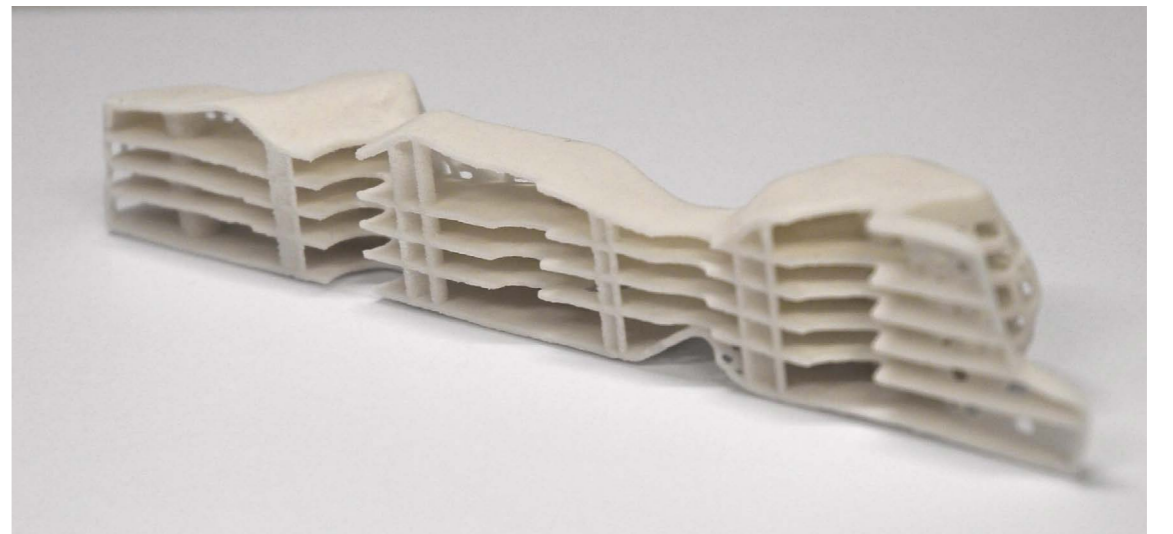
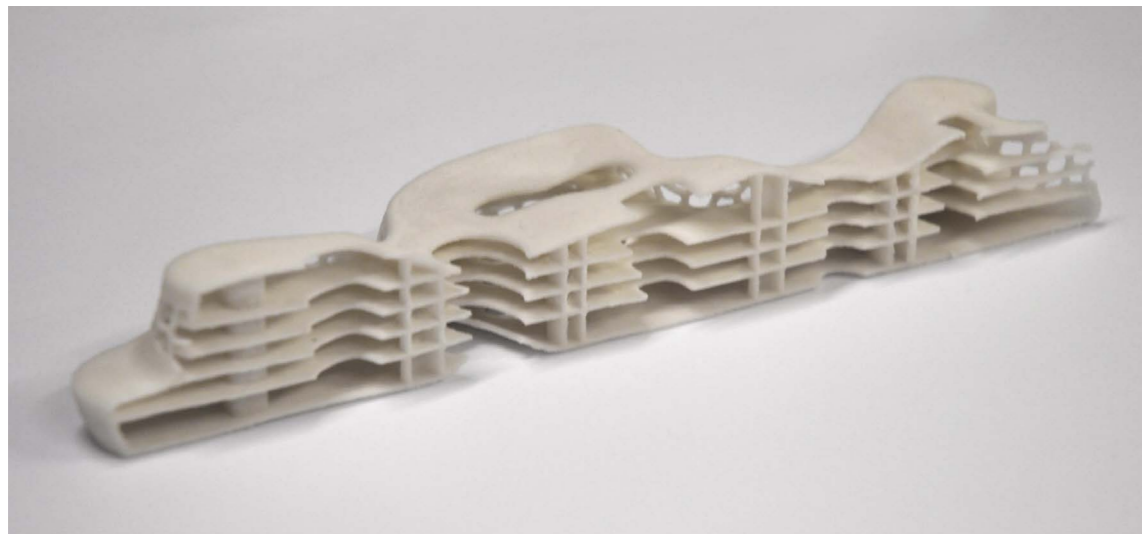
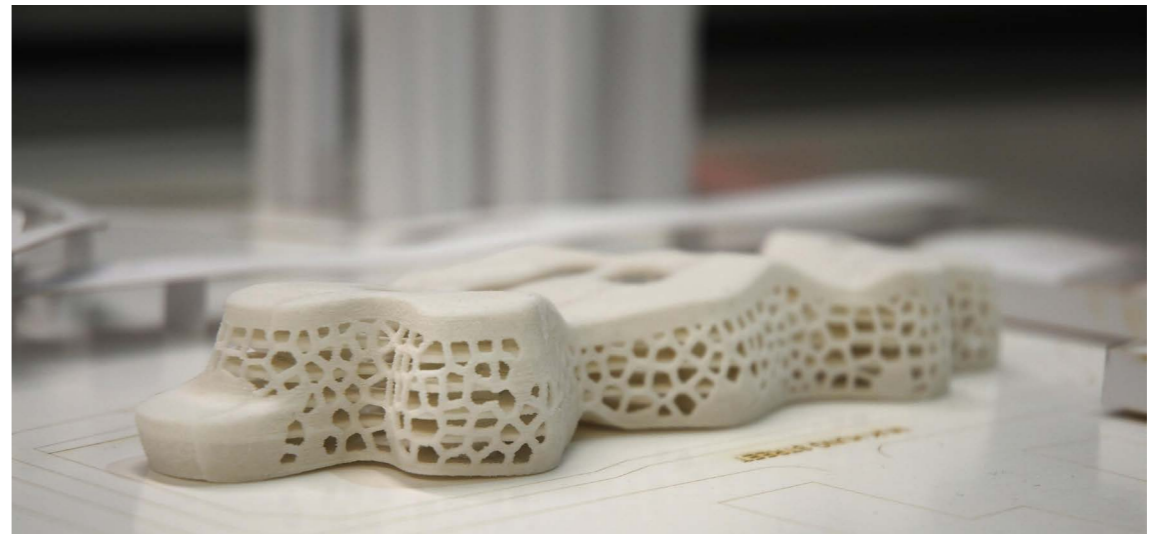
