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ARCHITECTURE AND EDUCATION IN JAPAN

From 'teaching school' to 'learning environment':

Analysis of open-plan schools

Abstract

The quality of the educational spaces clearly shows the essence of the values of a certain society. These spaces should be designed not only for the student to complete their academic career, but to serve to acquire the necessary skills for personal development. This is where the dialogue between architecture and education is established.

Education in Japan has a trajectory that goes back almost to the beginning of its culture. Although it has always been considered a fundamental pillar in society, the evolution of education and its structure has been fundamental for the country to become an international example in this field. Nevertheless, while the educational reforms focused on modifying the teaching content and improving it, the projection of the educational space was left aside until the middle of the 20th century, when new types of schools began to be conceived. These new schools, known as open-plan schools, made the relationship between space and educational method more tangible.

Due to this progress, contemporary school architecture has internalized the educational process and has used it as a project strategy, significantly improving the quality of teaching spaces and, consequently, positively influencing the students who enjoy them.

Keywords

Architecture, education, Japan, evolution, open-plan schools

Resumen

La calidad de los espacios educativos muestra claramente la esencia de los valores de una determinada sociedad. Estos espacios, no sólo deben estar pensados para que el alumno complete su trayectoria académica, sino que tienen que servir para adquirir las aptitudes necesarias para el desarrollo personal. Aquí es donde se establece el diálogo entre arquitectura y educación.

La educación en Japón tiene una trayectoria que se remonta prácticamente al inicio de su cultura. Aunque siempre se ha considerado un pilar fundamental en la sociedad, la evolución de la educación y su estructura ha sido clave para que el país se convirtiera en un ejemplo internacional en este campo. Sin embargo, mientras las reformas educativas se centraban en modificar el contenido docente, la proyección del espacio educativo se dejó al margen hasta mediados del siglo XX, cuando se empezaron a concebir nuevas tipologías de escuelas. Estas nuevas escuelas, conocidas como escuelas open-plan, consiguieron que la relación entre el espacio y el método educativo fuera más tangible.

Como consecuencia de este progreso, la arquitectura escolar contemporánea ha interiorizado el proceso educativo y lo ha utilizado como herramienta de proyecto, mejorando considerablemente la calidad de los espacios docentes y, en consecuencia, influyendo positivamente en los alumnos que las disfrutan.

Palabras clave

Arquitectura, educación, Japón, evolución, escuelas open-plan

Resum

La qualitat dels espais educatius mostra clarament l'essència dels valors d'una determinada societat. Aquests espais, no sols han d'estar pensats perquè l'alumne complete la seua trajectòria acadèmica, sinó que han de servir per a adquirir les aptituds necessàries per al desenvolupament personal. Ací és on s'establix el diàleg entre arquitectura i educació.

L'educació al Japó té una trajectòria que es remunta pràcticament a l'inici de la seua cultura. Encara que sempre s'ha considerat un pilar fonamental en la societat, l'evolució de l'educació i la seua estructura ha sigut clau perquè el país es convertira en un exemple internacional en aquest camp. No obstant això, mentres les reformes educatives se centraven a modificar el contingut docent i millorar-ho, la projecció de l'espai educatiu es va deixar al marge fins mitjan del segle XX, quan es van començar a concebre noves tipologies d'escoles. Aquestes noves escoles, anomenades escoles open-plan, van aconseguir que la relació entre l'espai i el mètode educatiu fora més tangible.

Com a conseqüència d'este progrés, l'arquitectura contemporània ha interioritzat el procés educatiu i ho ha utilitzat com a ferramenta de projecte, millorant considerablement la qualitat dels espais docents i, en conseqüència, influint positivament en els alumnes que les disfruten.

Paraules clau

Arquitectura, educación, Japón, evolución, escuelas open-plan

Contents

1. INTRODUCTION

It is an unfortunate truth that dignity and freedom of thought often depend on the proportions of a room, a delightful view out of the window, a certain measure of light and color, so that someone who has spent his whole life in a kind of oblong boxes and one day enters a room with noble proportions might wonder how much he might have been missing, spiritually, just because of the character of his living quarters.

Morgenstern, C. (1906)
Steps, Psychological Issues

At a glance, space has an influence on humans, giving us different impressions that turn in a wide variety of emotions. Space not only brings us impressions, it also communicates ideas, forms perceptions, and guide actions, as a teacher might[1]. Buildings are not only a physical structure, they also have assigned many different interpretations, that might change depending on the evolution of their social and historical context.
The built environment, I would argue, 'teaches' perception and behaviour on two basic levels: social and phenomenological[1].

On the one hand, the space satisfies our necessities and help us to adapt to society by situating us within a material context. On the other hand, it is also a place to carry out personal actions and projects, either individually or in group, by orientating perception to a given purpose or intention and providing a solution[2].

Consequently, we could say that space has a certain educational potential. Therefore, how can this be applied to the design of educational spaces?

Different typologies of educational spaces have been developed around the world and throughout history. However, in many cases the school architecture is disconnected from the educational method, conceived as two independent premises, which leads to a space used simply for the students to complete their academic career, without contemplating the possibility that space can be another resource for learning. *It is the opinion of many experts*

1 GISLASON N. (2007) *Placing Education: The School as Architectural Space in Paideusis*, Volume 16 (2007), No. 3, pp. 5-14
2 ROMAÑÁ T. (2004) *Arquitectura y educación: perspectivas y dimensiones*. Revista Española de Pedagogía nº 228

that there are communication problems between architects and educators and the main users of schools, teachers and students[3]. The result of this is obsolete, school buildings that still follow the 'traditional model' of school, based in a corridor surrounded by classes, characterized by a passive learning method in which all the students are treated in the same way and the teachers are the only source of knowledge.

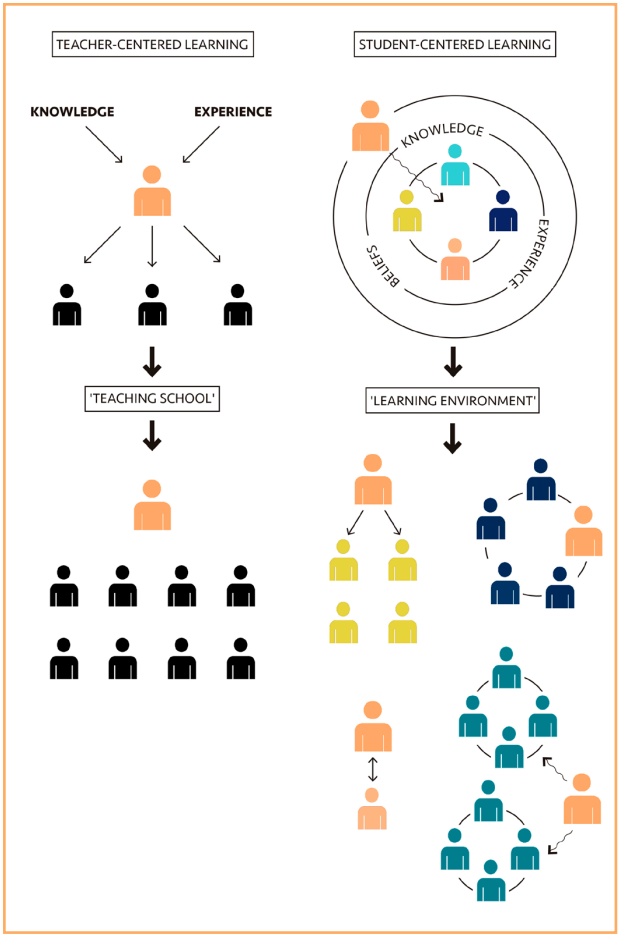
Education is not an affair of 'telling' and being told, but an active and constructive process.

Dewey, J. (1916)
Democracy and Education:
An Introduction to the Philosophy of Education

During the 20th century, new alternative methods of education appeared, approaching to a more student-centered learning (**F1**). As a consequence, the importance of the design of the educational spaces in children's learning process began to be discussed[4]. The traditional "classroom-based model of a school," in which time and motion are still segmented in a quasimonitorial fashion, governed by an industrial-era model of learning that is linear and one-dimensional was opposite to the idea that education should instead be holistic and multi-faceted and should involve project-based learning and a multidisciplinary approach. Learning spaces should therefore be made more flexible, in order to support dynamic educative processes[5]. One of the most important references in that century was John Dewey with his 'learn by doing' concept. His theories of education and the relation of the educational method with the educational space helped to change the school context and influenced many school designs. For Dewey, the students can learn not only from the teacher, but also from their books, their hands, their eyes, their ears, and their whole body in relation to their environment[6].

Even though there has been a lot of development in the area of the structure of educational spaces during the 20th century, the relation between method and space is usually only visible in schools that have an alternative method of teaching (e.g.

3 WALDEN R. (2015) *Schools for the Future*. Design Proposals from Architectural Psychology
4 DUDEK, M. (2000). *Architecture of schools: the new learning environments*. Oxford, Architectural Press. http://site.ebrary.com/id/10603395.
5 NAIR, P. & FIELDING, R. (2005). *The language of school design: Design patterns for 21 century schools*. Minneapolis: DesignShare.
6 DEWEY, J. (2005). *Democracy and education*. Stilwel, KS: DigiReads.com Publishing. (Original work published 1916).



F1 Teacher-centered learning vs. Student-centered learning.

Concept	Teacher-Centered Learning	Student-Centered Learning
Pedagogical approach	Single way of learning	Multiple way of learning
Teacher	Source of knowledge	Guide
Student	Passive	Active
Curriculum	Contents	Capacities
Evaluation	Exams	Feedback
Organization	Hierarchical	Interactive
System	Self-sufficient	Interdependent
Work environment	Individual	Cooperative
Relationship with the community	Closed	Urban
Classroom	Unique typology	Flexible and multiple
Space	**Teaching School**	**Learning environment**

F2 Teacher-centered learning vs. Student-centered learning.

Montessori schools, Waldorf, etc.), because even though a progression in the educational policies of countries all over the world is visible, the majority of centres are still focused on a teacher-centered learning (F2) and in consequence on a 'traditional model' of school.

However, nowadays, an exception can be found in the Japanese educational spaces. With the Educational reforms during the decade of 1990[7] and the influence of UK and USA school planning[8] the contemporary Japanese school architecture is giving the answer to the relationship of architecture and education. Changes in such educational programs called for new school buildings and as a result, open-plan schools appeared.

Although the Japanese educational system nowadays is still rigid, these schools are aiming to shift from uniform education to education based on learners, that respects children's spontaneity and creativity. Furthermore, in Japan compulsory education is basically divided into elementary school, junior high school and high school, but students of all ages don't have the same needs and process of learning. As a result contemporary school architecture doesn't have the same answer for every type of school, therefore open-plan school type usually is only applied in elementary school programs, due to the fact that it is in this age when children receive more information from their environment and, therefore, flexible learning is more suitable[9]. Consequently, the contemporary Japanese school architecture has managed to forget the traditional school typology, based on a simple corridor with classrooms, to create new spaces in which the academic career is not only a simple linear journey, but a multitude of experiences.

7 JICA Research Institute (2004) *The History of Japan's Educational Development. What implications can be drawn for developing countries today?*
8 WALDEN R. (2015) *Schools for the Future*. Design Proposals from Architectural Psychology.
9 DEWEY, J. (2005). *Democracy and education*. Stilwel, KS: DigiReads.com Publishing. (Original work published 1916).

1.1. Purpose

This research aims to analyze the relationship between architecture and education in educational spaces. This relationship is very remarkable in the country in which the analysis is centered: Japan. To achieve this, open-plan schools are taken as an example, for being a typology in which the educational method is present in the conception of the project.

Considering all the above, the purpose of this research is to analyze how the Japanese open-plan schools are designed to achieve rich educational spaces and their relationship with the Japanese educational system nowadays, through the comparative analysis of reference examples. Likewise, an evolutionary analysis of Japanese education and Japanese school architecture during the 20th century will be conducted, to understand its influence in the origin of the open-plan schools.

1.2. Methodology

The procedure that is going to be used to perform this research is as follows:

1- Analyze the evolution of education in Japan, especially during the 20th century, to understand how the current educational system has developed and how this evolution has influenced contemporary school architecture.

2- Study the relationship that exists between architecture and education in Japan, to extract the most notable characteristics and later perform an evolutionary analysis of Japanese school architecture during the 20th century, mentioning the most representative examples that show in a more clear and precise way such evolution.

3- Compose a graphic chronology, as a way of conclusion of the previous step, with the most representative examples, showing the evolution of school architecture during the 20th century in a more direct way.

4- Study the origin and characteristics of the open-plan movement, developed in the UK and USA, as well as its implementation in Japan and how it is developed.

5- Analyze remarkable examples of Japanese open-plan schools. These examples have been selected not only due to their relevance, but also due to their accessibility and the possibility of interviewing the architects.

To make an objective study of these schools and compare them, they are analyzed following a script with the most relevant features of the open-plan movement, extracted in the previous step, so it can be seen how these characteristics are developed in each of the examples. The information about how these characteristics are developed in these projects is obtained through the interviews carried out with the architects, in addition to the bibliography consulted.

6- Extract conclusions based on the entire previous process, to reach the established objectives.

The sources used to develop this research are going to be based on the consultation of graphic, written and audiovisual resources, extracted from books, architectural magazines, articles, academic works, etc. The analysis of the chosen projects have been completed with interviews with the architects, in addition to visits made to take pictures on-site and observe the functioning of the educational spaces.

1.3. Acknowledgments

I specially wanted to thank my professors at Hokkaido University, Takeo Ozawa and Hui Ping, for their support during the development of my research and for giving me the opportunity to contact the architecure studios directly to conduct the interviews and field trips.

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2. BACKGROUND

F3 Terakoya for girls in the Edo period.

2.1. Education in Japan

Japanese education was developed since its beginnings on the basis of different religions or philosophies that were established in Japan throughout its history. Highlighting Shintoism, Buddhism and Confucianism.

The beginnings of Shintoism date back to the 4th century AD, when shamanic immigrants arrived from Korea believing that the world was inhabited by spirits. Their beliefs were mixed until, finally, Shintoism was understood as the worship of different spirits of nature that can be described as a form of naturalistic animism and veneration of the ancestors. It is a religion that does not have norms, sacred texts or absolute values, thus being able to coexist with different religions[10].

On the other hand, Buddhism appeared in Japan during the time of Emperor Kimmei (539-571 A.D.), being already an institutionalized religion with strict principles. Japanese Buddhism is defined as:

A special transmission outside the scriptures.
No dependency on words and letters.
Pointing directly to the human mind.
Seeing into one's nature and attaining Buddhahood... [11]

This stream had wise priests who greatly influenced national education.

Both Shintoism and Buddhism instilled in the people a moral sentiment, which led to a remarkable cultural uplift. Even today, these two movements are those that prevail in the country. Likewise, Confucianism came to Japan simultaneously to Buddhism. This philosophical and religious doctrine defends that the Universe is a community governed by a superior order whose reflection in the human being is the moral law. It is a social philosophy that aims to transmit principles that allow achieving harmony in society, submission to authority and allowing order[12].

10 FERNÁNDEZ, P. (2006) *La Educación en Japón* <http://evaristocultural.com.ar/2006/11/21/la-educacion-en-japon/>
11 Poetry ascribed to Bodhidharma, founder of Zen Buddhism.
12 FERNÁNDEZ, P. (2006) op. cit.

All these religious and philosophical movements have greatly influenced Japanese society, inculcating values that make a difference in the way of conceiving the world and life. From these influences arises, especially, the great appreciation of nature, a value that will also be reflected in the educational system.

2.1.1. The development of education in Japan throughout history

The origin of the Japanese school system goes back to the influence that cultures like the Chinese and the Korean exerted on the Japanese territory since its inception.

Around the 4th century A.D. the first schools were established, whose main objective was the teaching of Chinese language and writing. Therefore, due to the great influence of this culture, the practices of Buddhism and Confucianism were extended.

In the Nara period (646-794) education was boosted considerably and the study of foreign civilizations was promoted. The invention of phonetic characters (*kana*) favored the development of the literature and the language itself. Two institutions were established: *Daigaku*, where children from higher ranks were educated; and *Kokugaku* for the children of army officers, and as an exception, also for children of plebeians[13].

Modernization of Japan and the Progress of Education[14]

The Tokugawa Period (Edo Era)

The Edo era (1868-1912) was characterized by national isolation and feudalism. There was an increasing cultural maturity among the population, without distinction of classes and, in comparison to the rest of the world at that time, the percentage of literacy was high.

The country had a great diversity of own educational institutions:

F4 *The Timeless Treasures of Literature* [First Volume, Last Volume] *(Bungaku Bandai no Takara* (Shinomaki, Suenomaki)) Painted by Issunshi Hanasato 1844-1848 (During the Kōka period)

13 GARCÍA-RAYO C. (2013) *Luces y Sombras en la Educación: Estudio Comparativo de los Sistemas Educativos de Japón y España*
14 JICA Research Institute (2004) *The History of Japan's Educational Development. What implications can be drawn for developing countries today?* p. 14-41.

F5 Scene of instruction at the Seidou institute.

F6 Illustration of a daily class in the Terakoya.

- The feudal schools or *Hanko*: public institutes for the samurai class, where the Chinese classics were taught.

- Private study schools: private sector academy

- The *Terayoka* or popular learning centers: learning institute for the common class, where they were taught to read, write and develop technical and practical skills.

Education in this era was secular and Japanese was established as a unique teaching language.

The Meiji era and the introduction of modern education

When the government of the Tokugawa family collapsed in 1868, the beginning of the so-called "Meiji Restoration" was established.

Taking as reference the Western countries, the government applied new policies that favored the country to develop as a modern and integrated nation. Educational reform was included in this modernization, thus extending Western education throughout the country.

Japanese educational institutions didn't own a modern school system, having the need to establish a National Educational System directed by the central government. Adopted as a reference to the United States, the following model was established:

- The school system was structured in 3 levels: primary, secondary and university level.

- The primary school was divided into 4 years of lower grade and 4 years of superior. Therefore, a total of 8 years of schooling were established as compulsory regardless of sex, occupation or social position. Although finally, due to the great impact that this caused in society, the compulsory nature was determined strictly in 3 years of schooling in primary school and 16 weeks or more for each year of school attendance.

-The subjects that were introduced were copied from the American system.

- The institutions known as "normal schools" were established to train the teaching staff.

Around 1886 the laws that formed the fundamental structure of the education system that would become the basis of the country's educational development were promulgated: "Elementary School Order", "Middle School Order", "Normal School Order" and "Imperial University Order". These laws specified the characteristics and objectives designed for each type of institution.

The 4 years of the first level of elementary school were established as compulsory, and the compulsory nature of education was legally defined for the first time. The middle school education was divided in three: middle schools, practical vocational schools, and girls' high schools.

They tried to impose two basic objectives for all education: the modernization of the country and the spiritual integration strengthening the morality and ethics of society. These objectives were distorted during the Second World War, since a military-type education was promoted.

In addition, an educational movement emerged in Japan known as Progressive Education Movement of the Taisho era (between the decade of 1910 and 1920) influenced by the ideas of John Dewey and the global New Education Movement that introduced a new type of school, especially private, that didn't follow the educational system established by the government.

The situation of the education system after the Second World War

After Japan lost the war in 1945, demilitarization, democratization and restoration of the country were the aspects that stood out at that moment. Regarding education, an educational reform was launched, structured as follows:

- A mono-linear system of 6-3-3-4 years was imposed.
- Compulsory education was fixed to 9 years.
- As a rule, mixed education was established.
- The 'normal schools' were annulled and the teaching staff was instructed in the university.

F7 A high school class in 1963.

F8 Juku poetry class.

F9 Elementary school class nowadays.

F10 Elementary school class nowadays.

Towards the current educational system

During the decade of the 60s, education in Japan experienced a very remarkable growth, even though it had problems that required a solution.

After the 'Third Educational Reform' was proposed during the 1970s and then suspended, a first report of a new educational reform that captured the real situation of the education in Japan was presented in 1986:

- Education had been a key element for national development. As a result, the level of the education in Japan was higher than the international average.

- However, there were problems that had caused negative effects, such as the delay in responding to internationalization and the lack of flexibility. The way in which the school and society were built had caused serious problems, such as the severe competitiveness of the admission exam, the mistreatment among the students, the materialism arising from the civilization of scientific technology, the scarce contact with nature, etc.

- As one of the national goals was to reach the Western countries' standards, education gave great importance to efficiency, resulting in its being extremely uniform. In this way, the system could not respond correctly to the needs of recent education, as well as to the changes and demands of society.

During the decade of the 90s, the Central Council for Education estimated that the future of society was uncertain and lacked clarity. As a result, it was established that the children of that new society would need to acquire the following skills:

- Qualities and capabilities that allow them to solve problems better by discovering for themselves the issues to be addressed. In addition to learning to think voluntarily and take both judgment and action with initiative.