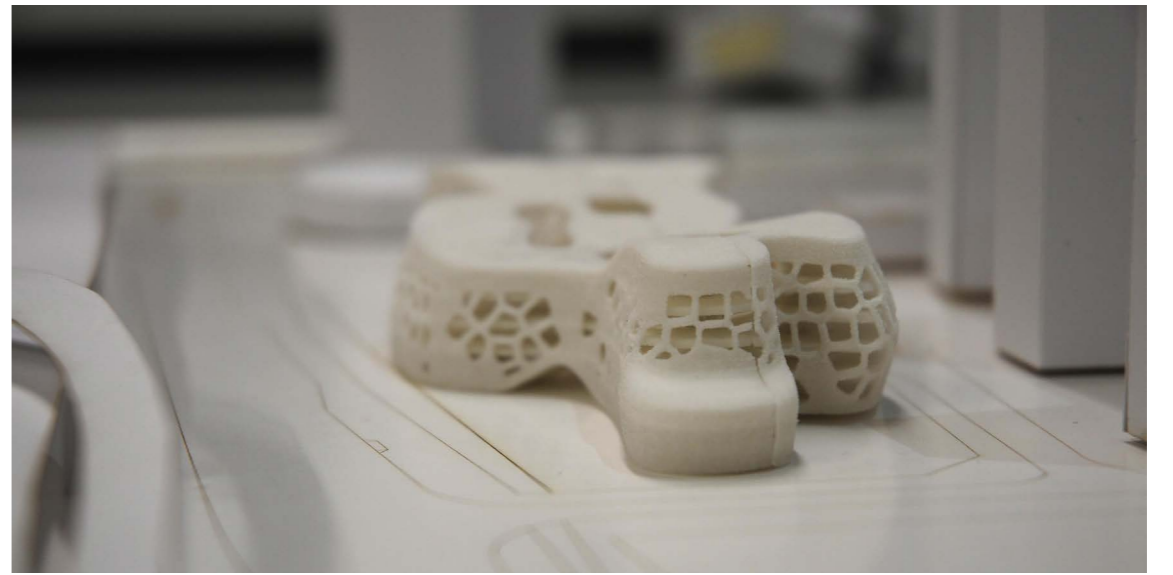
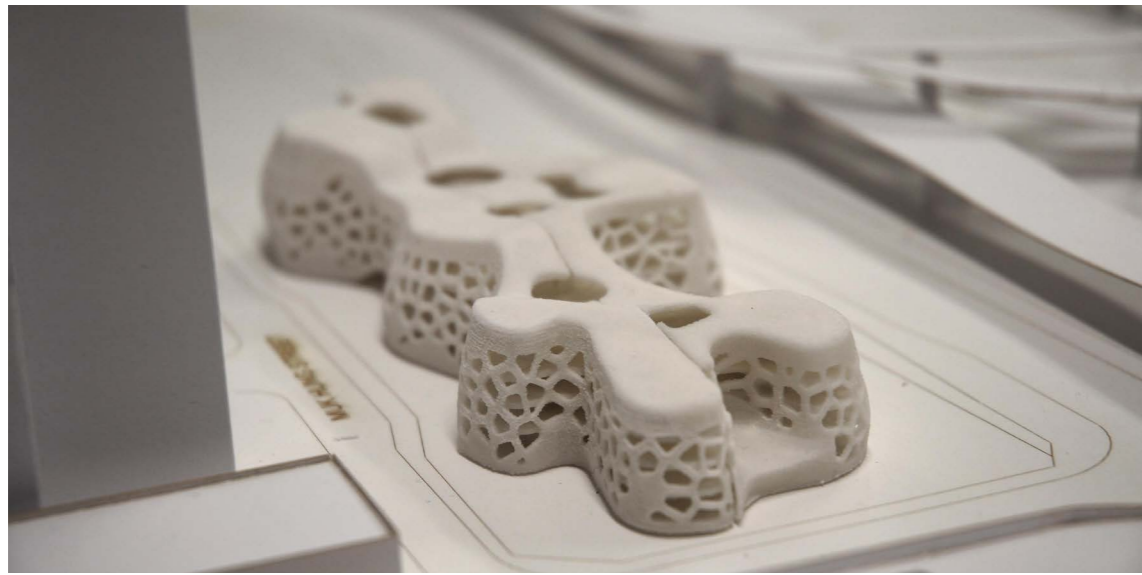


Figure 5.6.25 Common Space for working and encountering



Figure 5.6.26 Undulating floor generates vibrant school life





06 CONCLUSION

Conclusion

Education plays an important role for the development of children. The influence is not only to oneself but to the society. How the children grow up and what they are taught will change the future world. Hong Kong students are suffered from the score-oriented education system and poor learning environment which suppress their imagination, creativity, communication skill and aestheticism. The city becomes highly materialistic and people pay less attention to the spatial quality, while this situation resulted in building a worse city in the past decades. In order to instill the awareness of built environment in the children, a paradigmatic school is proposed to act as a pedagogical tool in this project.

The studies discussed in the previous parts have explicated the benefits of open education and the criteria of building good physical learning environment. On the basis of these studies and exemplifies Finnish learning environment, four approaches are implemented in this thesis to build a model school: openness, nature, sustainability and community. An open plan school creates the sense of freedom, enhances accessibility and allows flexible reconfiguration of the space. Such school setting is desirable for the modern learning pattern and adaptable to the changes in future. Nature constitutes daily life in Finland but is absent in the urban context in Hong Kong. However, nature is able to stimulate children's senses and build children's mental strength by retreating them in peaceful natural environments. Thus, bring the natural elements into the interior can simulate natural environment and generate sensory experience. Sustainability is a critical issue nowadays to retain pleasant living environment for next generations. Environmental, ecological, and social sustainabilities are taken into account in this project. Share school facilities to the public can increase the opportunity for community engagement. Students should not be fenced in school building and isolated from the real world. The connection with the community ensures the knowledge obtained from school is able to reflect the reality of life in the society.

This thesis developed a continuous learning landscape by applying the concepts of fluid movement, undulating landform and amoeba-like self-growing space to embody the four approaches mentioned above. The free flow of movement in open classrooms creates dynamic learning opportunities, so that knowledge accessibility is not limited by the physical boundary. The undulating floors reproduce the natural terrain to induce multi-functional spatial experience in the interior. Amoeba-like self-growing space generates versatile learning scenarios to fulfill the needs of different children according to their abilities and interests. In addition, daylight, natural ventilation, greenery and urban farm are introduced to the school to manifest environmental and ecological sustainability while sense of community achieves social sustainability. School facilities are opened up to reinforce the connection between school and the neighbourhood after school hour and in the weekend. The school building will not be enclosed by peripheral fence but a public passage passes through the building while greenery will extend from the school site to the street to blur the boundary. Periodical exhibitions will be opened to the public along the public passage and in the lobby showcases. Public facilities are housed on ground floor for neighbourhood's access in designated hours.