- Human quality that encourages them to collaborate with others with discipline, thinking about and considering others and having emotional sensitivity.

- Health and physical strength.

These qualities were named as *'zest for living'. In addition, the Council said, in order to develop 'zest for living' it was important for children, their schools, and the whole of society, embracing the family and the community, to have 'room to grow'*[15].

Based on all this, the new curriculum was created and the 'New Courses of Study' was announced in 1998, but put into effect from 2002. In this new guide the hours of annual study and the educational content were reduced, and the schedule for the 'global and integral learning' was implemented. In addition, the full school attendance regime of five-day school week was established.

F11 Students cleaning their classes in an elementary school.

2.1.2. The Japanese educational system nowadays

The education system in force in Japan is based on the 'new Courses of Study', already mentioned above, which was put into effect from 2002. In this Courses of Study some objectives and characteristics were established that are the basis of the structure and development of the current curriculum.

F12 Lunch time in an elementary school.

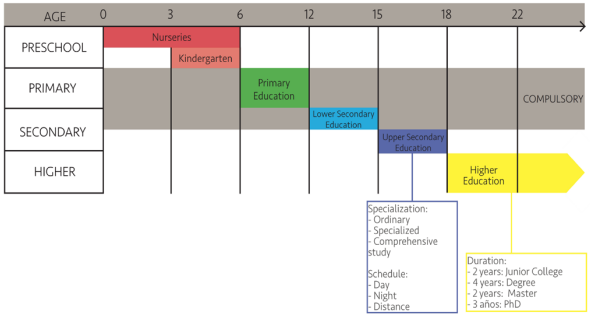
Aims and characteristics of the new Courses of Study[16]

Aims:
On the basis of the complete implementation of a 5-day school week, each school should develop a "distinctive form of education" within a framework that allows "room to grow," and while ensuring through acquisition by children of the basic learning content set out in the Courses of Study, should also encourage the development of "zest for living" in such forms as the ability to study and think independently.

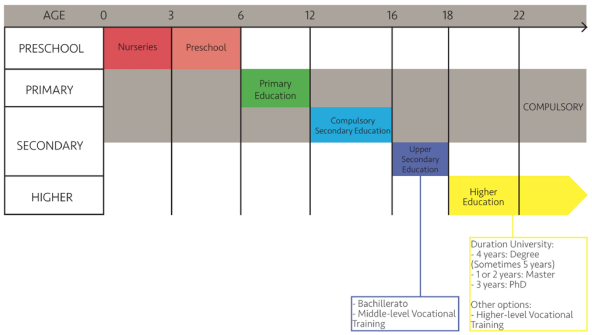
Characteristics:

- Clarification that the Courses of Study represent minimum required content.
- Strengthening of individually oriented teaching.

15 JICA Research Institute (2004) *The History of Japan's Educational Development. What implications can be drawn for developing countries today?* p. 14-41.
16 Ibid. p. 151 Box 10-1



F13 Japanese Educational System Structure. Made by the author.



F14 Spanish Educational System Structure. Made by the author.

- Creation of an "Integrated Study Period."

- Expansion of the framework allowing autonomous editing of the curriculum by schools.

- Reduction in class teaching hours and strict selection of educational content.

- Emphasis on experiential, problem-solving learning activities.

- Expansion of elective studies.

- Strengthening of evaluation (from norm referencing to criterion referencing).

Structure of the Japanese educational system[17]

It is a system of (6)-6-3-3-4 years, of which 9 years are considered basic education and are mandatory. The structure is divided into 4 major stages: pre-school education, primary education, secondary education and university higher education.

- **Preschool education**:

In this stage there are institutions of two types: nurseries and kindergartens. Nurseries (hoikuen) are for children from 0 to 6 years old. They are very useful for parents who, due to certain circumstances, cannot take care of their children from an early age. On the other hand, kindergartens (yochien) accept children from 3 years to 6 years old. Both cases can be national, municipal or private. Attendance at this stage is not mandatory.

- **Primary education:**

Primary education is considered, together with lower secondary education, part of basic education and is, therefore, mandatory. It consists of 6 years, from 6 years to 12 years old, and takes place in the so-called primary schools (shogakko), which can also be national, municipal or private.

- **Secondary education:**

It is divided into two stages: lower (or elementary) secondary education and upper secondary education. Lower secondary education lasts for 3 years, from 12 years to 16 years old, and

17 CHACÓN F., M. A., *Metodología y Evaluación en la educación en el Sistema Educativo Japonés, su visión Holísitica e integral*, in CIEMAC, VI, 2009.

is considered part of basic education. Lower secondary schools (chugakko), like primary schools, can be national, municipal or private. Higher secondary education is carried out in different centers than the ones for lower secondary education, and the content depends on the specialization chosen by the student: ordinary course, specialized course and comprehensive study course. In addition, there are also different types of schedule: day, night and distance learning course. In addition to schools of upper secondary education (koko) there are vocational schools where specific knowledge is given in order to learn a specific profession.

- **Higher education:**

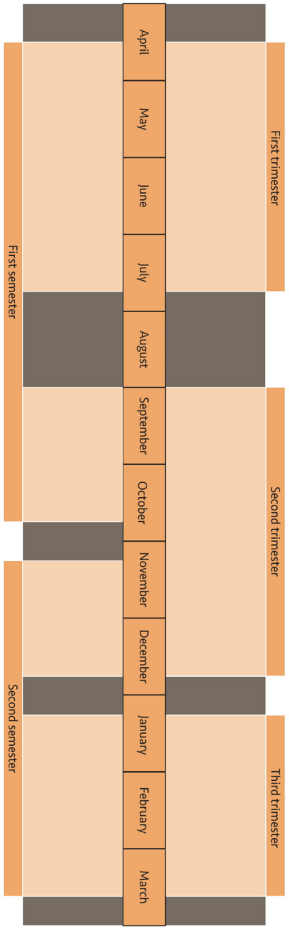
The University (daigaku) can be accessed by anyone with 18 years old who has passed the corresponding entrance exams with the necessary requirements to access the university career that they are applying for. In Japan there are two types of entrance examinations: the first exam, organized by the National Center of Entrance Examinations, and the second exam, organized by each of the universities. This is only for applying to national and autonomous universities, private universities have their own selection system. Generally, university studies last for 4 years, but there are short cycle studies with a duration of 2 years. In addition, the universities also have master's programs (2 years) and doctorate (3 years).

As a conclusion, the structure of the Japanese educational system is very similar to the Spanish educational system. The only difference is the length of compulsory secondary education and upper secondary education of the Spanish system, with respect to the lower and upper secondary education of the Japanese system, as well as the distribution of courses in the university.

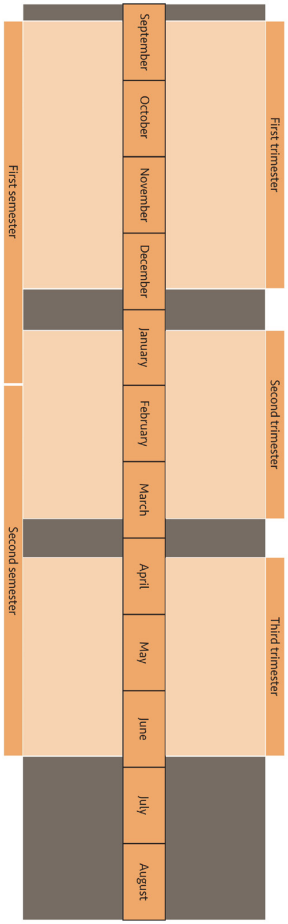
School calendar [18]

In Japan the academic year starts in April and ends in March of the following year. Although most schools adopt a quarterly structure, some prefer to structure the course in semesters.

Even though organizing the year in trimesters or semesters is very



F15 Japanese school calendar.



F16 Spanish school calendar.

18 CLAIR (2012) *Educación* <http://www.clair.or.jp/tagengorev/es/j/01_2.pdf>

Type	Description	Author
Annual teaching plan	The basic teaching plan divided up by grade and by subject (compiled on the basis of the Course of Study for each subject)	Each board of education or each school
Subject unit-based teaching plan	A teaching plan which allocates time units in accordance with the learning activity time divisions in such a way that learning and teaching can be developed in each subject unit.	Each school grade or individual teacher
Individual lesson teaching plan	A detailed lesson teaching plan containing the results of consideration of such points as the time allocation needed to develop learning points, lesson development, points to be written on the blackboard	Each individual teacher

F17 Teaching plans.

Name	Individual learning	Full class learning	Small group learning
Style	Style in which individual children's aptitudes and learning suited to their level are furthered.	A style in which one teacher using one method teaches the same content to all the children in a class at the same time.	Style in which children are divided into groups of 2 or more, and common learning is promoted for each group.
Strong points	Possible to respond to individual children's reactions and to differences between children.	Very easy to acquire common academic ability because shared information can be transmitted quickly to all members of the class.	Good development of thinking within the group and readiness of group members to articulate their thoughts. Positive attitude to tackling difficult problems.
Weak points	Difficult to transmit shared ability. Costly and a drain on teachers' energies.	Tendency for teaching to concentrate on force-feeding of facts and surface-level verbal transmission. Difficult to respond to individual differences and possibility of children getting left behind.	Tendency for dependence on the most able children to develop. Without strict rules, learning can become inefficient.

F18 Kinds of learning styles and their characteristics.

- Lecturing
- Discussion
- Q & A
- Presentation
- Revision
- Experiments and observations

F19 Kinds of teaching methods.

similar to the Spanish system, the start and end dates of the academic year are very different, since in Spain it starts in September and ends in June of the following year.

Structuring of the classes[19]

In most countries of the world it is still common to attend classes in which the teacher writes the lesson on the board and the students simply copy it, known as 'Chalk & Talk', where the educational process is based on listening and write the little part that could have been retained, limiting the time used to perform the 'educational activity' of children, which should be, ultimately, the goal of attending class.

In Japan, as education progressed, the educational content was corrected by analyzing the repeated classroom practices. It was concluded that the educational process should be developed around the activities of children, without forgetting that "children are the true protagonists of the educational process" and that therefore, educators must know the necessary techniques to design the educational process, with the purpose that children reach the necessary knowledge effectively and efficiently. Due to this reason, in Japan, phrases such as 'lesson planning' and 'lesson structuring' are widely used.

Taking into account all the above, the classes are planned through the 'teaching plans', which consists of an educational project to facilitate an efficient teaching, systematizing the educational content and classifying always following the current curriculum. It is normally divided into three documents (F17).

When the teaching plan for a specific lesson is made, the teacher has to choose the appropriate learning style (F18) and teaching method (F19). To do this, they must know the advantages and disadvantages of each option, as well as contemplate the possibility of combining them. However, although the structuring of lessons is an effective and beneficial method for the Japanese educational system, the truth is that it is usually applied in schools that teach basic education. Therefore, in more advanced level classes tend to relapse into the classic 'Chalk & Talk', mentioned above.

19 JICA Research Institute (2004) *The History of Japan's Educational Development. What implications can be drawn for developing countries today?* p. 183-202

Japanese educational system

Level of Education	Preschool	Primary	Lower secondary	Upper secondary	University
Educational Institution	Nursery and Kindergarten	Primary School	Lower Secondary School	Upper Secondary School	University
Age	Nursery: 0-6 years old Kindergarten: 3-6 years old	6-12 years old	12-15 years old	15-18 years old	From the age of 18 years old
Students per class	Maximum 35 students per class	40 students per class	Minimum 35 students per class	Minimum 35 students per class	Depends
Compulsory	No	Yes	Yes	No	No
Class hours during the course	Flexible	Depends on the grade. Between 587 and 709 hours	Approximately 817 hours	Depends on specialization and schedule	Depends on the career and level of studies
Duration of a class	Flexible	45 minutes	50 minutes	50 minutes	1 hour and a half

F20 Japanese educational system characteristics.

Spanish educational system

Stage	Preeschool	Primary	Secondary Compulsory	Secondary Post-compulsory	Upper University
Educational Institution	Nursery and Kindergarten	Primary Education Center	Institute of Secondary Education	Institute of Secondary Education o Formative Cycle DE Average grade	University
Age	Nursery: 0-3 years old Kindergarden: 3-6 years old	6-12 years old	12-16 years old	16-18 years old	From the age of 18 years old
Students by class	25 students per class	25 students by class	Maximum 30 students by class	Maximum 35 students per class	Depends
Compulsory	No	Yes	Yes	No	No
Class hours during the course	Flexible	Depends on the grade. Around 792 hours	Approximately 1054 hours	Depends on specialization	Depends on the career and level of studies
Duration of a class	Flexible	50 minutes	50 minutes	50 minutes	Approximately 1 hour and a half

F21 Spanish educational system characteristics.

Arrival at school	8:00 – 8:30
Morning assembly for the whole school, homeroom, etc.	8:30 – 8:40
1st class	8:40 – 9:25
2nd class	9:30 – 10:15
Break	10:15 – 10:35
3rd class	10:35 – 11:20
4th class	11:25 – 12:10
School lunch	12:10 – 12:55
Lunch break*	12:55 – 13:30
5th class	13:35 – 14:20
6th class	14:25 – 15:10
End-of-the-day homeroom*	15:10 – 15:20
Dismissal	15:30

F22 Schedule model.

Subjects	1st grade	2nd grade	3rd grade	4th grade	5th grade	6th grade
Japanese	272	280	235	235	180	175
Social Studies	×	×	70	85	90	100
Arithmetic	114	155	150	150	150	150
Science	×	×	70	90	95	95
Living Environment Studies	102	105	×	×	×	×
Music	68	70	60	60	50	50
Arts and - handicrafts	68	70	60	60	50	50
Home Economics	×	×	×	×	60	55
Physical Education	90	90	90	90	90	90
Moral Education	34	35	35	35	35	35
Special Activities	34	35	35	35	35	35
Integrated Studies	×	×	105	105	110	110
Total School-Hours	782	840	910	945	945	945

F23 Annual Standard School-Hours per Subject

Primary Education[20]

The structure of the elementary schools is explained in more detail below because they are those where the open-plan typology is usually applied. This is because the curriculum of primary education allows more flexibility than the one of higher levels of education.

Primary education is part of compulsory education, together with lower secondary education, so that 99% of Japanese children are enrolled during this stage.

As shown above, the academic year calendar starts in April and ends in March, with a total of 35 weeks with class per course (34 in the first course).

Textbooks in elementary schools are free for all students. They are planned to develop skills and abilities through the simulation of real contexts and situations, to promote student curiosity and discussion.

The performance of the students in their day-to-day life is kept in each student's teaching-learning record (Shido-Yoroku). This report includes academic performance, special activities and integrated studies, attendance, teacher comments, etc. Parents review the notebook once every quarter.

Food in schools is prepared in two ways, either in school lunch centers away from the schools to which food is then transported, or in a space intended for it inside the schools. The students are responsible for distributing the food to their classmates. In addition, in most schools, students eat in their classrooms, although there are also schools that have a dining room where students of different ages eat together.

There are special activities included in the curriculum of primary education, such as ceremonies (entrance and graduation), cultural events, health and sports events, excursions and group trips. Sport days are usually organized as community activities and are usually held on weekends so that parents can attend school.

20 NUMANO T. (2015) *Primary schools in Japan.* <https://www.nier.go.jp/English/educationjapan/>

Conclusion

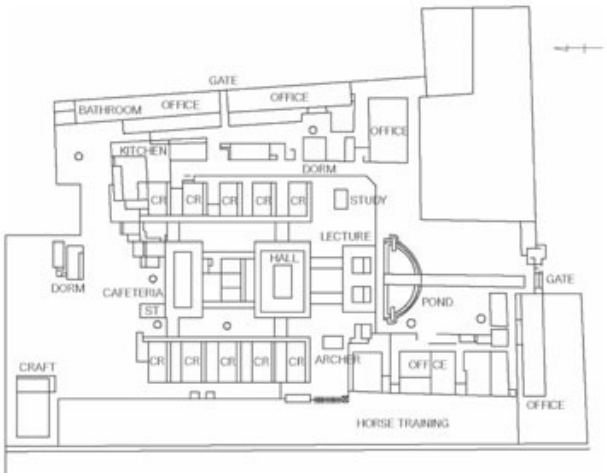
The progression of the Japanese educational system has been positive throughout history. The educational reforms that have been carried out show a beneficial development for the students and manage to involve all the educational sectors together, allowing all of them to play a fundamental role in the functioning of the education system.

During compulsory education a homogenized education can be seen, with a good quality and free access. In addition, through the structuring of lessons, is committed to the autodidacticism, creating an active attitude in class that allows the student to be the main character of the educational process, but without leaving aside the need of some guidance given by teachers and, therefore, creating situations of passive attitude on the part of the student, thus achieving a combination of activity and passivity. Likewise, it should be noted as a positive aspect the involvement of students in certain responsibilities about the school and its environment, such as cleaning tasks, the distribution of food to students, the organization of events of various kinds, etc.

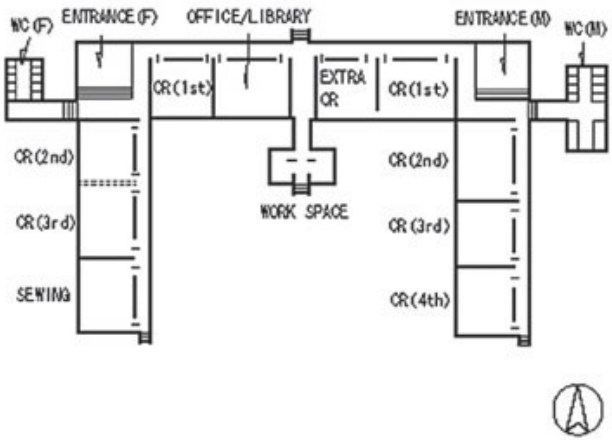
However, there are certain contradictions that should be highlighted. In the first place, although the structuring of classes is presented as something flexible that the teacher decides always keeping in mind that the student is the center of the educational process, the schedule even in primary education continues to be quite inflexible and stipulated. On the other hand, the educational system becomes rigid as elementary education ends, creating a really strict and stressful environment in upper secondary education, which leads to the entrance examinations, known in Japan for being really hard tests in which it is intended to demonstrate everything learned previously. This is certainly very similar to the Spanish educational system, but it is still a negative measure, since the purpose is to determine the fate of an 18-year-old student through qualifications obtained in tests that attempt to condense all the information learned. In addition, these exams favor the mechanical memorization, which is totally opposite to the autodidacticism which is encouraged in the structuring of lessons of the elementary education.

F24 Elementary school class nowadays.

F25 College entrance exam.



F26 Floor plan of Shizutani Gakko Elementary School (1675).



F27 Floor plan of a school model plan created in 1895.

2.2. Evolution of the educational space

By looking back into the evolution of the Japanese educational system, we found that the educational institutions that really influenced the Meiji era (1868 – 1912) were the three mentioned before: *Hanko* (for samurai), *Terayoka* (for local people) and private schools with specialized learning.

Regarding the planning of each type of school, the different ways of learning determined the configuration of the spaces and the entire building itself. In the *Terayoka*, children of different ages were mixed together in one entire class with one teacher, therefore the building consisted in one big room. On the other hand, Hanko had a more complex design, organized in different rooms and a main hall, because children were separated in different groups. One of the best examples of Hanko that is still preserved nowadays is Shizutani Gakko (F26), built in 1675, not only for samurais, but also for local people. Finally, private schools planning was more flexible, depending on the specialization[21].

After the Edo era (1603-1868) collapsed and the modern educational system was established in Japan with the beginning of the Meiji era (1868 – 1912) the construction of schools increased rapidly all around the country. However, as this modern system was based on the Western countries' educational system, two trends in school planning emerged: one still following the traditional Japanese school planning and another strongly influenced by the Western culture, also known as semi-Western-style. These semi-Western-style schools, many of them still preserved today as cultural heritage, were also a way of creating an image of the country as a modern and a global nation. However, as it was urgent to build as many schools as possible, due to the increasing number of schooled children and these constructions need an important amount of budget, the government decided to create in 1890 a guideline for building standardized schools, in order to make the process faster and cheaper, deciding the design parameters and style of the educational spaces. Following this guideline, a school model plan was created in 1895 (F27), where classrooms for 80 students were designed with an area of 65m^2 connected to each other by a corridor with a façade facing the exterior in other to provide ventilation and natural light. This model plan

21 WALDEN R. (2005) *Historical Background of the Japanese School*, Schools for the Future, Springer Fachmedien Wiesbaden p. 41-50

had a big influence in the Japanese public-school planning and still nowadays we can see many of these design characteristics in some contemporary schools, especially the single-loaded corridor connecting all the classrooms.[22]

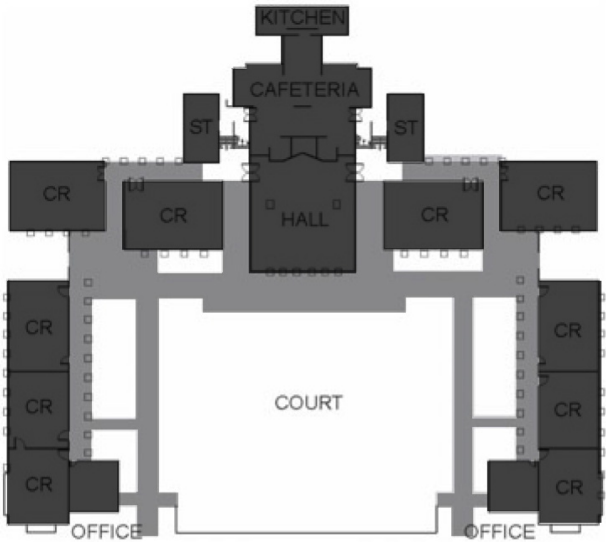
2.2.1. Japanese school planning during the 20th century

The beginning of the 20th century and the situation before the Second World War (1900-1945)

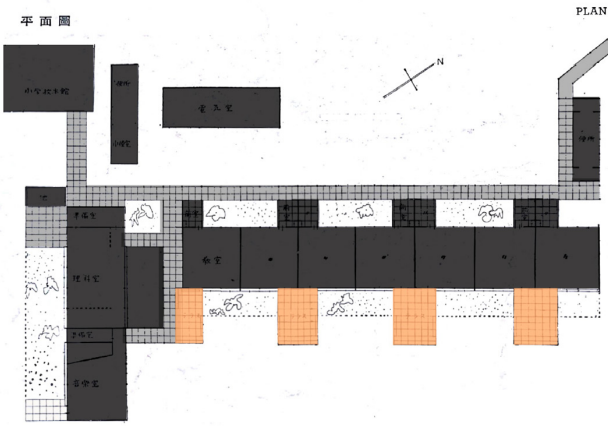
The standardization of the school building in order to accelerate the construction was still the main purpose during the beginning of the 20th century. Still influenced by the Western countries, new subjects were added to the curriculum and new types of classroom were also added to the school model plan.

On the other hand, with the emergence of the Progressive Education Movement influenced by USA and UK new schools were built thinking about the importance of the school planning and the design of the educational spaces. One of the most important examples in Japan was Jiyu Gakuen (F28), built in Tokyo in 1921, designed by the architects Frank Lloyd Wright (main building) and Arata Endo (annex building). The main building still follows the traditional typology of single-loaded corridor, but in this case the corridors are exterior, and they are connected directly with the big central courtyard, making the atmosphere of the school much more open and linked to nature. The indoor space of this school, entirely designed in Prairie School style, shows how all the details were carefully designed, even the furniture [23].

However, after the Kanto earthquake in 1923, many school buildings were destroyed and the government decided to rebuild as many as possible using reinforced concrete and implementing new modern conveniences [24].



F28 Floor plan of Jiyu Gakuen Elementary School (1921).

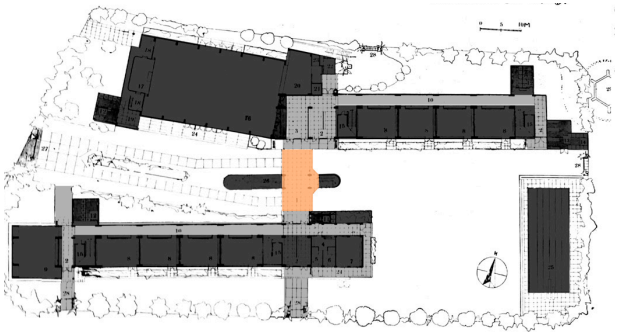


F29 Floor plan of Nishitoyama Elementary School (1950).

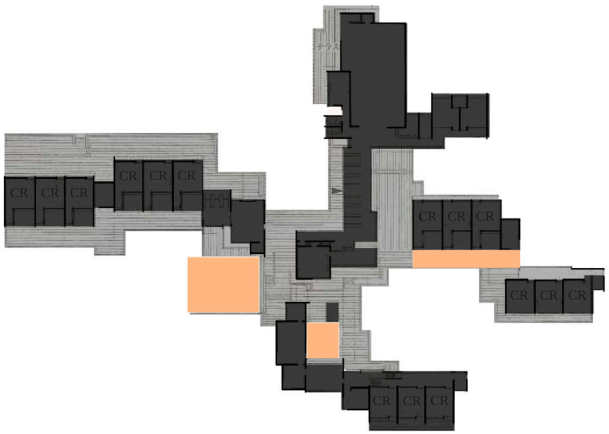
- .....single-function closed space
- .....single-function open space
- .....multi-function space
- .....transition
- .....corridor

22 WALDEN R. (2005) *Historical Background of the Japanese School*, Schools for the Future, Springer Fachmedien Wiesbaden p. 41-50
23 JIYUGAKUEN (2002) *Myonichikan* < http://www.jiyu.jp/tatemono/index-e.html>
24 WALDEN R. (2005) op. cit.

F30 Floor plan of Miyamae Elementary School (1955).



F31 Floor plan of Sekei Junior High School (1951).



F32 Floor plan of Johnan Elementary School (1965).

Post war reconstruction period (1945-1955)

After the establishment of the new educational structure composed by 6-3-3-4 years and a new curriculum, the government started a period based on war damage reconstruction. The review of the standards and construction technology was regarded as an urgent task. In 1949, the Japanese Industrial Standards (known before as Japanese Engineering Standards) changed strongly due to the damages caused by the war. The construction of reinforced concrete schools was promoted as opposed to traditional wooden schools and this standard design of the RC building school was commissioned from the Ministry of Education to the Japanese Architectural Institute. As a result, Nishitoyama Elementary School (F29) was designed as a model school following the RC standards and the construction of many schools following it rapidly progressed afterwards. This model was a replacement of the northside corridor type school made out of wood, but with reinforced concrete[25].

On the other hand, in 1954 steel structure standards for building schools were included in the JIS. Furthermore, in order to continue promoting standardization, Miyamae Elementary School (F30) was also designed as a steel-structured model, but it never replaced the reinforced concrete one[26].

In addition, as a progressive example, Seikei Junior High School (F31) built in 1951 was designed taking into consideration the body size of children and their psychology. The scale of the house was taken as a reference in order to make children feel more comfortable. As a result, small square classrooms of 8.1m^2 were designed, with a tiny front room attached to leave the coats and the shoes before entering (as per the Japanese tradition) and a private terrace in the back part, in order to create the atmosphere of many independent units composed by those three spaces, each of them similar to the concept of a house[27].

25 THE ARCHITECTURAL INSTITUTE OF JAPAN (2005) *Compact architectural design documentation (Konpakuto kenchiku sekkei shiryou shuusei)*, General Architects Association of Japan, p. 216-217
26 WALDEN R. (2005) *Historical Background of the Japanese School*, Schools for the Future, Springer Fachmedien Wiesbaden p. 41-50
27 THE ARCHITECTURAL INSTITUTE OF JAPAN (2005) op. cit.

High Economic Growth Period (1956 - 1972)[28]

In 1958 was established a national subsidy system for the construction of public schools and, as a result a development era on this field started. The majority of these new schools constructed between 1959 and 1965 was still based on standard design in order to give a fast response to trends like the Baby Boom, increasing concentration of population due to high urbanization, rising of high school attendance rate, etc.

However, after the development of large-scale new cities like Tama and Tsukuba and the success in the construction of new schools taking into account the increase in population, new model plans trials were designed through analysing the existing schools and influences by foreign schools trying to solve some other issues related with the quality of the educational spaces:

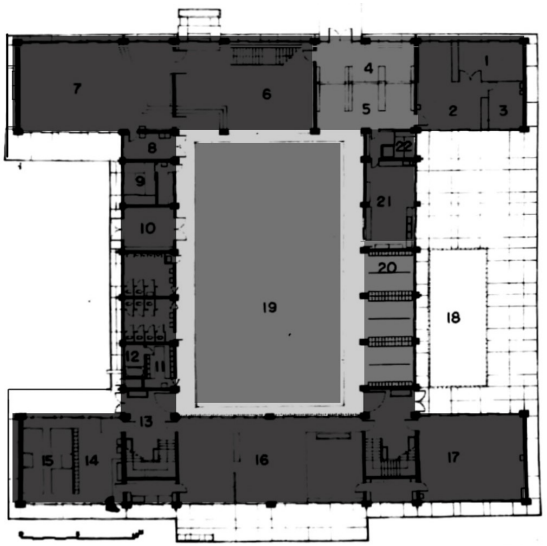
- Improving the classrooms: to ensure natural lighting and ventilation in both sides of the classrooms, courtyards were placed between the northern side corridor and the classroom. The Design Summary created in 1895 was reviewed taking this into account.

- Three principles of classroom arrangement: classroom arrangement inside the same grade, classroom arrangement divided into different grades and classroom arrangement regarding the needs of each subject.

- Unit configuration: Johnan Elementary School (F32) built in 1965 and Shirohama Junior High School (F33) built in 1970 are clear examples of designing different units grouped by grades creating an organic dispersed floor plan[29].

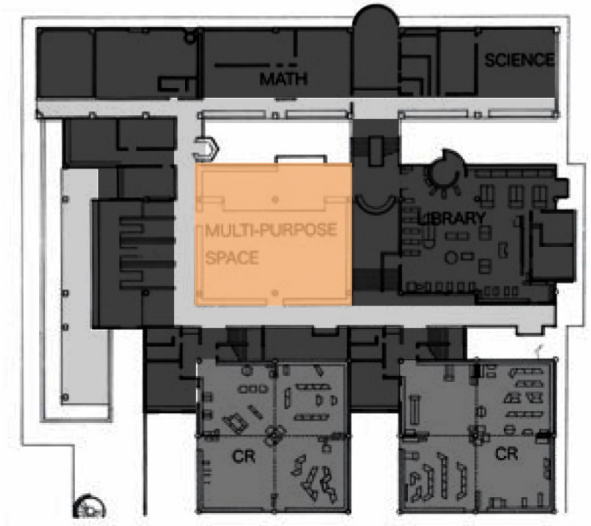
- Pursuit of area efficiency: by ensuring a determined number of classrooms with a limited area, 2nd floor configuration and open corridor type schools. Blue Elementary School (F34) is one of the examples that follows these measures, as well as implementing a classroom arrangement based on the type of subject, mixing children of different ages and creating various common spaces, following the reference of the British Model Schools of the 1950s .

F33 Floor plan of Shirohama Junior High School (1970).

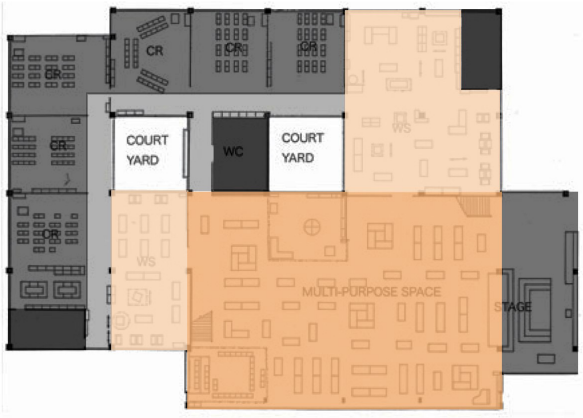


F34 Floor plan of Blue Elementary School (1957).

28 THE ARCHITECTURAL INSTITUTE OF JAPAN (2005) *Compact architectural design documentation (Konpakuto kenchiku sekkei shiryou shuusei)*, General Architects Association of Japan, p. 216-217
29 WALDEN R. (2005) *Historical Background of the Japanese School*, Schools for the Future, Springer Fachmedien Wiesbaden p. 41-50



F35 Floor plan of Kato Gakuen Elementary School (1972).



F36 Floor plan of Ogawa Elementary School (1978).

- .....single-function closed space
- .....single-function open space
- .....multi-function space
- .....transition
- .....corridor

Stable Growth Period (1973-1985)

In this period, quantitative improvement of school facilities came to an end and the Building Design Guidelines were formulated in 1974 in order to provide schools of a better quality[30].

As a remarkable example of school design in this period, the first open-plan schools were built in the 1970s to encourage the student-centered learning and influenced by the open-plan school movement of UK and USA to change the traditional classroom type school.

One of the first examples was Kato Gakuen Elementary School (F35), built in 1972 as a private school. In this example, two open large classrooms are designed with the possibility of being closed by movable partitions. In addition, one big space is created only as a multi-purpose space, giving the school a flexibility of the indoor space never seen before. Furthermore, due to the expanding situation of this movement, the government started to promote this typology and in 1978 the first public open-plan school was built, Ogawa Elementary School (F36). In 1984, the government implemented a subsidy for designing multipurpose spaces and, as a result, a new typology of open-plan school with a very wide corridor used also as a learning space spread all over the country, such as Honcho Elementary School (F37) built in 1984[31].

On the other hand, proposals for expanding the classroom unit configuration and promoting the dispersed configuration of the floor plan appeared also in the 1970s, following the case of Johnan Elementary School (F32) and Shirohama Junior High School (F33), mentioned before. These schools emerged as a response against the open-plan schools criticizing the openness and the lack of human scale of the spaces and defending the need of various types of spaces for individuality. The most important example following this typology is Kasahara Elementary School (F38) built in 1982 by Atelier Zo[32].

30 THE ARCHITECTURAL INSTITUTE OF JAPAN (2005) *Compact architectural design documentation (Konpakuto kenchiku sekkei shiryou shuusei)*, General Architects Association of Japan, p. 216-217
31 WALDEN R. (2005) *Historical Background of the Japanese School*, Schools for the Future, Springer Fachmedien Wiesbaden p. 41-50.
of Japan, p. 216-217
32WALDEN R. (2005) op. cit.

Bubble Growth Collapse Period (1986 -)

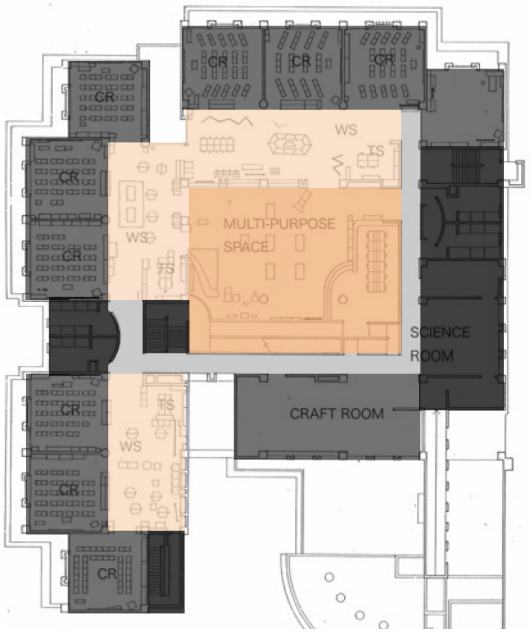
The subsidy for multipurpose spaces established by the government in 1984 influenced also the school buildings in this period. In addition, although the construction of schools in reinforced concrete continued being popular, the government promoted the use of wood as a way of being environmentally friendly and using the local materials. In the 1990s, as a response to new technologies, new types of classroom were implemented in the school planning, such as computer room. Furthermore, the schools began to have a great impact on the urban surrounding and the concept of the school building as an educational- but also a social facility became very important in this period[33].

The most remarkable example that has strongly influenced all the contemporary school designs is Utase Elementary School (F39) designed in 1995 by Coelacanth and Associates. In this example, although classrooms follow the open-plan typology, different spaces with various sizes were created in order to promote also the individual and small group learning. Each classroom unit is carefully designed to be suitable in scale for the activity of each grade. In addition, the school is used as a community facility[34].

F39 Floor plan of Utase Elementary School (1995).

33 THE ARCHITECTURAL INSTITUTE OF JAPAN (2005) *Compact architectural design documentation (Konpakuto kenchiku sekkei shiryou shuusei)*, General Architects Association of Japan, p. 216-217

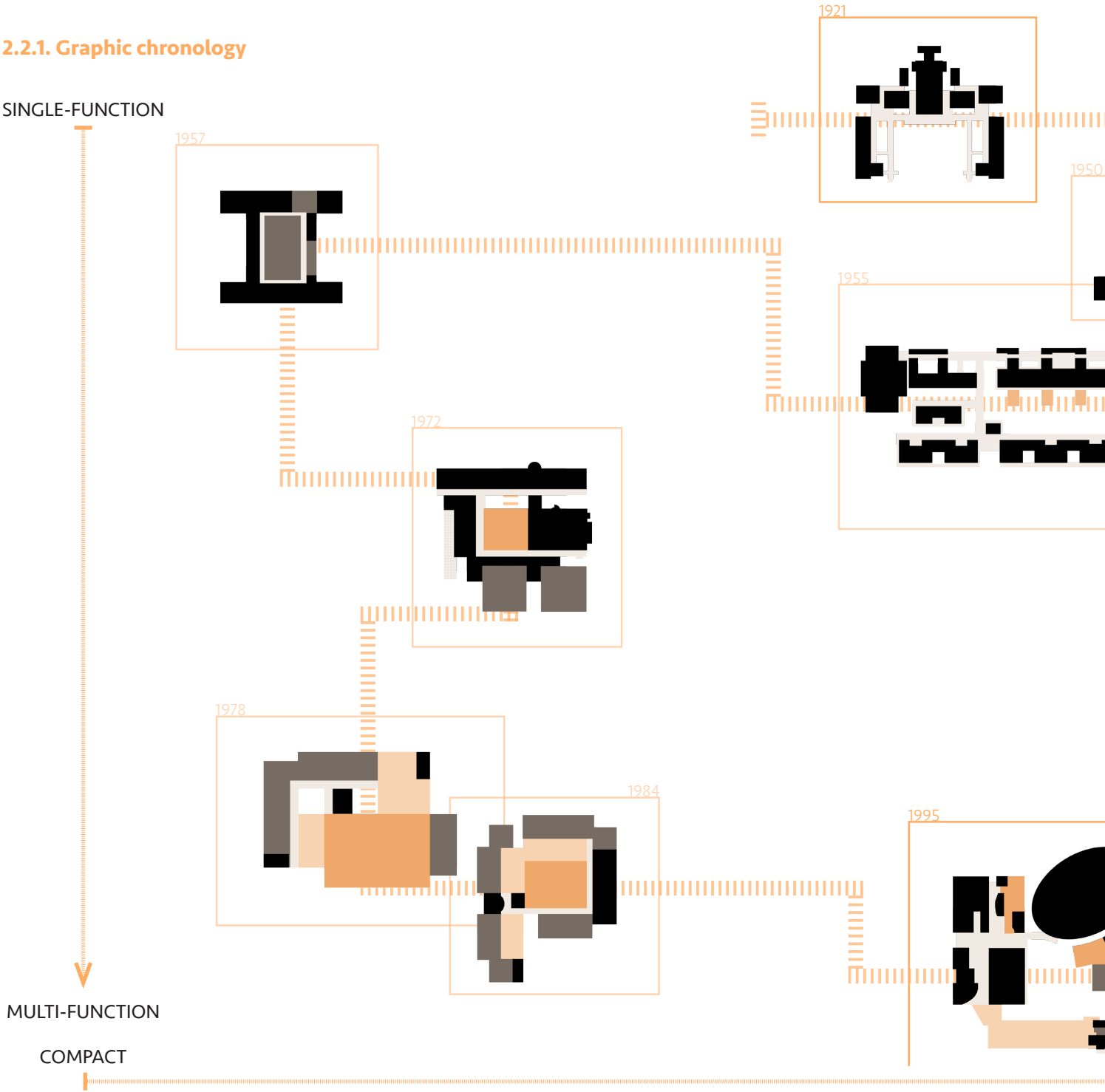
34 WALDEN R. (2005) *Historical Background of the Japanese School*, Schools for the Future, Springer Fachmedien Wiesbaden p. 41-50.