This school provides conditions for the users to learn by experience which will influence them subconsciously and profoundly. The senses of space can therefore be evoked and young generations will learn to appreciate and respect to the living environment and take responsibility to develop and preserve it in a positive manner.

BIBLIOGRAPHY

Books:

- ADLER, D. (1999) *Metric handbook : planning and design data*. 2nd Ed. Oxford: Architectural Press.
- ALLEN, S. (2009) From Object to Field: Field Conditions in Architecture and Urbanism. In: *Practice: Architecture, Technique and Representation*. London: Routledge.
- DUDEK, M. (2000) *Architecture of Schools: The new learning environments*. Oxford: Architectural Press.
- DUDEK, M. (2005) *Children's Spaces*. Oxford: Architectural Press.
- FACER, K. (2011) *Learning Futures: Education, technology and social change*. London: Routledge.
- FOWLER, C. (1996) *Strong arts, strong schools: the promising potential and shortsighted disregard of the arts in American schooling*. New York: Oxford University Press. p.46-66.
- HETLAND, L., WINNER, E., VEENEMA, S. & SHERIDAN, K. (2013) *Studio Thinking 2: The Real Benefits of Visual Arts Education*. New York City: 2nd Teachers College Press.
- JETSONEN, S. et al. (2011) *The Best School in the World*. [Online] Helsinki: Museum of Finnish Architecture. Available from: http://issuu.com/suomen-rakennustaiteen-museo/docs/bestschoolintheworld_book [Accessed: 24th March 2015].
- LANCASTER, J. (1990) *Art in the Primary School*. London: Routledge.
- MESKANEN, S. (2009) *Future School - Designing With Children*. Helsinki: Aalto University School of Science, Department of Architecture.
- NIEMI, H., TOOM, A. & KALLIONIEMI, A. (2012) *Miracle of Education: The Principles and Practices of Teaching and Learning in Finnish Schools*. Helsinki: Sense Publishers.
- OWP/P Architects, VS Furniture & Bruce Mau Design (2010) *The Third Teacher: 79 Ways You Can Use Design to Transform Teaching & Learning*. New York: Abrams.
- PALLASMAA, J. (2005) *The Eyes of the Skin: Architecture and the Senses*. Great Britain: Wiley-Academy.
- SCOTT, D. & SCOTT, W. (2012) *Make Space: How to set the stage for creative collaboration*. New Jersey: John Wiley & Sons, Inc.
- SCOTT, S. (2010) *Architecture for Children*. Camberwell: ACER Press.
- TAYLOR, A. (2009) *Linking Architecture and Education: Sustainable Design of Learning Environments*. Albuquerque: University of New Mexico Press.
- WINCHIP, S. M. (2011) *Fundamentals of Lighting*. 2nd Ed. New York: Fairchild books.
- WOOLNER, P. (2010) *Future Schools: Design of Learning Spaces*. London: Continuum International Publishing.
- ZUMTHOR, P. (2006) *Atmospheres: Architectural Environments - Surrounding Objects*. Berlin: Birkhäuser.

Articles, Newspapers, Magazines and Journals:

- ARK ARKKITEHTI. (2013) Saunalahden Koulu. *ark Arkkitehti*. 2013 (1). p.33-43.
- ARKKITEHTUURIKILPAILUJA. (2010) Kastelli Multipurpose Building, Oulu. *Arkkitehtuurikilpailuja*. 2010 (5).
- ARKKITEHTUURIKILPAILUJA. (2012) Opinmäki, Espoo. *Arkkitehtuurikilpailuja*. 2012 (6).
- ARKKITEHTUURIKILPAILUJA. (2013) Vantaa Aurinkokivi: Aurinkokivi Service Building, Vantaa. *Arkkitehtuurikilpailuja*. 2013 (3).
- BARRETT, P. et al. (2012) A holistic, multi-level analysis identifying the impact of classroom design on pupils' learning. *Building and Environment*. [Online] 59 (2013) 678-689. Available from: <http://ecadmin.wdfiles.com/local--files/facilities/Impact%20of%20Classroom%20Design%20on%20Learning.pdf>. [Accessed: 18th August 2015].
- CUBAN, L. (2004) The Open Classroom. *Education Next*. [Online] Spring Vol. 4, No. 2. Available from: <http://educationnext.org/theopenclassroom>. [Accessed: 17th July 2015].
- DETAIL. (2013) Building for Children. *Detail*. 2013 (3).
- EHRENFREUND, M. (2015) Finland's new plan to change school means combining subjects. *The Washington Post*. [Online] 24th March. Available from: <http://www.washingtonpost.com/news/wonkblog/wp/2015/03/24/finlands-radical-new-plan-to-change-school-means-an-end-to-math-and-history-class/>. [Accessed: 9th May 2015].
- FOWLER, C. (1994) Strong Arts, Strong Schools. *Educational Leadership*. [Online] November Vol. 52, No. 3. Available from: <http://www.ascd.org/publications/educational-leadership/nov94/vol52/num03/Strong-Arts,-Strong-Schools.aspx>. [Accessed: 10th April 2015].
- GROSS, C. (2014) Finnish Education Chief: "We Created a School System Based on Equality": An interview with the country's minister of education, Krista Kiurui. *The Atlantic*. [Online] 14th March. Available from: <http://www.theatlantic.com/education/archive/2014/03/finnish-education-chief-we-created-a-school-system-based-on-equality/284427/>. [Accessed: 7th March 2015].
- HERTZBERGER, H. (1969) *Harvard Educational Review: Architecture and Education*. 39 (4). p.95.
- KLEIN, R. (2015) Finland's Schools Are Overhauling The Way They Do Things. Here's How. *The Huffington Post*. [Online] 28th March. Available from: http://www.huffingtonpost.com/2015/03/28/finland-education-overhaul_n_6958786.html. [Accessed: 9th May 2015].
- RÄSÄNEN, J. *Architecture Education in Finland*. [Online] Available from: <http://www.playce.org/uploads/pdf/7%20Jaana%20R%C3%A4s%C3%A4nen.pdf>. [Accessed: 12th April 2015].
- SAYEJ, N. (2013) Building an even better Finnish school. *This is Finland*. [Online] September. Available from: <http://finland.fi/Public/default.aspx?contentid=283337&nodeid=41807&culture=en-US#!prettyPhoto>. [Accessed: 15th March 2015].
- SHIELD, B., GREEN, E. & DOCKRELL, J. (2010) Noise in open plan classrooms in primary school: A review. *Noise and Health*. [Online] Vol. 12, Issue 49. p.225-234. Available from: <http://www.noiseandhealth.org/article.asp?issn=1463-1741;year=2010;volume=12;issue=49;spage=225;epage=234;aulast=Shield>. [Accessed: 12th July 2015].

Publications:

CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT (2010) *Air Ventilation Study for Kai Tak Development - Final Detail Air Ventilation Study Report*. [Online] Available from: http://www.pland.gov.hk/pland_en/info_serv/ava_register/ProjInfo/AVRG63_AVA_FinalReport.pdf. [Accessed: 15th September 2015].

CURRICULUM DEVELOPMENT COUNCIL. (2002) *Arts Education: Key Learning Area Curriculum Guide (P1-S3)*. [Online] Available from: http://www.edb.gov.hk/attachment/en/curriculum-development/kla/arts-edu/references/con_eng.pdf. [Accessed: 5th March 2015].

CURRICULUM DEVELOPMENT COUNCIL. (2014) *Visual Arts Curriculum and Assessment Guide (Secondary 4-6)*. [Online] Available from: http://www.edb.gov.hk/attachment/en/curriculum-development/kla/arts-edu/references/VA%20C&A%20Guide_updated_e.pdf. [Accessed: 5th March 2015].

FINNISH NATIONAL BOARD OF EDUCATION. (2012) *Finnish education in a nutshell*. [Online] Available from: http://www.oph.fi/download/146428_Finnish_Education_in_a_Nutshell.pdf. [Accessed: 7th March 2015].