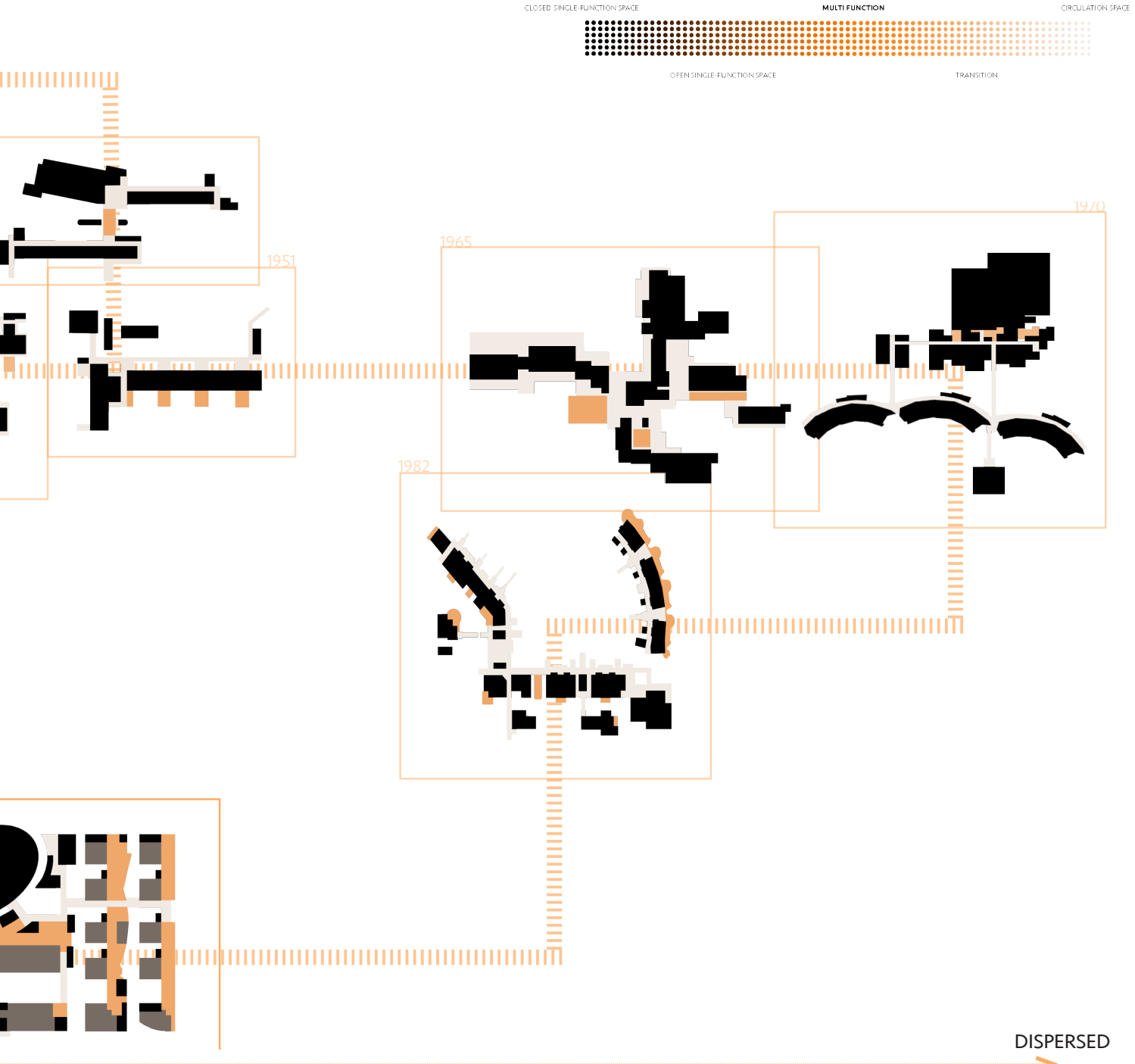


F37 Floor plan of Honcho Elementary School (1984).

F38 Floor plan of Kasahara Elementary School (1982).

2.2.1. Graphic chronology

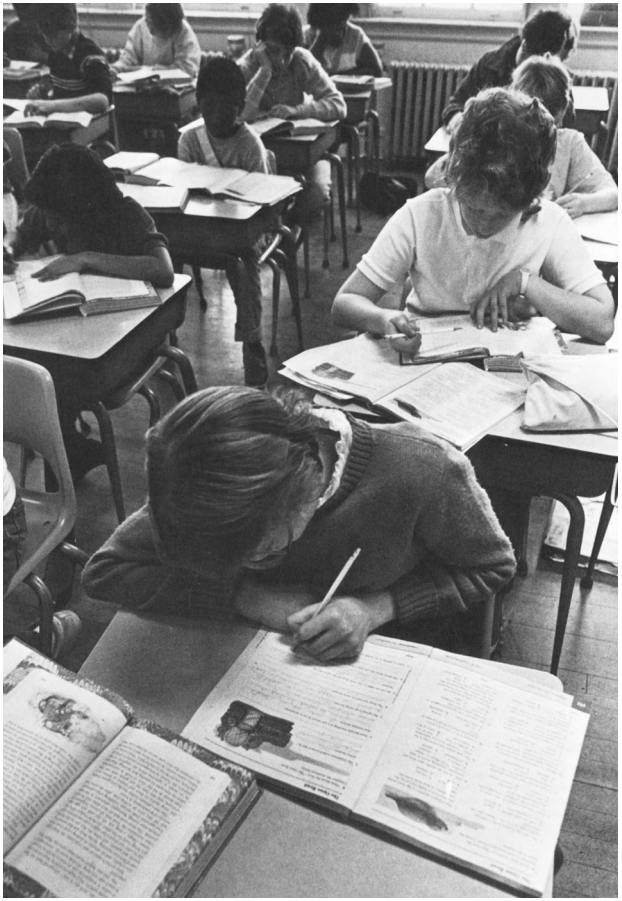



CLOSED SINGLE-FUNCTION SPACE
MULTI FUNCTION
CIRCULATION SPACE
OPEN SINGLE-FUNCTION SPACE
TRANSITION
1951
1965
1970
1982
DISPERSED

3. OPEN-PLAN SCHOOLS

3.1. Origin and history of open-plan schools

3.2. The open-plan concept in Japanese schools



F40 Children studying at an elementary school in the UK.

3.1. Origin and history of open-plan schools

Brief History

Open-plan schools were born in the UK in a context of remarkable expansion. After the Second World War the country lived thirty years characterized by a constant renewal and a society aiming for social and political changes[35].

This situation also applied to education. As many children had been evacuated to the countryside during the war while many others were living with their teachers, there were big differences in educational opportunities between children, not related with social classes. Consequently, after the war, schools were full of children of different ages with different levels of achievement[36]. Taking this into account, the schools needed bigger classrooms than before the war, because they have to be able to accommodate children of different ages all together, but also, due to the atmosphere of social reconstruction and the influence of 'informal education[37]' (that evolved since the 1920s in England), teachers wanted children to learn in ways closer to their natural approach to assimilate the world around them creating new environments far from the traditional classroom atmosphere.

Post war schools need more useful floor area than those built before World War Two (...) (They) need more individual spaces (...) of many different sizes and shapes (...) Some of the spaces will be quiet and clean, others noisy and dirty. The tools to be used may be pens, needles, chisels, lahtes, pianos or vaulting horses. There is thus a need for very different physical conditions in different spaces. These spaces must be adaptable not only to present variety of uses; but also to the changes which the future is bound to bring, sometimes suddenly, sometimes imperceptibly. The spaces are designed for children[38].

35 HAMILTON, D. (1976) *A Case Study of a New Scottish Open Plan School*, Edinburgh, The Scottish Council for Research in Education, p. 33-36.
36 ROTHENBERG, J. (1989). *The open classroom reconsidered*. Elementary School Journal, 90, p. 69 –86.
37 *Informal Education is a general term for education that can occur outside of a structured curriculum. Informal Education encompasses student interests within a curriculum in a regular classroom, but is not limited to that setting.* ROGOFF, B.; CALLANAN, M.; GUTIÉRREZ, K.; ERICKSON, F. (2016). The Organization of Informal Learning. Review of Research in Education.
38 Paragraph of Derek Morell (member of the Development Group) but found in HAMILTON, D. (1976) *A Case Study of a New Scottish Open Plan School*, Edimburgo, The Scottish Council for Research in Education, p. 34.

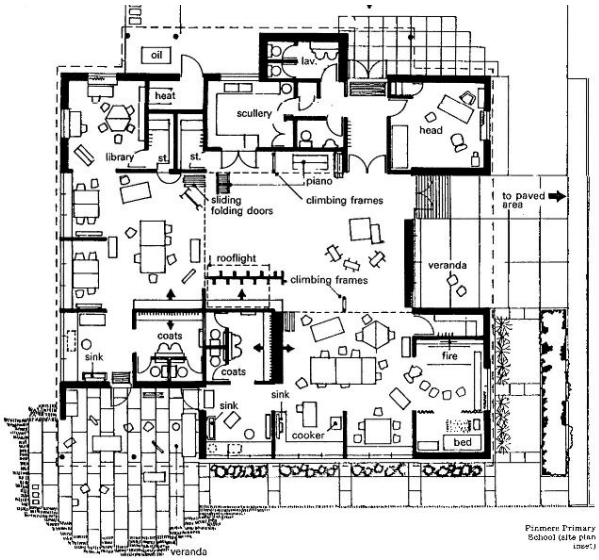
Before the 1960s, due to the creation of the traditional school during the Industrial Revolution, the classroom was the only unit configuration accepted for the spatial configuration of every school. However, between the 1960s and the 1980s, educators and architects started to rethink the spatial configuration of schools and how to socially organize them. New educational philosophies related with democratic and experimental education advocated by John Dewey or Friere encouraged new pedagogies and rearrangement of the educational spaces[39].

As a response to the characteristics and demand of this context, open-plan schools emerged during the 1960s and had a strong development between the 1960s and 1970s. The first open-plan school was built at Finmere (England) in 1959 (**F41**) for fifty pupils.

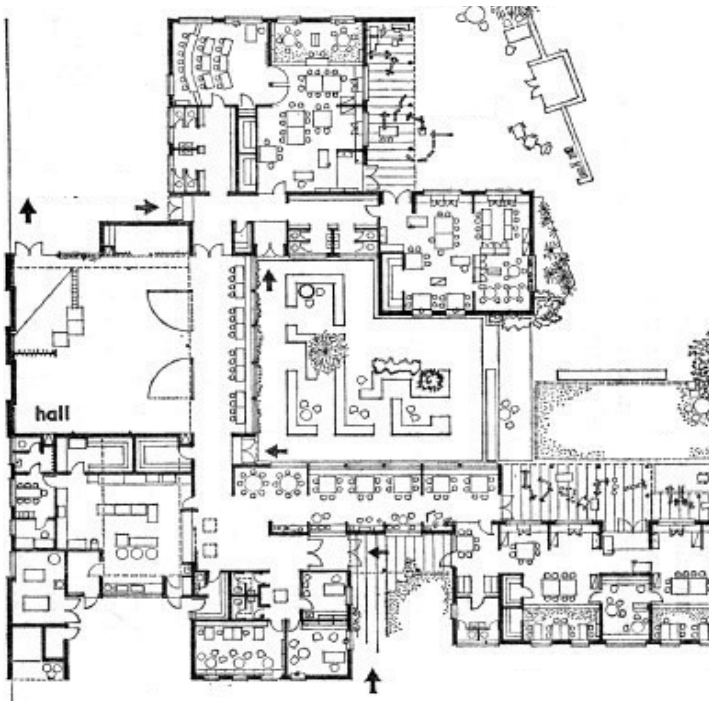
This village school was designed in 1958 by the Ministry's Development Group in collaboration with the Oxfordshire local education authority. The essence of the plan is that the children mostly work in small groups or individually, the two teachers sharing their time between them. The accommodation consists, therefore, of a series of small working areas, all with a degree of seclusion, while still a part of the whole. (...) These open on to somewhat larger areas which in turn are linked, by means of sliding-folding doors, to a space large enough for groups of children to move about more freely. If both sets of doors are open, the whole teaching area (approximately 1,800 sq. ft.) can become one space. By closing one or both sets of doors, it can become either two or three separate rooms[40].

After the publication of The Plowden Report (1967) by the Central Advisory Council for Education (England) that provided descriptions of new schools and informal education, another remarkable example of open-plan school was built following that idea, the Eveline Lowe School (**F42**) built in 1967 (England) for 320 pupils. The main characteristics of this school were:

- *The need to sub-divide the available space to allow a number of small groups of individuals to pursue widely varying activities.*

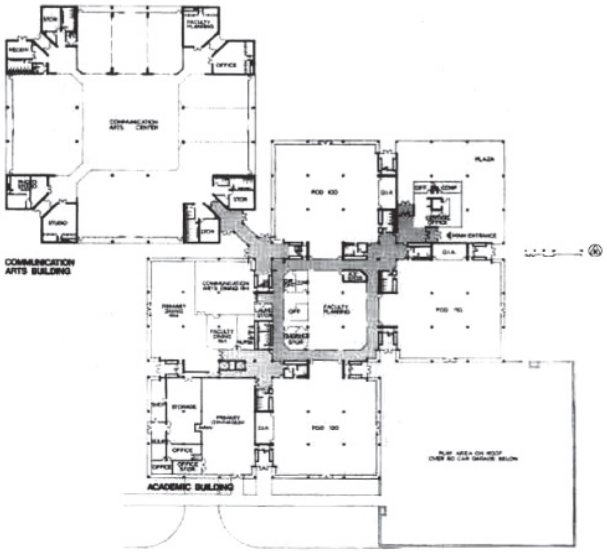


F41 Floor plan of Finmere Elementary School (1959).



F42 Floor plan of Eveline Lowe School (1959).

39 CLEVELAND, B.W. (2011). *Engaging spaces: Innovative learning environments , pedagogies and student engagement in the middle years of school*, p. 56 – 64.
40 THE PLOWDEN REPORT (1967) *Children and their Primary Schools.* A Report of the Central Advisory Council for Education, p. 396.



F43 Floor plan of Disney School (1959).

- The need to make a distinction in character (i.e. in finishes, scale, colour, lighting, furniture) between a small, quiet carpeted area; a general working area; and an area equipped for messier kinds of work.

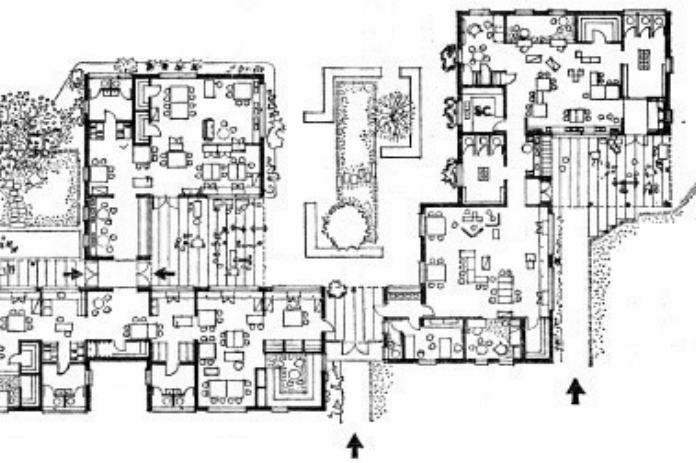
- The importance of direct access to a sheltered veranda and to the ground outside.

- The need to take into account the use of sizes of furniture from an early stage in design process[41].

On the other hand, in the 1960s American society, influenced by English elementary schools and 'informal education', also demanded a school reform relating traditional schools with repressive and authoritarian environments[42]. As a result, after the creation of the Educational Facilities Laboratories (EFL) the open-plan school concept spread all over the USA. This research group became very popular at that time due to their progressive thinking regarding school facilities.

An example of open-plan school in the USA is the Disney School (F43) in Chicago built in 1960 by Perkins and Will. Large "pod" areas served as the major classroom spaces, with little definition of space within them[43].

However, after open-plan schools became popular in many countries all over the world, between 1970s and 1980s the movement experienced a decrease in reputation and the traditional classroom became again the main school model. Some researchers in the USA think that the reason why this happened is because parents responded negatively to open-plan model. In addition, they suggest that teachers didn't manage to take advantage of the spatial potential and as a result, educational methods didn't follow the steps of architectural innovation[44].



41 THE PLOWDEN REPORT (1967) *Children and their Primary Schools.* A Report of the Central Advisory Council for Education, p. 400.
42 ROTHENBERG, J. (1989). *The open classroom reconsidered.* Elementary School Journal, 90, p. 69 –86.
43 CLEVELAND, B.W. (2011). *Engaging spaces: Innovative learning environments , pedagogies and student engagement in the middle years of school*, p. 56 – 64.
44 Ibid.

The original concept

Finding a specific definition that explains accurately such a broad concept as 'open-plan school' is complicated, however an approximation can be found in some specialized books:

A school built to a design which does not include self-contained classrooms. Typically, an open plan school has fewer internal doors and walls than a classroom school accommodating the same number of pupils[45].

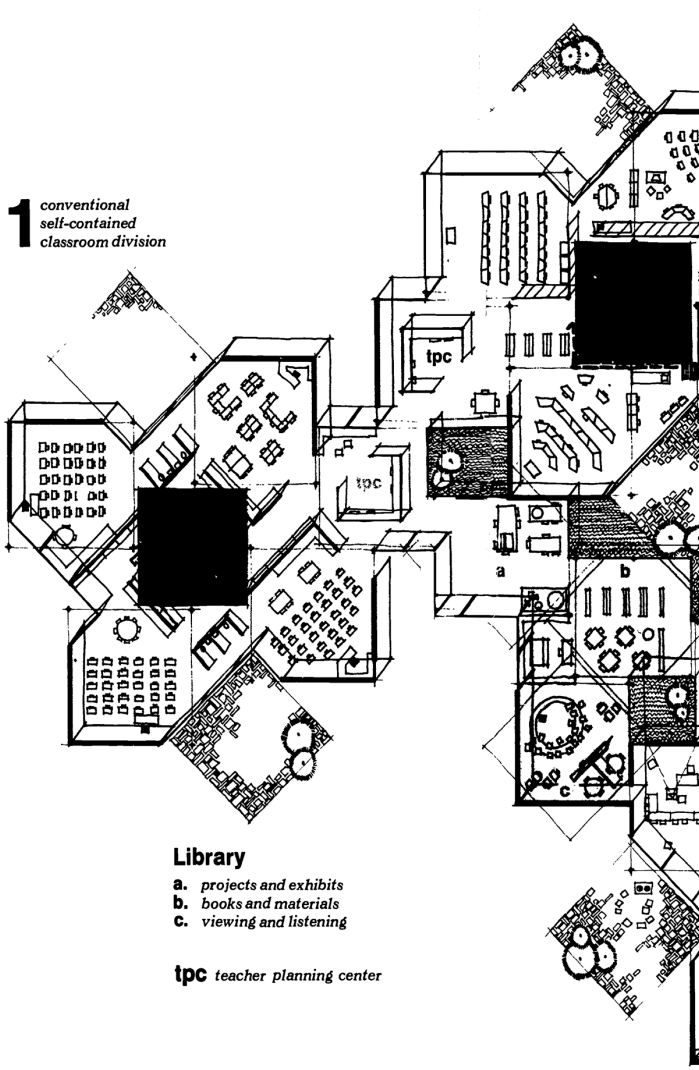
In addition, the Educational Facilities Laboratories (EFL) mentioned before in their report, defined the design intentions of this typology as:

[Open plan classrooms] can accommodate the conventional self-contained classroom program if that is called for – but they do not lock the user into that pattern, if a different approach commands itself now or later on (...) In short, these designs give freedom to teachers, administrators, and students[46].

With these words we can clearly understand that open-plan school concept is not about a specific teaching method, but a specific configuration of the space characterized for being simple and flexible, admitting many uses, without constraining the relationship between users and facilitating different types of social arrangements.

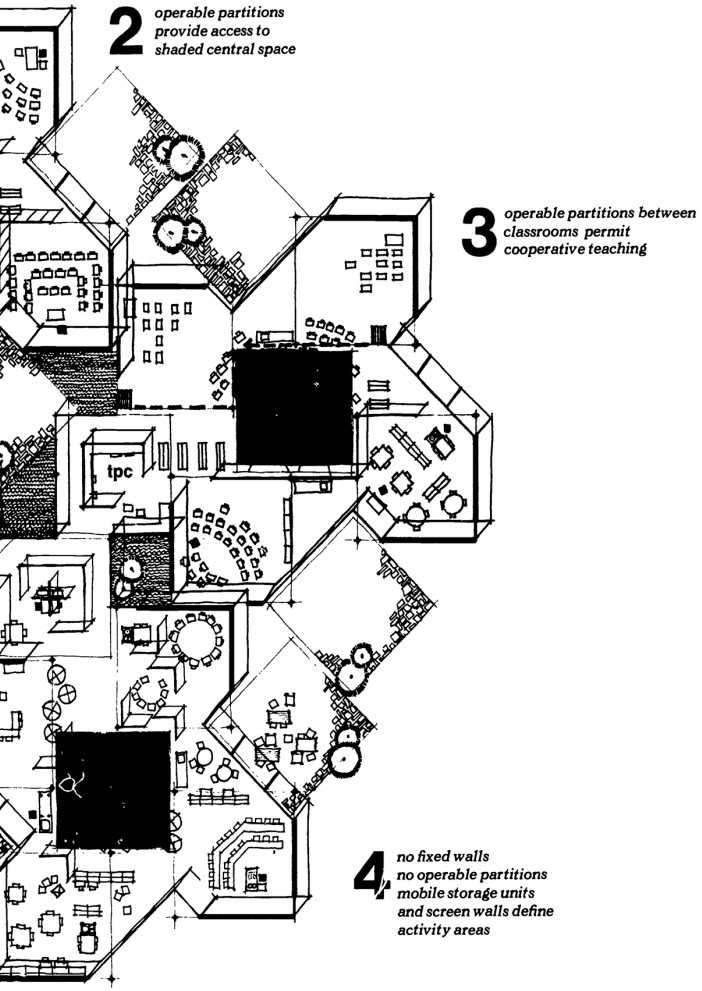
However, although these open-plan schools can admit different teaching methodologies and ways of using the spaces, as this typology was born influenced by the 'informal education' and looking for an educational reform, researchers at that time believed that an ideal open-plan school educational program should follow these *characteristics*[47]:

- Children need to learn how to live in a complex, technological society. This means not only learning the basic skills like read or write, but also to become independent and self-sufficient individuals able to co-work with others.



F44 Floor plan of the design proposal made by EFL.

45 ROTHENBERG, J. (1989). *The open classroom reconsidered.* Elementary School Journal, 90, p. 8.
46 GROSS, R., & MURPHY, J. (1968). *Educational change and architectural consequences. A report on facilities for individualised instruction.* New York: Educational Facilities Laboratories.
47 ROTHENBERG, J. (1989) op.cit. p. 72.



- Education should be student-centered. Educators must take into account the individual differences of each children, performing a flexible educational program that starts with the student.

- Teachers should choose the adequate activities to reach that educational program. However, there are many ways of achieving it. These forms will change as the teacher and the student get to know each other better.

- Needs are also different between different grades. The educational program must take this into account.

Translating these ideas into spatial configuration, the EFL described in the report how a school should be arranged depending on the level of education. Regarding elementary schools, which are the main example of open-plan school typology, they considered that the main spatial *characteristics*[48] were:

- ***Flexibility*** *provided by space-dividing devices, permits teachers and administrators to organize instruction in any way they wish and to select or manipulate a correspondingly appropriate setting (...).*

- ***Diversity*** *in the scale of space available permits selection of the appropriate three-dimensional (architectural) environment for each reasonably predictable activity: high-ceilinged, lofty space for large groups or vigorous action; versatile, medium-sized areas approximately the size of the standard classroom; small intimate, low-ceilinged alcoves suitable for individual study or tutorial work (...).*

- ***Accessibility****, in this design, means chiefly that the means of instruction are readily available – that teachers and students can command the resources they want at a particular time, fast, with a minimum of red-tape, paper work, and trouble.*

Their design proposal (**F44**) is based on a cluster-type school. Each cluster contains an area with high ceiling in the centre surrounded by four teaching areas with a more common height and four small alcoves more intimate. The clusters surround a central library, connecting these two spaces with a space where

48 ROTHENBERG, J. (1989). *The open classroom reconsidered.* Elementary School Journal, 90, p. 8.

the teachers work. The scheme shows a transition from the standard, *self-contained classroom to a free-wheeling open plan for instruction*[49]. In contrast, they suggest that noisy activities, like music subject, should be performed in a closed environment in order to not disturb to the users in the other areas.

However, although we can find many design proposals or real examples of open-plan schools through the years, the truth is that there is not a fixed way of designing a school that follows the characteristics mentioned above. In addition, open-plan school architects are not completely sure about if their way of designing these schools is the ideal one or not. It is still a typology in process of research and that's why defining its concept objectively is a difficult task, because it changes depending on the country (since society and culture is different in each one) and the time (open-plan schools nowadays are not equal to the original ones).

F45 Common Japanese elementary school in the 1960s.

F46 Common Japanese elementary school in the 1960s.

3.2. The open-plan concept in Japanese schools

School planning: between West and East

To understand how different Japanese educational spaces nowadays are from Western ones it is necessary to know how school architecture was before its contact with the West during the Meiji Restoration and how this transition affected the configuration of these spaces.

The introduction of Western education to the country during the Meiji period was one of the ways of achieving the modernization of the country. From the moment the modern education in Japan began, the traditional learning spaces from the Edo period became modern schools. However, as we can see comparing the school planning in Japan with the Western countries, the truth is that these modern schools were not just copied and adapted to the Japanese school system, because we can recognise Japanese elements in them. *This can be seen as a process of Japanese elements transforming the Western school architecture model from the inside*[50] .

49 GROSS, R., & MURPHY, J. (1968). *Educational change and architectural consequences. A report on facilities for individualised instruction.* New York: Educational Facilities Laboratories.
50 YAMANA, J. (2010 - 2011) *Japan's School Architecture as Mixture between the West and the East*, Graduate School of Education, Kyoto University.

F47 *Shoukou-kuchi* (昇降口).

F48 Common Japanese elementary school in the 1960s.

There are many examples of Japanese elements that remained in these new Western-type schools, but probably the most noticeable for people unfamiliar with this culture is the *shoukou-kuchi* (昇降口). This space is specially used for storing one's outdoor shoes and change them into indoor shoes (or the opposite way when you go back home). Such traditional custom is followed when entering any building in order to preserve the cleanliness, also in schools. By analysing its function, this space can be understood as a boundary between indoor and outdoor[51]. This boundary and its transition are especially important in Japanese culture, there are many traditional rituals which maintain the distinction between the inside and the outside[52]. In addition, *shoukou-kuchi* (F47) was also traditionally used in schools to separate status, by placing the *shoukou-kuchi* for the teachers at a central position and the one for students at one side of the building, and gendered in some cases.

Another important element is the big sports ground that can be already found in some schools of the second half of the Meiji era. It is said that this sports ground became larger do to the increase of school enrolment rate and the need of increasing the space to hold the traditional Sports Day. Another reason could be the demand of space that a sport like baseball (national sport in Japan) requires.

With the influence of Progressive Movement in the Taisho era (1912-1926), in order to promote student-centered learning Japanese schools implemented a typo of classroom called *jishuu-shitsu* (自習室) where students can study on their own different subjects in one space, with the purpose of connecting all the subjects between each other. Furthermore, schools also used spaces as small forests and farms to connect nature with the indoor space of the building, remarking the strong relationship that Japanese culture has with the natural environment (these resources can also be seen in the open-plan schools that will appear after)[53].

On the other hand, another difference between Western schools and Japanese ones is the configuration of the classroom. These

51 YAMANA, J. (2010 - 2011) *Japan's School Architecture as Mixture between the West and the East, Graduate School of Education*, Kyoto University.
52 OZAKI R. (2006) *Boundaries and the meaning of social space: a study of Japanese house plans*, Environment and Planning D: Society and Space, volume 24, pages 91 – 104.
53 YAMANA, J. (2010 - 2011) op.cit.

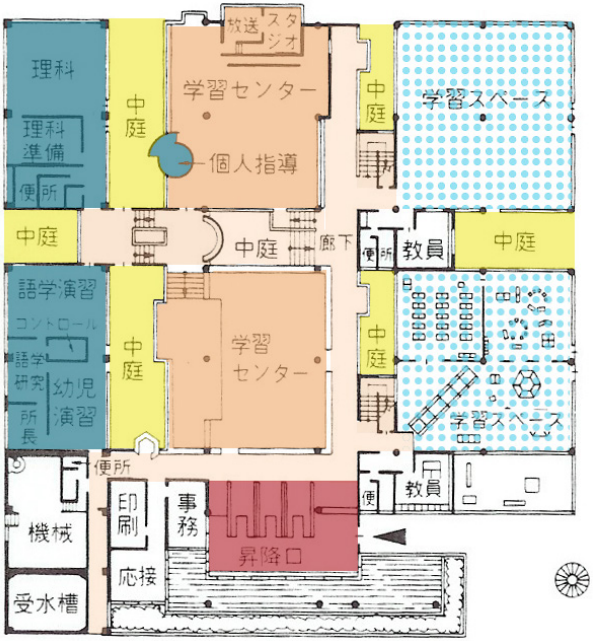
schools were born following the concept of UK and America, it can be remarked that meanwhile Western open-plan schools tried to avoid using a blackboard in the teaching process to remove the teacher-centered learning, Japanese open-plan schools still placed blackboards in the classrooms because Japanese teachers used them as an element of simultaneous guidance, not as the only tool for teaching. In addition, in a Japanese classroom the space in the back part is used for storage, being seen more like a 'daily' (even messy) space, while the front part is seen as a formal space. This configuration remained in the open-plan schools (with some variants), whereas in the Western open-plan schools the storage space is placed separately from the classroom space[54].

In conclusion, all these elements have to be taken into account in the analysis of any Japanese school as a way of integrating the foreign planning typologies with the Japanese culture and as a result, adapting the functioning of the educational spaces with their traditional way of understating them.

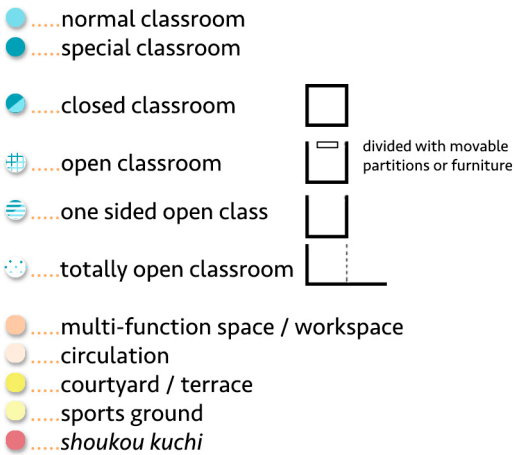
The evolution of the concept

Since the open-plan school concept arrived in Japan around the 1970s until nowadays it has experienced many changes as it has been adapting to the evolution of society and education. Probably if we ask a Japanese contemporary architect about an open-plan school his/her image of the space and its arrangement will be different from the first examples of that typology that were built in the country. However, the fact that open-plan schools in Japan have been adapted over time is the reason why this typology is being used still nowadays, unlike in the USA and in the UK where these schools disappeared during the 1980s. Moreover, the education reforms that Japan has experienced have favoured that the use of this typology have endured over the time, although still there are many educational aspects to improve[55].

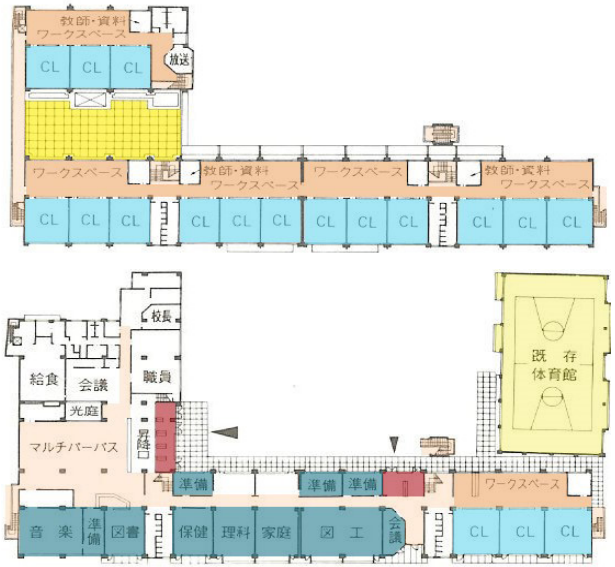
When this open-plan concept was taken from the USA and UK schools (more directly from the USA) and the first school following it, known as Kato Gakuen Elementary School (**F49**), was built in Japan in 1972 the definition of this concept was understood as:



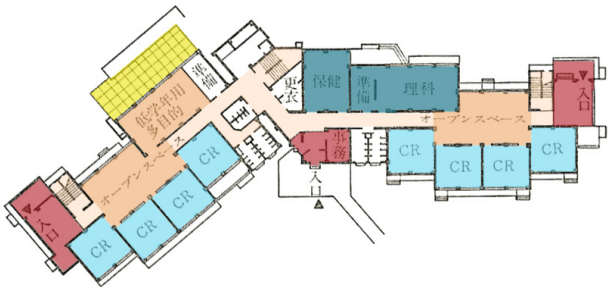
F49 Floor plan of Kato Gakuen Elementary School (1972).



54 NOJIMA N. (2011) *Kyōshitsu kyōshitsu mawari no keikaku o kangaeru*, Institute of Educational Environment (IEE) (Japanese).
55 THE ARCHITECTURAL INSTITUTE OF JAPAN (2005) *Compact architectural design documentation (Konpakuto kenchiku sekkei shiryou shuusei)*, General Architects Association of Japan, p. 217-218



F50 Floor plan of Inaradai Elementary School (1975).



F51 Floor plan of Miyako Elementary School (1974).

Open-plan school refers to a layout that arranges functions by dividing a large continuous space with movable furniture and partitions[56].

The configuration of the space in this school was very progressive due to the two large spaces that are used as classrooms, that can be divided into four smaller spaces, and the introduction of a large multi-purpose space (in this case separated from the other spaces).

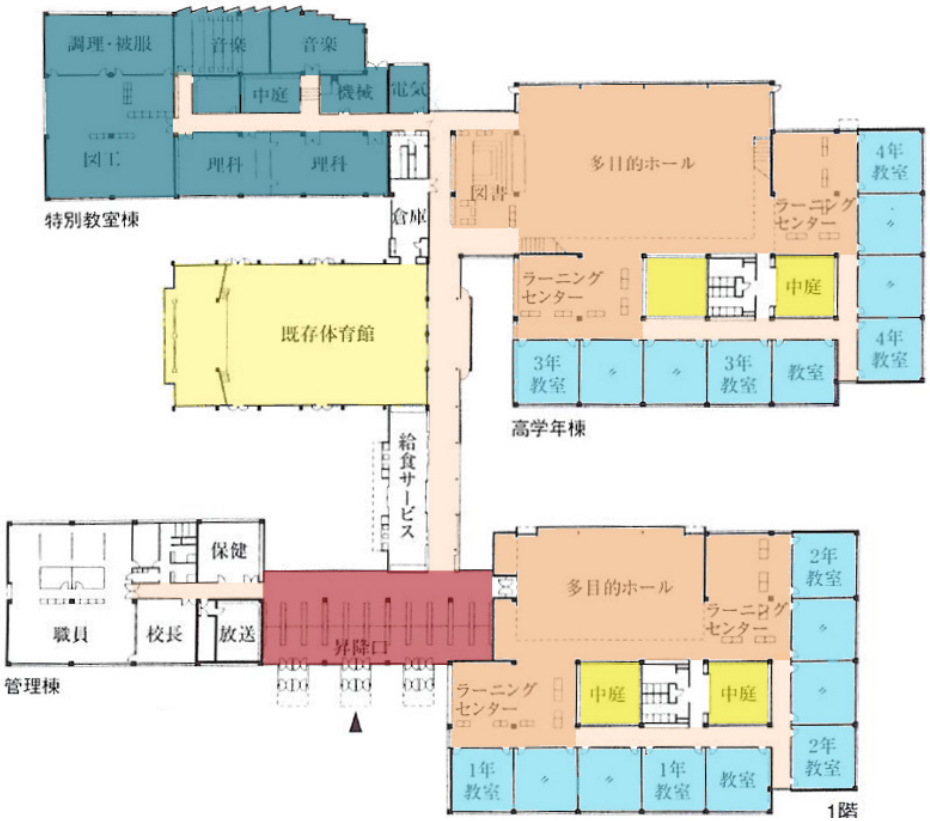
However, like in the USA and the UK, this typology emerged also due to an interest in changing the educational situation of the moment. In order to support student-centered learning and make teachers leave their classes and work together, it was necessary to open the closed environment of the traditional concept of classroom.

After Kato Gakuen Elementary School, which was a very revolutionary design, some of the open-plan schools built during the 1970s returned to having a configuration of the space similar to the traditional school but designing the corridor wider and using it as a 'work space'[57]. Examples of this type are Inaradai Elementary School (1975) (F50) and Miyako Elementary School (1974) (F51).

Ogawa Elementary School (F52) built in 1978 introduced the concept of 'learning space', used as a smaller common space for each grade, while having also two large common spaces for both grades. For this reason, *this school is also famous as a pioneer in the development of new curriculum and educational methods emphasizing individual and diversified education*[58]. Furthermore, in 1980 the configuration of the classroom changed, removing the wall that faced the corridor and creating a totally open and continuous space (F55).

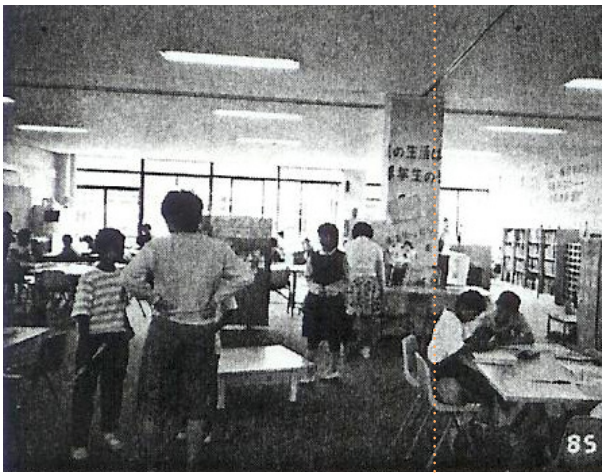
The purpose of achieving openness while promoting the individualization and personalization of learning and the configuration of a continuous space between the classroom and the contiguous space (wide corridor, work space, learning space, etc.) by removing the wall, but maintaining a clear division

56 KURAKAZU R. (2006) *"Open Space" "Open School" "Open Plan"?* < http://school.ouen-dan.com/sb/log/eid4.html> (Japanese)..
57 NAGASAWA S. (2017) *Gakkō shisetsu seibi no dōkō to kadai* (Japanese)
58 WALDEN R. (2005) *Historical Background of the Japanese School*, Schools for the Future, Springer Fachmedien Wiesbaden p. 41-50

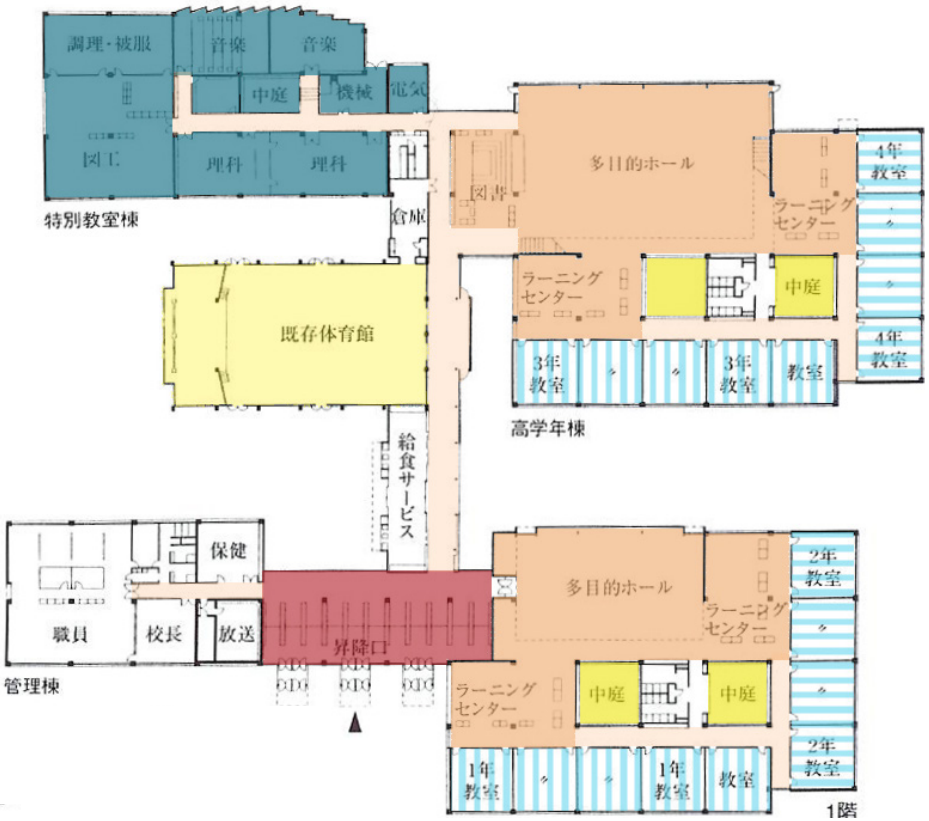


F52 Floor plan of Ogawa Elementary School (1978).

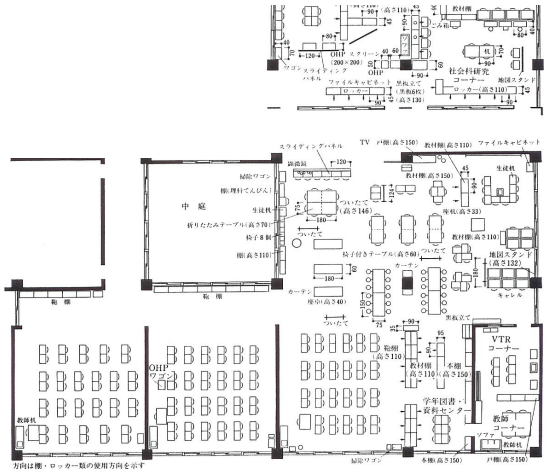
F53 The indoor space of the school in 1978.