FINNISH NATIONAL BOARD OF EDUCATION. (2004) *National Core Curriculum for Basic Education 2004*. [Online] Available from: http://www.oph.fi/english/curricula_and_qualifications/basic_education. [Accessed: 7th March 2015].

FINNISH NATIONAL BOARD OF EDUCATION. KUUSKORPI, M. (2014) *Perspectives from Finland - Towards new learning environments*. [Online] Available from: http://www.oph.fi/download/154594_perspectives_from_finland.pdf. [Accessed: 15th March 2015].

MUSEUM OF FINNISH ARCHITECTURE. KASVIO, M. (2011) *The Best School in the World: Seven Finnish Examples from the 21st Century*. [Online] Available from: http://issuu.com/suomen-rakennustaiteen-museo/docs/bestschoolintheworld_book. [Accessed: 30th March 2015].

OECD. (2006) *21st Century Learning Environments*. [Online] Available from: <http://mphs.wikispaces.com/file/view/21st+Century+Learning+Environments+-+OECD.pdf>. [Accessed: 12th March 2015].

OECD. (2012) *PISA 2012 Results in Focus: What 15-year-olds know and what they can do with what they know*. [Online] p.5. Available from: <http://www.oecd.org/pisa/keyfindings/pisa-2012-results-overview.pdf>. [Accessed: 6th March 2015].

THE HONG KONG PLANNING DEPARTMENT. (2012) *Approved Kai Tak Outline Zoning Plan No. S/K22/4*. [Online] Available from: http://www1.ozp.tpb.gov.hk/plan/ozp_plan_notes/en/S_K22_4_e.pdf. [Accessed: 24th March 2015].

WINNER, E., GOLDSTEIN T. & VINCENT-LANCRIN S. (2013) *Art for Art's Sake? The Impact of Arts Education*. [Online] Available from: http://www.keepeek.com/Digital-Asset-Management/oecd/education/art-for-art-sake_9789264180789-en#page1. [Accessed: 5th March 2015].

Pamphlets:

THE HONG KONG INSTITUTE OF EDUCATION. (2005) *From Rooftop Schools to Post-Millennium Schools: The Post-War Evolution of School Buildings in Hong Kong*. Hong Kong: The Hong Kong Museum of Education.

Theses:

BATISTA, J. (2013) *Are you my type?* MSc (Arch) thesis, Politecnico di Milano.

Websites:

ARKKI. [Online] Available from: <http://arkki.net/en/>. [Accessed: 15th March 2015].

FINNISH NATIONAL BOARD OF EDUCATION. [Online] Available from: <http://www.oph.fi/english>. [Accessed: 6th March 2015].

HESCHONG MAHONE GROUP. (1999) *Daylighting in Schools - PG&E 1999*. [Online] Available from: <http://h-m-g.com/projects/daylighting/summaries%20on%20daylighting.htm#Re-Analysis>. [Accessed: 13th March 2015].

MINISTRY OF EDUCATION AND CULTURE. [Online] Available from: <http://www.minedu.fi/OPM/Verkkouutiset/2015/03/curricula.html?lang=en>. [Accessed: 6th May 2015].

PLAYA ARCHITECTS. [Online] Available from: <http://www.playa.fi/works/aurinkokivi-school/>. [Accessed: 10th March 2015].

PLAYCE. [Online] Available from: <http://www.playce.org/index.php?page=main>. [Accessed: 19th March 2015].

THE THIRD TEACHER+. [Online] Available from: <http://thethirdteacherplus.com/>. [Accessed: 12th March 2015].

HONG KONG INSTITUTE OF PLANNERS (2009) *Kai Tak - A Sustainable and A Sustainable and Green Development Green Development*. [Online] Available from: http://www.hkip.org.hk/plcc/download/Ava_NG.pdf. [Accessed: 15th September 2015].

HONG KONG PLANNING DEPARTMENT. *Hong Kong Planning Standards and Guidelines - A Summary*. [Online] Available from: http://www.pland.gov.hk/pland_en/tech_doc/hkpsg/sum/ch3/ch3_sum.htm. [Accessed: 25th September 2015].

Interview:

MESKANEN, P. (2015) *Architecture education for children and youth*. [Interview]. 13th April 2015.