F54 The indoor space of the school in 1980.



F55 Floor plan of Ogawa Elementary School (1980).



F56 Floor plan of the classrooms and workspace after the remodeling (1980).

F57 The indoor space of the school in 1980.

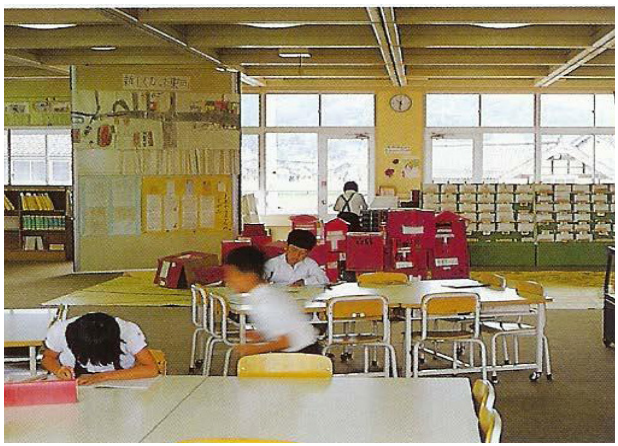
between classrooms, became main aspects in the design of open-plan schools and this has remained till nowadays. All the open-plan schools designed from the late 1970s began to create different clusters for each grade but establishing also common spaces for all the grades[59]. Fukumitsu Chubu Elementary School (F58) built in 1978 was designed following these characteristics, with the difference that the movable partitions that divide each classroom permitted modifying the area when necessary[60].

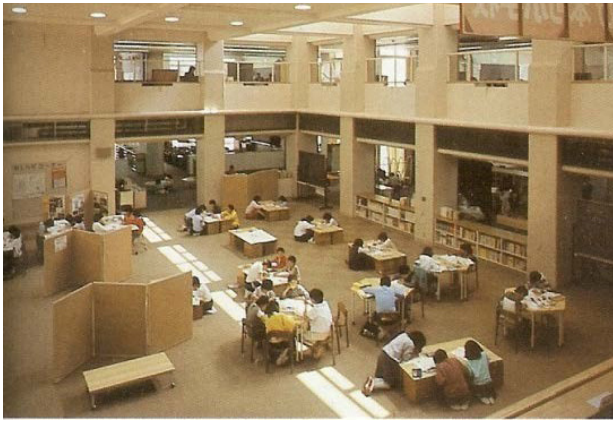
During the 1980s and the establishment of the subsidy for multipurpose spaces in 1984, the number of open-plan schools around the country rapidly increased. Furniture became a very important component in the design of open-plan schools. Some of the new schools started to use furniture, such as shelves, as a way of dividing the spaces without breaking the openness (a Furniture Guide for Multipurpose Spaces was created in 1994[61]). One of the examples is Honcho Elementary School (F61) built in 1984. In addition, as technology continued developing some open-plan schools, like Megumi Elementary School (F63) built in 1985, implemented a space to have computers or TVs, known as media spaces or media corners, were children can get familiarized with it in order to be prepared for the future society.

However, the educational system in Japan at this moment was still rigid and not compatible with the configuration of the space inside these open-plan schools. The reason why open-plan schools were born in the UK during the 1960s was that due to the strong influence of informal education, classes, timetables and grades were removed and as a result, so was the spatial concept of 'classroom'. However, in Japan that scheme was not accepted. The education progressed since the establishment of modern education, but not enough to create a strong dialogue with the spatial configuration of these open-plan schools. As Professor Ueno said, *a change in school building occurred, but the reality of education was not accompanying it*[62]. Furthermore, as classrooms were used in the traditional way (a teacher speaking while students copy), one of the big issues in this type of schools was the noise that spread from one class to another due to the openness of the space.

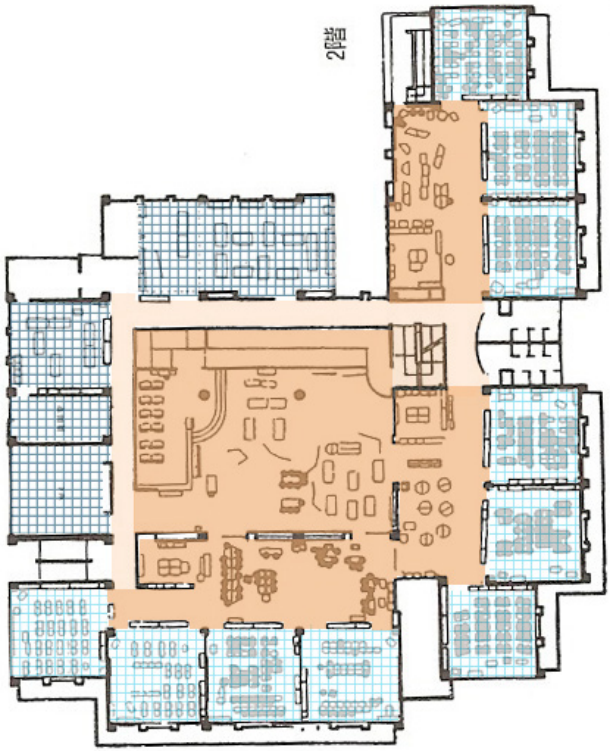
59 WALDEN R. (2005) *Historical Background of the Japanese School*, Schools for the Future, Springer Fachmedien Wiesbaden p. 41-50.
60 NAGASAWA S. (2017) *Gakkō shisetsu seibi no dōkō to kadai* (Japanese)
61 Ibid.
62 EZAWA K. (2011) *Gakkou shisetsu no kadai - Gakkou kaikaku no shiza kara* (Japanese).

F58 Floor plan of Fukumitsu Chubu Elementary School (1978).


F59 Indoor space of Fukumitsu Chubu Elementary School.



F60 Indoor space of Honcho Elementary School.



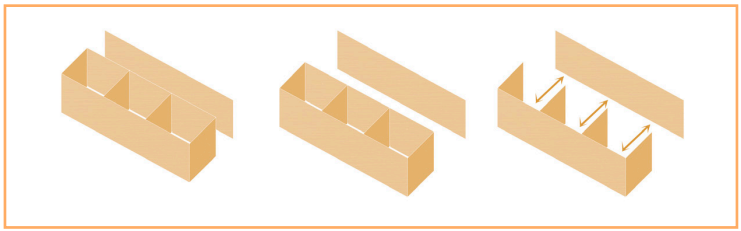
F61 Floor plan of Honcho Elementary School (1984).

Sakura Junior High School built in 1991 is an example of a school going against the educational situation of the moment, changing the traditional arrangement of students by classroom by implementing a subject classroom configuration, in which each subject has its own classroom[63].

During the 1990s the educational system began to be questioned and as a result, a new Courses of Study was announced in 1998. The new curriculum was more flexible and closer to a student-centered learning approach. The open-plan school educators tried to adapt better to how the space should be used and started to think about the advantages of this concept and how the new curriculum could fit in it better than ever.

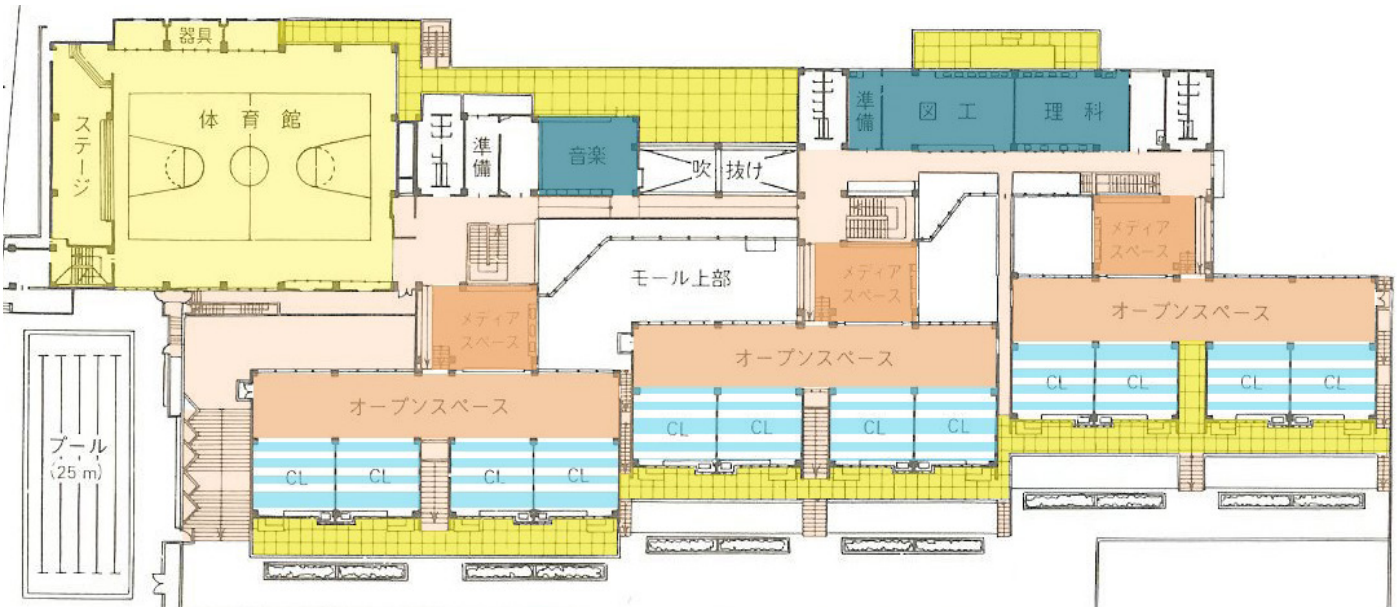
The new open-plan schools designed during the 1990s followed three purposes: flexibility, diversity and continuity[64]. In order to accomplish them these schools were designed to allow many different activities with many different types of spaces, in scale and in configuration, to make children feel comfortable but without losing the character of a continuous space.

The architectural studio that was the pioneer of this concept of open-plan schools was Coelacanth and Associates (C+A) with many remarkable examples such as Utase Elementary School built in 1995 (already mentioned before) as the first example of mixing the open-plan concept with small independent spaces[65] and Kibi Kogen Elementary School built in 1998.

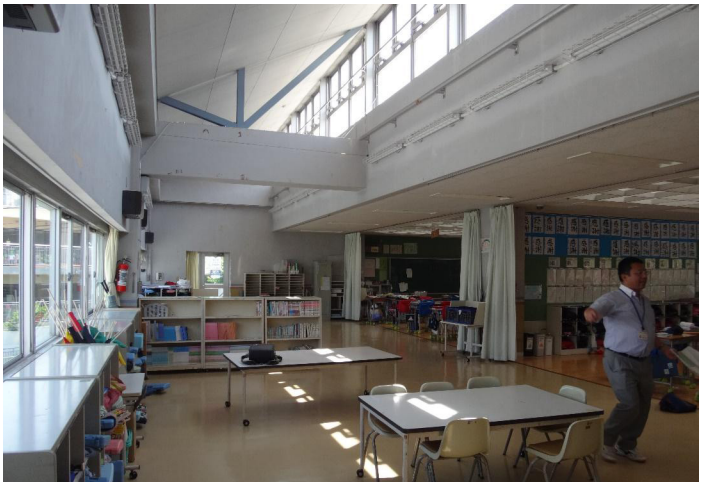


F62 Evolution of the relationship between classroom and corridor in the open-plan school typology.

63 THE ARCHITECTURAL INSTITUTE OF JAPAN (2005) *Compact architectural design documentation (Konpakuto kenchiku sekkei shiryou shuusei)*, General Architects Association of Japan, p. 217-218.
64 NAGASAWA S. (2017) *Gakkō shisetsu seibi no dōkō to kadai* (Japanese)
65 WALDEN R. (2005) *Historical Background of the Japanese School*, Schools for the Future, Springer Fachmedien Wiesbaden p. 41-50.



F63 Floor plan of Megumi Elementary School (1985).



F64 Indoor space of Megumi Elementary School.

F65 Indoor space of Megumi Elementary School.

F66 Open-plan school activity performance during one day.

The contemporary open-plan school

Learning from the mistakes of the past and analyzing the progression of open-plan schools, contemporary architects have set up new educational spatial goals while designing these schools in order to take advantage of the spatial richness and connecting it in the best possible way with the current educational system (F66).

These educational spatial goals are as follows[66]:

1. Creating an environment that can enhance active and subjective behavior.

- By explaining the attractiveness and issues of the subject, posting teaching materials and works inviting students and displaying exhibitions.

- As each type of activity is different, the place of each can be also different and children can choose it.

2. Creating and space that can admit different types of learning and with many types of resources available.

- Self-directed learning, comprehensive learning, individual learning, etc.

- Books, teaching materials, equipment, computers, etc. that can be used at any time during the learning process.

3. Creating a space that improves cooperative learning, creating a strong relationship between people.

- By techniques as self-affirmation, recognizing a good work and effort, empathy, etc.

- Including different levels of relationship: same class, same grade, children in different grades, children and teachers, etc.

4. Creating a space that can encourage teacher's collaboration and support.

- Decreasing the traditional power of the teacher inside the group.

- Using a flexible group configuration.

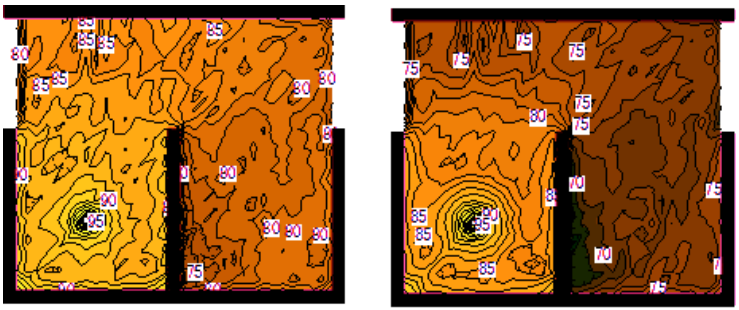
- Looking at children with multiple eyes.

66 NAGASAWA S. (2017) *Gakkō shisetsu seibi no dōkō to kadai* (Japanese)

5. Creating a school that can improve our community.

- School as a community building where many different activities for the people of the area can be performed.

In addition, with the new construction technologies the problem of the transmission of noise between classrooms in open-plan schools can be solved. Many studies and technical trials have proven that using the right materials and placing an acoustic insulation material especially in the ceiling can decrease notably the propagation of sound between classrooms[67](F67).



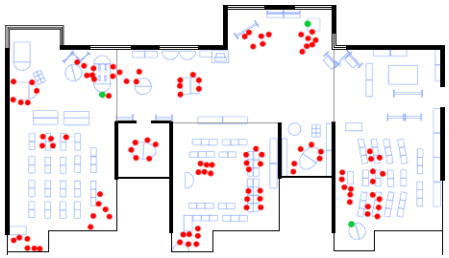
F67 Noise propagation.

Furthermore, as schools in Japan are also used as emergency buildings in case of disaster these schools, as well as any type of school, must have all the necessary security measures to fulfill that function.

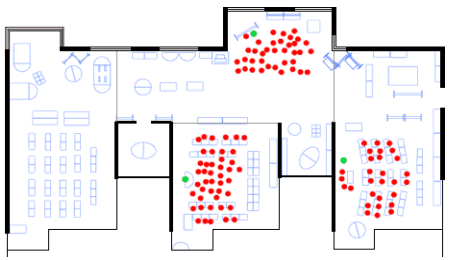
All in all, there are a lot of architects that still nowadays trust in this typology to design school buildings. I had the opportunity to interview personally two architecture studios specialized in open-plan schools: C+A (mentioned before) and Atelier BNK. By choosing one educational project of each as a case study, and giving a general overview about some others, I'm going to analyze the progression that this typology has experienced since the 1990s till nowadays, and how the specific conditions of each project affect the design solution.

67 KURAKAZU R. (2006) *Ōpun kyōshitsu no onkyō seinō* <http://school.ouen-dan.com/sb/log/eid7.html> (Japanese).

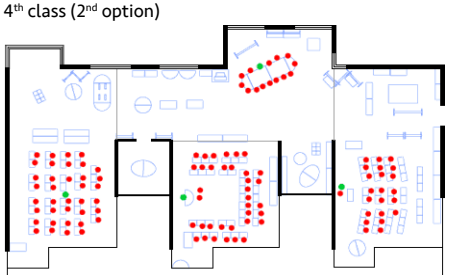
3rd class



4th class (1st option)

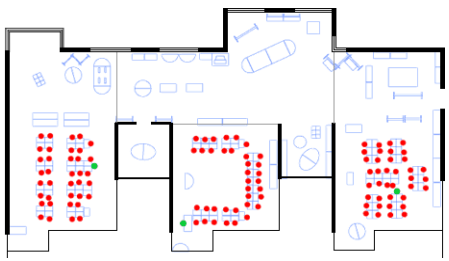


4th class (2nd option)



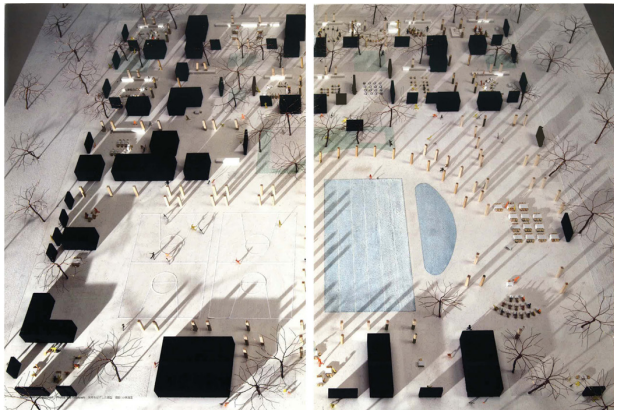
Small group study guidance

Open space is also used as a learning space in learning activities such as "Small Group Study Guidance" and "Teaching by Level of Proficiency" that are beginning to be introduced in math and languages.



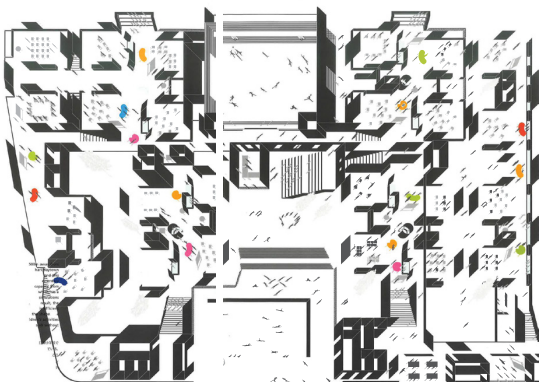
Lunch break

4. CASE STUDIES



F68 Model of Kibi Kougen Elementary School representing *'black' and 'white'*.

F69 Outdoor space of Kibi Kougen Elementary School.



F70 Floor plan of Mihama Utase Elementary School.

4.1. Coelacanth and Associates (C+A)

Coelacanth and Associates is an architectural design office composed by four main members: Kazuhiro Kojima (until 2016), Kazuko Akamatsu, Yasuyuki Ito and Susumu Uno.

Established in 1986 as Coelacanth, reorganized as Coelacanth and Associates in 1998 and subdivided in CAt (Coelcanth and Associates Tokyo) and CAn (Coelacanth and Associates Nagoya) in 2005[68].

Since their beginning they have designed a lot of projects all over Japan and one of their main specialization is educational facilities. Their method of designing in quite unique and innovative and as a result their school planning has become a reference for other design offices. Furthermore, they became pioneers of open-plan school design in the 1990s with their projects, changing the concept of the moment and influencing the evolution of this typology in the following years.

Their design method is based on four main premises[69]:

- *'Black' and 'white'*
- *Activity*
- *Space Blocks*
- *Fluid Direction*

However, in school architecture it only*'Black' and 'White'* and *Activity* can be applied.

'Black' and 'White' is a concept used to define two classifications of space. *'Black'* means spaces made only for a specific use, such as toilet, scientific laboratory, etc. On the other hand, *'white'* means spaces that can be used in various ways. This technique is basically used to make spaces comprehensible to clients. As they use open-plan typology in their educational projects, they want *'white'* space, because if about half of the whole building is *'white'*, the space becomes far more free[70].

68 Coelacanth and Associates <https://ja.wikipedia.org/wiki/シーラカンスアンドアソシエイツ>
69 THE JAPAN ARCHITECT, vol. 61 (2006) *Kazuhiro Kojima + Kazuko Akamatsu/ CAt*, p. 4-11.
70 THE JAPAN ARCHITECT, op. cit.

By using the concept of activity in their projects, they are aiming for a condition where *the whole is made from an accumulation of individual components*[71]. They used this concept for the first time in Utase Elementary School (1995), analyzed later.

Although they started to become popular after designing Utase Elementary School, they have many other remarkable educational projects:

- Kibi Kougen Elementary School (1998):
In this project the indoor space and the outdoor space have a strong relationship due to the inner courtyards and single-storied buildings. Furthermore, the open-plan school configutation makes the space entirely transparent, the flows of activity being completely visible from outside[72].

- Mihama Utase Elementary School (2006):
This school is located 500m away from Utase Elementary School and due to the success of the first one they designed Mihama Utase Elementary School following the same plan. However, to design this school they made an exhaustive computational acoustic analysis of the whole school, *in order to create open spaces where classes could be held without sound interferences*[73].

- Uto Elementary School (2011):
In this school the volume of the classroom broke and became a space delimited by L-shape walls, used as *a device of gentle articulation and connection of spaces allows for reversing "in" and "out", "class rooms" and "corridor/workspace"*[74] where the activity is completely open to the outside.

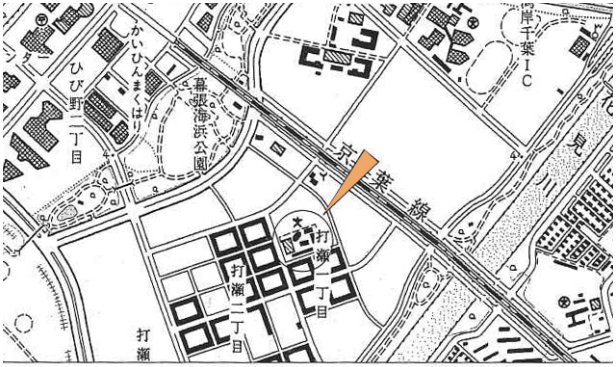
- Kamaishi Unosumai Elementary/Junior High School (2017):
This project is a restoration of the educational facilities located here before suffering the Great East Earthquake disaster in 2011. The main idea of this school is the grand staircase that unifies all the buildings of the complex and adapts to the topography[75].

F71 Indoor space of Uto Elementary School.

F72 Concept of Uto Elementary School.

F73 Kamaishi Unosumai Elementary/Junio High School.

71 THE JAPAN ARCHITECT, vol. 61 (2006) *Kazuhiro Kojima + Kazuko Akamatsu/ CAt,* p. 4-11.
72 THE JAPAN ARCHITECT, op. cit. p. 50-58.
73 THE JAPAN ARCHITECT, op. cit. p. 64-65.
74 GA JAPAN (2017), *Kamaishi Unosumai Elementary/Junior High School*, vol. 148, p. 62-76.
75 C+A, *Uto Elementary School* <http://c-and-a.co.jp/projects/school/uto-elementary-school.html>



F74 Location.

F75 Image from the exterior.

F76 Image from the exterior.

4.1.1. Utase Elementary School (1995)

Architects: C+A (Kazuhiro Kojima and Kazuko Akamatsu)

Location: Mihama-ku, Chiba, Japan

Plot Area: 16,500 m2

Building Total Floor Area: 7,584. 86 m2

Project year: 1995

Utase Elementary School is a large school built in Makuhari Baytown, a neighbourhood inside Mihama Ward and located in the Chiba prefecture, that is near Tokyo. The urban planning of this area is based on city block-type housing complexes where the walls of the buildings are placed abutting the roads. Regarding this context the configuration of the school is open to the city[76]. At the beginning it contained 18 classrooms, but a wing for the lower grades was added later, increasing the number to 24 classrooms in total[77].

The interior of this school was designed as an open-plan type. However, the way of mixing open spaces of many different uses, sizes and shapes, combining them with the outdoor space, made that this project became a pioneer example of contemporary open-plan school design in Japan. The configuration of the space in this school brings the concept of 'school without walls' to both inside and outside[78].

As a consequence, the idea of this school could be summarized in four main purposes[79]:

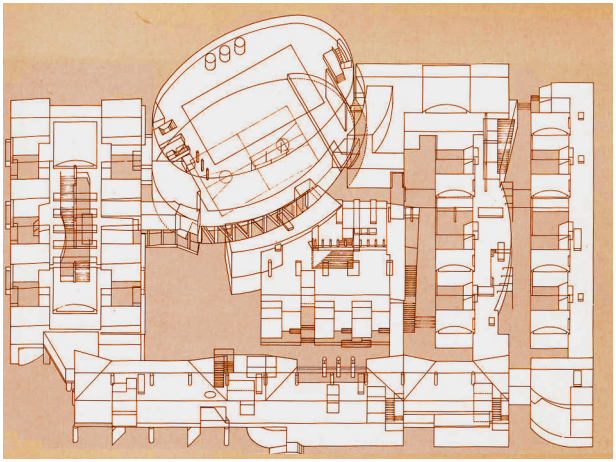
- Elementary school with high continuity with the surrounding area
- Classroom with an easy accessibility to the outside space
- An open school with a high degree of flexibility
- Space to trigger activities

76 THE JAPAN ARCHITECT, vol. 61 (2006) *Kazuhiro Kojima + Kazuko Akamatsu/ CAt*, p. 60-61.
77 SHINKENCHIKU:1995, 7 (1995) *Utase Elementary School*, p. 153-155.
78 THE JAPAN ARCHITECT, op. cit.
79 SHINKENCHIKU:1995, 7 (1995) op. cit.

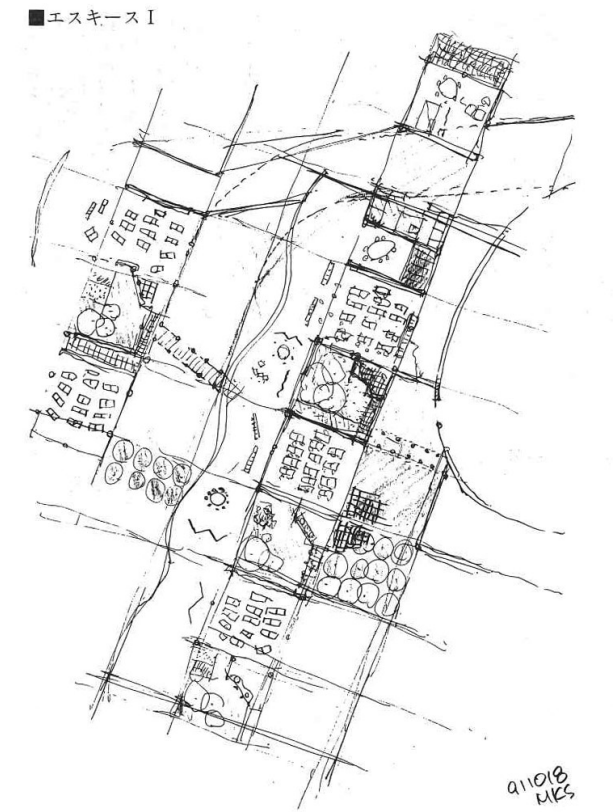
F77 Floor plan of the site of Utase Elementary School.

F78 Aerial view of Utase Elementary School.

F79 Aerial view of Utase Elementary School.



F80 Volumetry of Utase Elementary School.



F81 Sketch of the project's idea.

1. Relationship with the outside

Contrary to its surrounding, the school opens to the community by different ways: creating alleyways or passages on the ground floor which citizens can pass through, connecting the large ground of the school with the adjacent park, emptying the corner of the volume on the ground floor to create a covered plaza. On the other hand, some spaces located on the ground floor have a strong relationship with the community and can be used also by the other citizens of the neighborhood for some activities when the students don't have class, such as open indoor playgrounds, the swimming pool and some classrooms with a specific learning function (computer room, cooking room, etc.)[80].

In addition, the aim of the school is not to restrict children's activities to the indoor space, but to enhance the relationship with the outdoor space. To achieve this the strategies are: strengthening the contact with the outside on the ground floor, creating a distributed-type entrance with access from the outside and the inside, designing different scales of garden with a strong relationship with the classrooms and introducing the courtyard as one of the main elements of the project[81].

As a result, the volume of the school is an interesting mix between compact and dispersed, configured by the voids that this contact with outer space introduces into it.

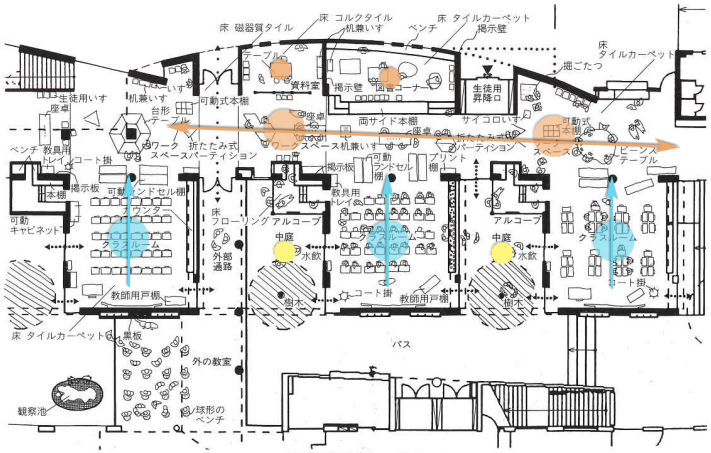
2. Spatial configuration

At the time Utase Elementary School was conceived, many open-plan schools were already built in Japan. However, problems such as lack of individualization or human scale inside large and homogeneous open spaces, bad orientation of the spaces and sound interference were decreasing the popularity of this typology during the 1990s. In contrast, Utase Elementary School emerged as a new open-plan school model, changing the conception of the configuration of the spaces in this type of schools from then on.

80 SHINKENCHIKU:1995, 7 (1995) *Utase Elementary School*, p. 153-155.
81 Ibid.

A whole where diverse elements simultaneously coexist . This was the main premise on which the architects were based to configure the spaces of the school[82].

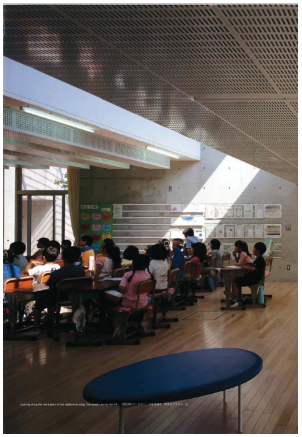
Utase Elementary School has all the characteristics of a typical open-plan school of the moment. The walls that divided the classrooms and corridors were removed. The width of the corridors became double and were attached to the classroom space as work spaces. However, the arrangement of these spaces is totally different to the usual concept. As the school has a lot of students (more than 300) each grade is arranged in one big cluster, with all the clusters connected between them. By doing this the issue of losing the human scale is controlled better. Meanwhile, all the special classrooms that have a limited function (such as cooking classroom or music room) are settled all together forming another cluster[83].

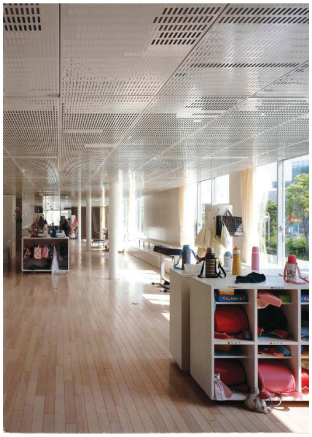


F82 Functioning and furniture of lower grade cluster.

On the other hand, inside each cluster there is another unit configuration based on classroom, courtyard and alcove. This unit is placed repeatedly north-south along the work space and, in some clusters, the 'pass' (external passage), having the courtyard between two classrooms. This composition, even though this school was conceived as open-plan, allows to perform simultaneous lessons in all the classrooms, which is almost the present situation[84].

82 THE JAPAN ARCHITECT, vol. 61 (2006) *Kazuhiro Kojima + Kazuko Akamatsu/ CAt*, p. 60-61.
83 SHINKENCHIKU:1995, 7 (1995) *Utase Elementary School*, p. 153-155.
84 Ibid.





F83 Indoor space of the lower grade cluster.

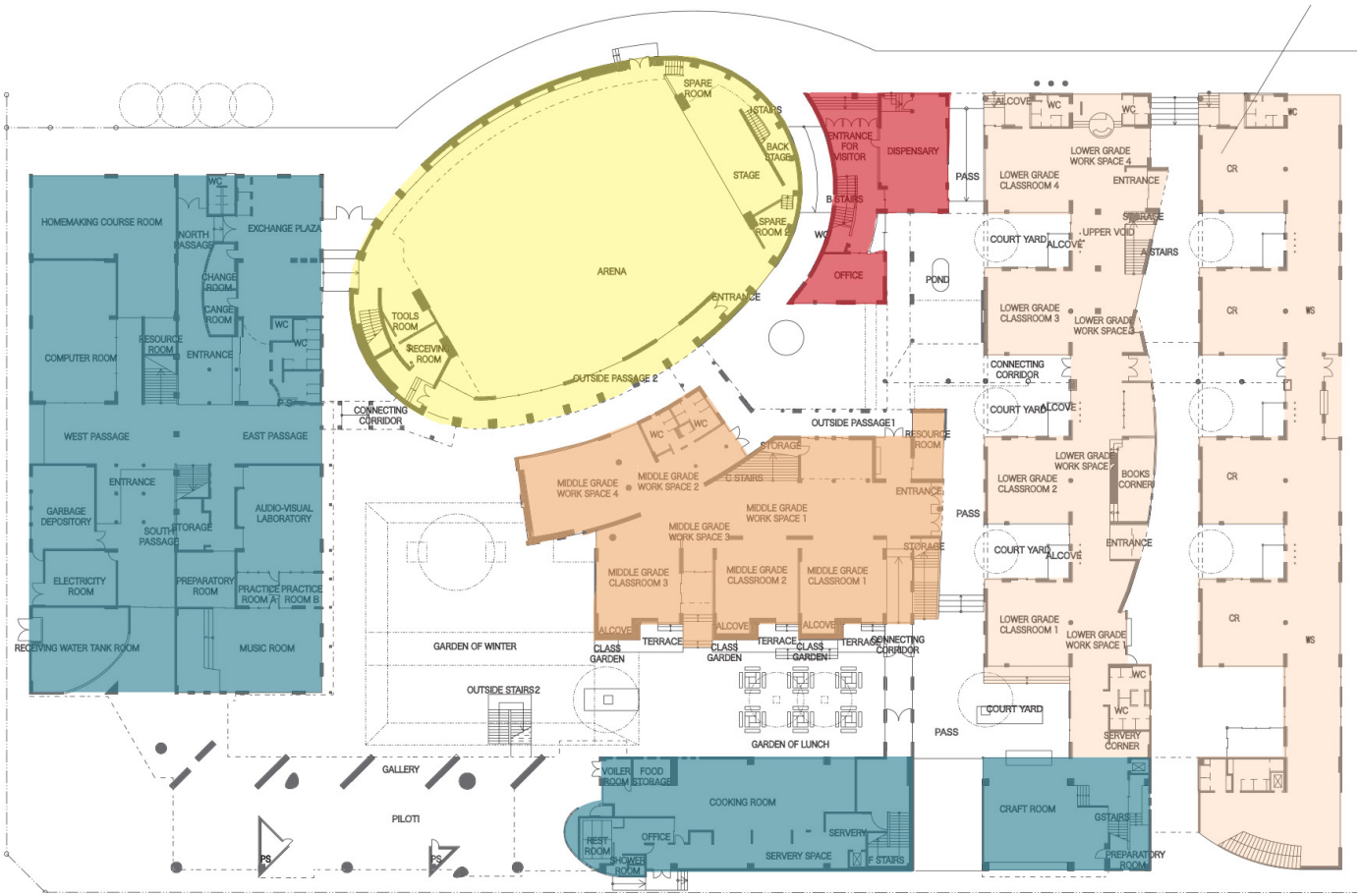
F84 Indoor space of the upper grade cluster.

.....classroom
.....multipurpose space / work space
.....courtyard / terrace

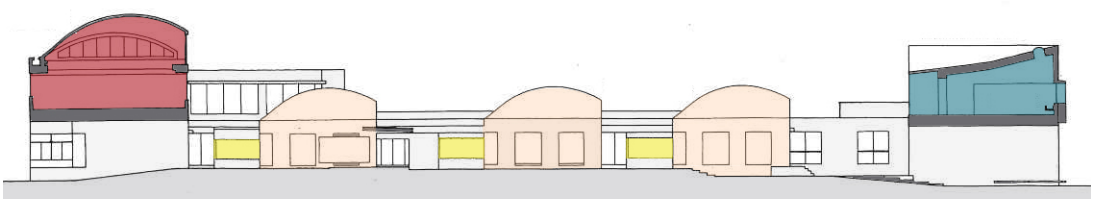
F85 Floor plan of the 1st floor indicating the different usage areas.

- bathroom
- special classroom
- alcove
- classroom
- multipurpose space / work space
- courtyard / terrace
- sports ground
- teacher's space
- warehouse / other facilities
- access

F86 Outdoor space of the school.



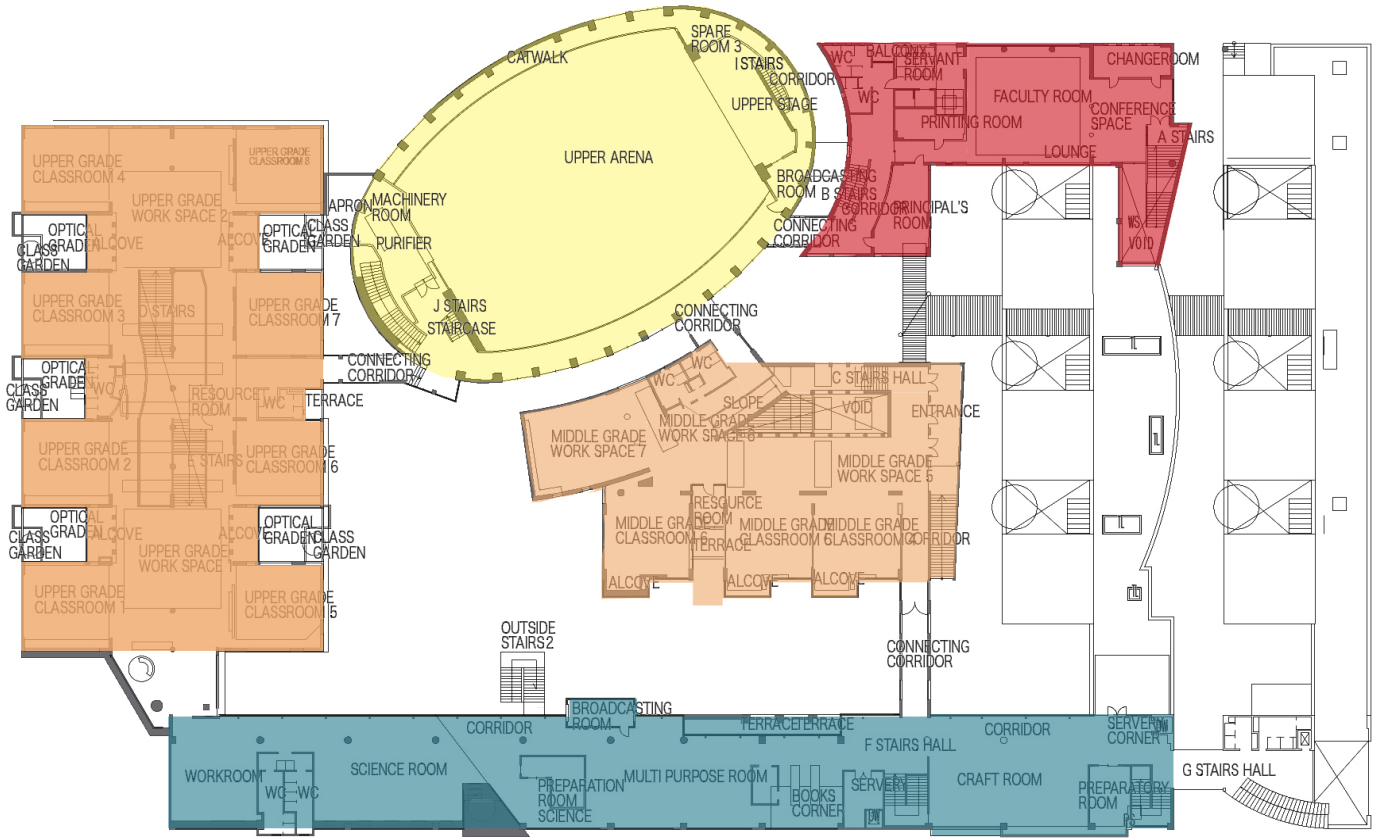
F87 Floor plan of the 1st floor indicating the different grades.