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THE HONG KONG INSTITUTE OF EDUCATION. (2005) *From Rooftop Schools to Post-Millennium Schools: The Post-War Evolution of School Buildings in Hong Kong*.
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<http://www.legco.gov.hk/yr12-13/english/fc/pwsc/papers/p13-07e.pdf>. p.13-15.
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http://www.oph.fi/english/education_system_education_policy.
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FOWLER, C. (1996) *Strong arts, strong schools: the promising potential and shortsighted disregard of the arts in American schooling*. p.58-66.
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LANCASTER, J. (1990) *Art in the Primary School*. p.10.
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<http://www.tahrirnews.com/uploads/images/219041.jpg>. [Accessed: 5th March 2015].
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DUDEK, M. (2000) *Architecture of Schools: The new learning environments*. p. 14
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DUDEK, M. (2000) *Architecture of Schools: The new learning environments*. p. 7
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DUDEK, M. (2005) *Children's Spaces*. p.41-42.
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<http://www.archdaily.com/202358/vittra-telefonplan-rosan-bosch/>
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DUDEK, M. (2000) *Architecture of Schools: The new learning environments*. p.57.
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DUDEK, M. (2000) *Architecture of Schools: The new learning environments*. p.57.
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DUDEK, M. (2005) *Children's Spaces*. p.80.
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<http://www.archdaily.com/420348/house-of-children-in-saunalahti-jkmm-architects/>.
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<http://www.coroflot.com/tailee-thad/CSULB-Corridor-Design>.
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SCOTT, D. & SCOTT, W. (2012) *Make Space: How to set the stage for creative collaboration*. p.130.
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DETAIL. (2013) *Building for Children. Detail*. p.169.
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<http://www.archdaily.com/406513/saunalahti-school-verstas-architects/>.
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<http://www.archdaily.com/450625/vuc-syd-aart-architects-zeni-architects/>.
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<http://www.rayparry.co.uk/wp-content/uploads/2014/09/Clamber-Stack1.jpg>.
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<http://www.learninglandscapesdesign.com/wp-content/uploads/2014/02/mccarthy-tezler2-accessibleplaygroundnet.jpg>.
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<http://www.thearchitectureofearlychildhood.com/2011/08/little-houses-of-light-new-design-in.html>.
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<http://plentyofcolour.com/2013/10/28/kindergarten-kekec-colourful-places-spaces/>.
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<http://blogs.voanews.com/photos/2012/10/02/october-2-2012/>.
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<http://nurturerstore.co.uk/homemade-paint-recipe-messy-play>.
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http://www.dac.dk/media/11545/Oerestad_Gymnasium.jpg.
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http://si.wsj.net/public/resources/images/OB-TG522_DSCHOO_H_20120606141144.jpg.
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http://www.sadas-pea.gr/archive/2000-2011/SAFA_Meskanen.pdf, p.55.
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 MESKANEN, S. (2009) *Future School - Designing With Children*. p.46, 48 & 54.
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 ARKKITEHTUURIKILPAILUJA. (2010) Kastelli Multipurpose Building, Oulu. *Arkkitehtuurikilpailuja*. p.8-9.
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<http://www.lemminkainen.com/References/2014/Oulun-Kastelli; and>
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 ARKKITEHTUURIKILPAILUJA. (2012) Opinmäki, Espoo. *Arkkitehtuurikilpailuja*. p.6.
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<http://divisare.com/projects/224305-Playa-Architects-Aurinkokivi-school-competition>.
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<http://divisare.com/projects/224305-Playa-Architects-Aurinkokivi-school-competition>.
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 ARKKITEHTUURIKILPAILUJA. (2013) Vantaa Aurinkokivi: Aurinkokivi Service Building, Vantaa. p.7.
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 THE HONG KONG PLANNING DEPARTMENT. (2012) *Approved Kai Tak Outline Zoning Plan No. S/K22/4*. p.79.
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http://www.hkip.org.hk/plcc/download/Ava_NG.pdf. p.18.
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 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT (2010) *Air Ventilation Study for Kai Tak Development - Final Detail Air Ventilation Study Report*. p.81.
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 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT (2010) *Air Ventilation Study for Kai Tak Development - Final Detail Air Ventilation Study Report*. p.138.

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*“The sense of self, strengthened by art and architecture,
allows us to engage fully in the mental dimensions of
dream, imagination and desire.”*

- Junani Pallasmaa, The Eyes of the Skin