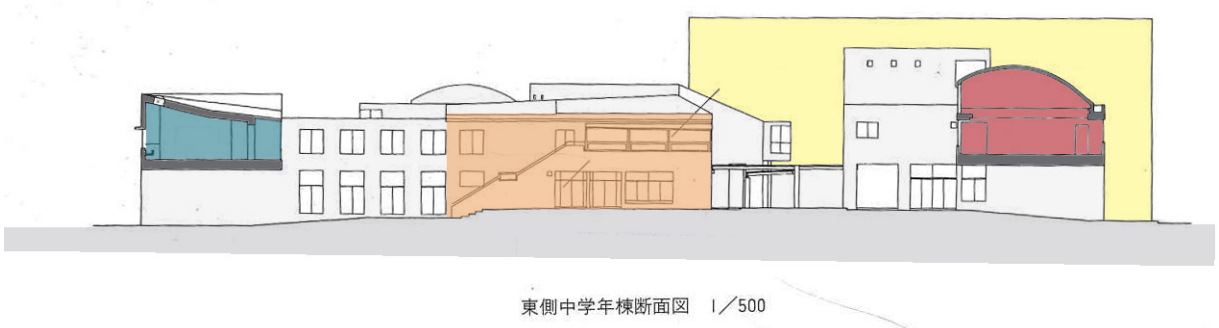
西側低学年棟断面図　1／500

- .....upper grade
- .....middle grade
- .....lower grade
- .....sports ground
- .....teacher's spaces
- .....special classroom

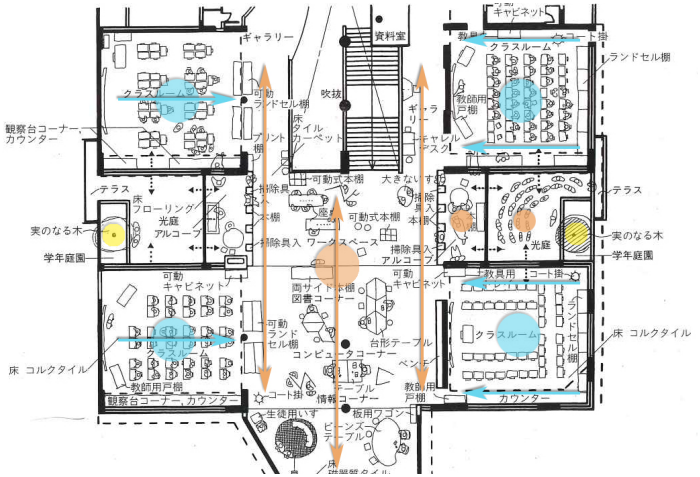
F88 Section indicating the different grades.



F89 Floor plan of the 2nd floor indicating the different grades.



F90 Section indicating the different grades.



F91 Functioning and furniture of upper grade cluster.

In addition, these different scales of units are not unconnected between each other, there is no dead end in the flow line of the movement of the school, children can choose even two or more different paths to go from one point to another. By ensuring this degree of freedom and selectivity of movement, the aim is that children feel comfortable and perceive the school as a whole, where children of a lower grade can move to the upper grade cluster freely if they want to[85].

3. Indoor Environment

By arranging the classrooms in north-south direction with a courtyard in between, the air circulation causes a convection movement at the part of the high ceiling[86]. This phenomenon, as well as the fact of having a courtyard itself, provides good ventilation. On the other hand, the courtyards also ensure good natural lighting inside each classroom, in addition to the use of skylights in the workspaces[87].

Regarding the noise issue, although the arrangement of the units partly solves it, fixed distances between all classrooms and special materials in the ceiling are established to provide a good

F92 Indoor space of upper grade cluster.

F93 Skylights.

- .....classroom
- .....multipurpose space / work space
- .....courtyard / terrace

85 SHINKENCHIKU:1995, 7 (1995) *Utase Elementary School,* p. 153-155.
86 Ibid.
87 THE JAPAN ARCHITECT, vol. 61 (2006) *Kazuhiro Kojima + Kazuko Akamatsu/ CAt,* p. 60-61.

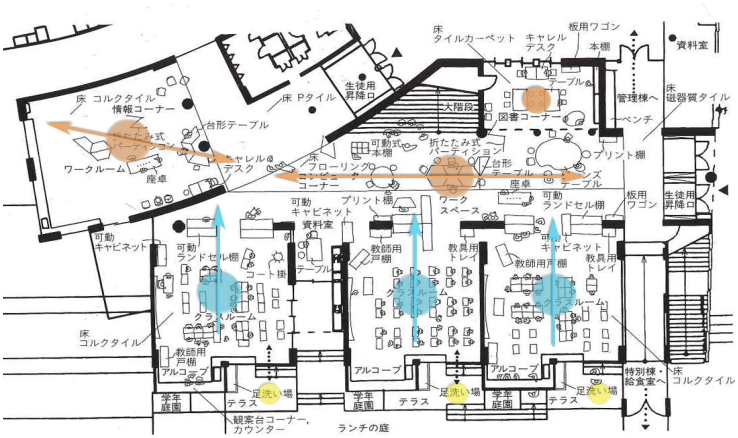
F94 Stairs used to gather together in middle grade cluster.

F95 Concrete spheres used as chairs nearby the external passage.

acoustic insulation. However, at the time this school was built the technology was not as advanced as nowadays and computational acoustic tests couldn't be made. This aspect was improved later in other educational projects, specially in Mihama Utase Elementary School in which an acoustic computational test of the whole school was performed[88].

4. Furniture and equipment

One of the main problems of the open-plan schools built before Utase Elementary School was that work space were not used effectively. This is related with the lack of furniture placed in these spaces[89].



F96 Functioning and furniture of middle grade cluster.

The architects of Utase Elementary School think that the 'activity' of the school is not only related with the 'architectural space', but also with the elements that accompany it. These elements that they mentioned refer to the 'furniture', understanding this word not only with desks and chairs, but also other things like water and stairs. This concept can be seen in every detail of the school, such as the big stairs that are used as a place to gather all the children together and where some learning activities can be done. It is very important to decide the size and location of these elements and spread them correctly through the architecture,

88 THE JAPAN ARCHITECT, vol. 61 (2006) *Kazuhiro Kojima + Kazuko Akamatsu/ CAt,* p. 60-61.
89 Ibid.

because they will cause users to stop and perform an activity in that space. As an example, the space of the library in this school turns into small reading corners dispersed all around the building. In addition, one of the most remarkable design decisions that the architects put into practice in Utase Elementary School is to place chairs and desks also in the courtyard, to symbolize that classes and learning activities can be done outside. For example, inside the external passage there are some aligned concrete spheres on the floor, where children can sit down, and a blackboard. *The ideal is a space where many things can be done, in a place that everybody enjoys*[90].

Regarding the equipment, although in the 1990s the technology was not as advanced as nowadays, this school was one of the pioneers in establishing a computer room inside the program.

F97 Model of Shinseikan Elementary School.

4.2. Atelier BNK

Atelier BNK was founded in Sapporo as an architectural design studio in 1970 by Takashi Akiyama, Tatsuya Goto, and Akio Hamada. In the beginning, they were focused on houses and interiors, but after the 1980s they got involved in public architecture.

Their designs are basically located inside Hokkaido area, having to face a tough subarctic climate, and this aspect strongly characterized their projects. Conceived as shelters, Atelier BNK's designs try to take the nature and surroundings to the indoor space, due to the restricted outdoor activities that can be done in this climate[91].

Furthermore, their respect for nature and environment makes sustainability become a main concept in their projects, with the purpose of reducing the environmental load as much as possible. In order to achieve this, lighting is an essential element, trying to get as much natural light as possible in the inside by the use of skylights and reflected light. As a result, their designs can be defined as *shelters full of soft light*[92].

F98 Numata Elementary School.

F99 Indoor space of Numata Elementary School.

90 SHINKENCHIKU:1995, 7 (1995) *Utase Elementary School,* p. 153-155.
91 ATELIER BNK (2014) *Atelier BNK 2000-2014*, Kenchiku Gahou Inc, p. 6-7.
92 Ibid.

F100 Indoor space of Shinseikan Elementary School.

F101 Indoor space of Numata Elementary School.

On the other hand, as a way of respecting the traditional aspects of Hokkaido's architecture they use materials that have been in use in this area for a long time, such as galvanized steel, concrete and ceramic materials.

Looking at their trajectory, it can be perceived that school architecture is an important component. Apart from Itoi Elementary School, that is going to be analyzed later and has won the *Public Building Award, Excellence Prize* in 2012, they have many other remarkable educational projects:

- Shinseikan Elementary School (2005):
This projects was Atelier BNK's first elementary school design and since the beginning they used the open-plan typology. This school is a result of combining four elementary schools, a nursery school, a child care support center and a mini children's hall, becoming a complex of building for children. As they wanted the complex to be fully integrated with the urban surrounding and a symbolic appearance was avoided[93].
The importance of sustainability can be found in the use of solar panels and the aim of teaching children how energy works in the school by some lessons regarding this topic.

- Elementary School in Imanake (2005):
The design of this school building is configured around the gymnasium, with the classrooms located in two sides and a third side open, facing the playground and the mountains. The space evokes activity by emphasizing the relationship between seeing and being seen[94].

- Numata Elementary School (2013):
This open-plan school is the most remarkable example of Atelier BNK regarding sustainability and reduction of energy consumption, being designed to accomplish this purpose. The sense of openness is highlighted with the big amount of natural light that enters the space through the skylights. Even though the school has a second storey, the open-plan isn't faded due to the double-height multi-purpose space that creates an atmosphere where all the space is perceived as a whole[95].

93 ATELIER BNK (2014) *Atelier BNK 2000-2014*, Kenchiku Gahou Inc, p. 46-51.
94 ATELIER BNK <http://www.atelier-bnk.co.jp/projects/200501/1149>
95 ATELIER BNK (2014) op. cit. p. 104-113.

4.1.1. Itoi Elementary School (2008)

Architects: Atelier BNK (Makoto Katoh)

Location: Shibetsu, Hokkaido, Japan

Plot Area: 11,000 m2

Building Floor Area: 3,893 m2

Project year: 2008

This small school is located in the northern part of Hokkaido island, in Japan. The original name of the town was Asahi but, as the adjacent towns combined into one, the name changed into Shibetsu[96]. A former school was located in the same place for 100 years and Itoi Elementary School was built with the idea of renovating it as a symbol of the town to the future generations[97].

For the architect, the reasons why they decided to use the open-plan school typology are two-fold: indoor environment and program. They believe that this typology can create optimum conditions for the indoor space (good lighting, ventilation, etc.) achieving the purpose of reducing energy consumption. In addition, as the program in open-plan schools is flexible, they can design a school where children and teachers can choose the place they want according to the curriculum[98].

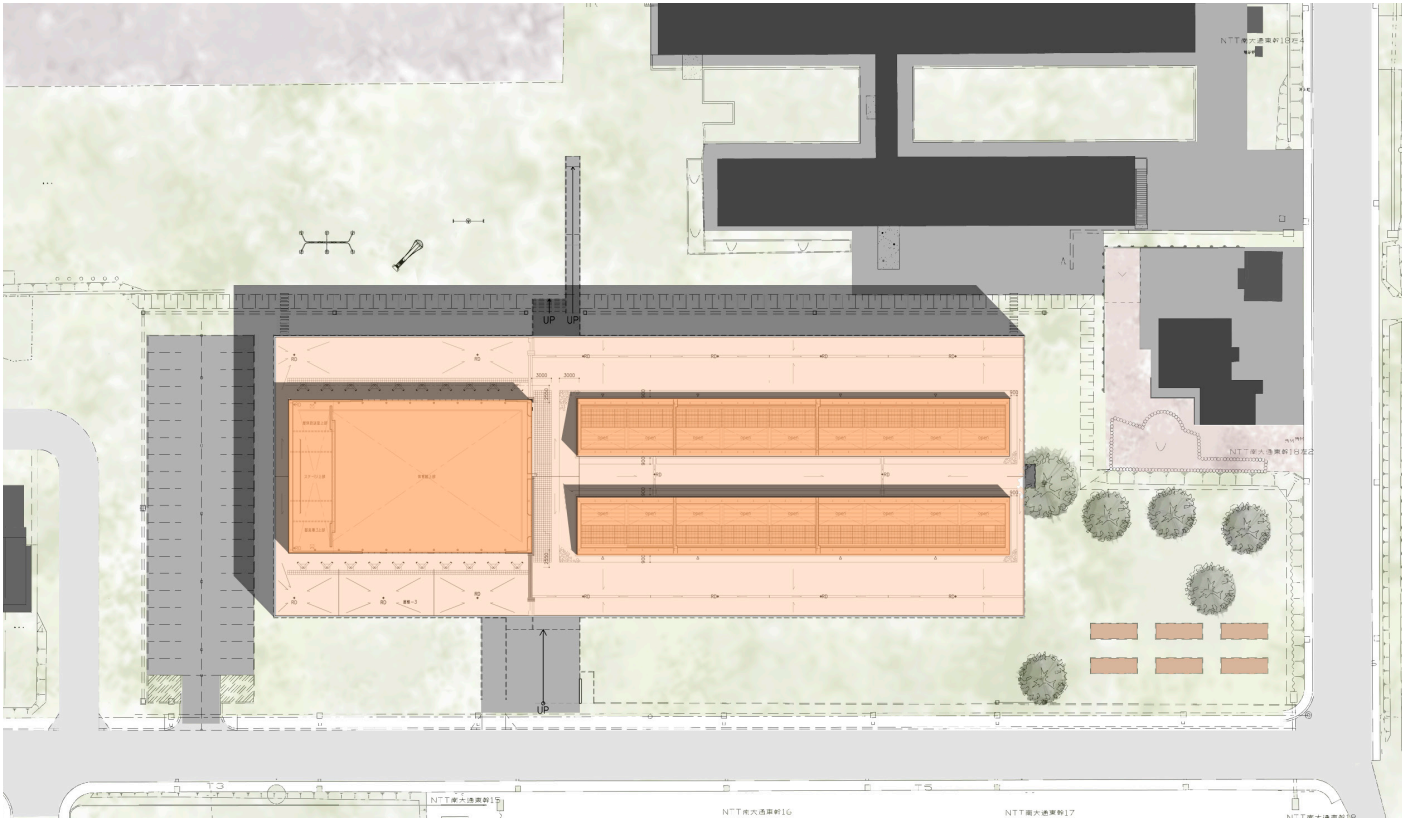
However, due to the climate conditions and the small number of students (10 students in each grade) the designed school turned out very different from many other open-plan schools all around Japan.

F102 Location.

F103 Access.

F104 Image from the exterior of the school during summer.

96 SHINKENCHIKU:2009, 9 (2009) *Itoi Elementary School*, p. 166-171.
97 ATELIER BNK (2014) *Atelier BNK 2000-2014*, Kenchiku Gahou Inc, p. 68-77.
98 KATOH M. (July 23rd, 2018) *Personal interview conducted by the author*, chief designer of Itoi Elementary School and member of Atelier.



F105 Floor plan of the site of Itoi Elementary School.

F106 Image from the exterior of the school during summer.

1. Relationship with the outside

The subarctic climate of Hokkaido strongly limits the realization of outdoor activities during nearly half of the year. Taking this into account the designers created a very compact volume where all the activities can be done on the inside during the whole year. However, although maybe having a compact volume restrains the relationship with the outdoor space, children can feel the outside from the inside due to how the light changes depending on the moment of the day, as well as the views to the exterior. However, although the climate restrains the outdoor activities, the school has a big outside ground with some equipment to play sports and a playground, as well as a small vegetable garden where children can learn how to cultivate and gather them[99].

The materials used to create the volume (reinforced concrete walls, galvanized steel sheet roof and steel structure) integrate perfectly the building in the landscape of the town, because these materials are commonly used in any town located in Hokkaido, due to climate conditions[100]. Furthermore, in winter, as the school is prepared to be covered by snow, the building becomes part of the white landscape.

The main access is located in the south side, delimited in the exterior by a concrete floor. Another secondary entrance is in the north side and a smaller entrance used when children are using the vegetable garden is located in the east side.

The transition between outdoor and indoor is made in all the access by the *shoukou-kuchi* (place to change shoes), mentioned before, in this case without separating teachers, students and staff.

2. Spatial configuration

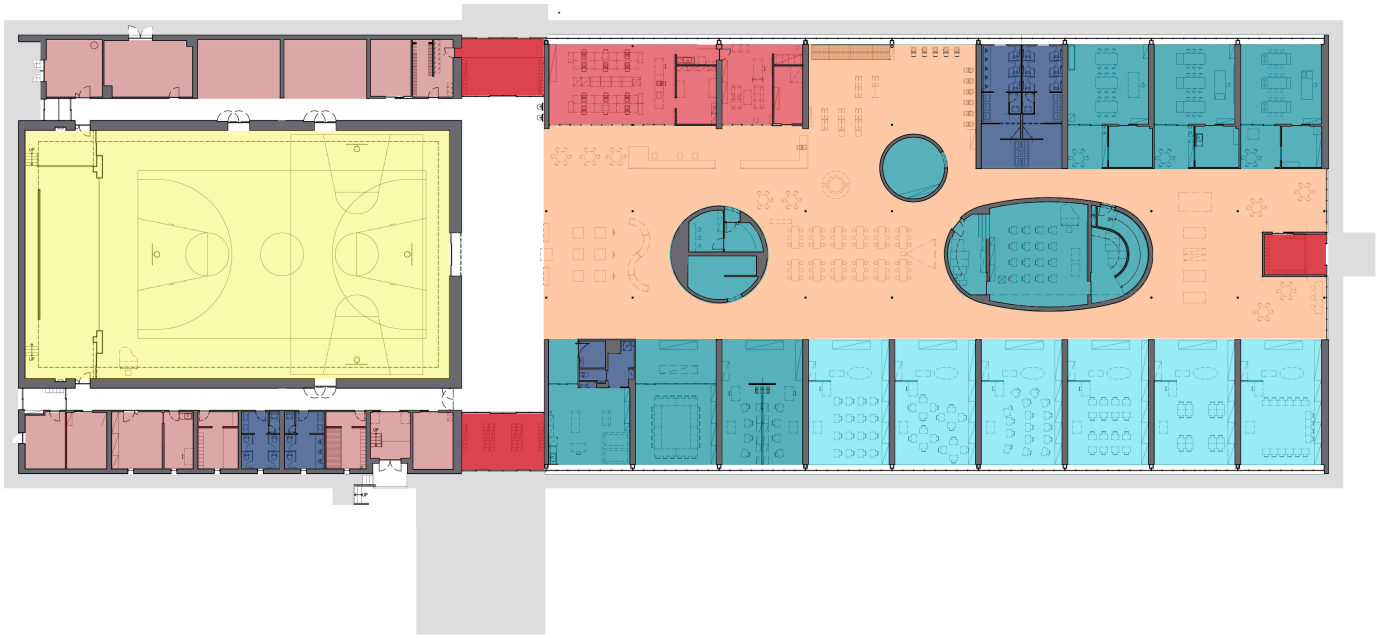
The freedom and variation in the program and the spatial configuration were one of the main reasons why the architects

F107 Image from the exterior of the school during winter.

F108 Image from the exterior of the school during winter.

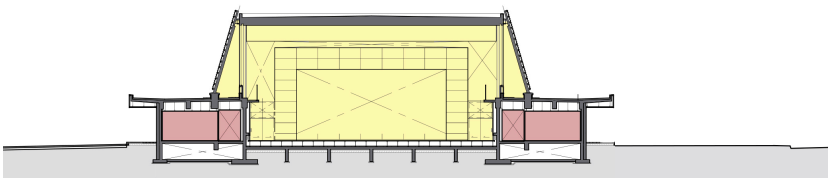
F109 The main access during winter.

99 KATOH M. (July 23rd, 2018) *Personal interview conducted by the author*, chief designer of Itoi Elementary School and member of Atelier.
100 SHINKENCHIKU:2009, 9 (2009) *Itoi Elementary School*, p. 166-171.

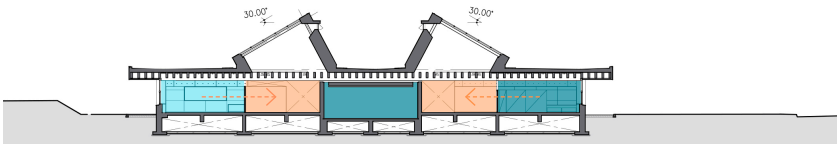


F110 Floor plan indicating the different usage areas.

- .....bathroom
- .....special classroom
- .....classroom
- .....multipurpose space / work space
- .....courtyard / terrace
- .....sports ground
- .....teacher's space
- .....warehouse / other facilities
- .....access



F111 North-south section indicating the different uses.



F112 North-south section indicating the different uses and visuals.

chose the open-plan school typology to design their schools. In this school, not only one teacher can give the lesson, but two or three teachers can gather together using the space of one classroom, combining it with the space of the corridor or using another space inside the school as a teaching space, avoiding having spaces dedicated only for movement. Having this concept in mind, although the current situation is that during class time each subject is held in one classroom, the ideal situation of this school is that according to the subject and the lesson teachers and students can choose the place where they feel comfortable, using the whole area of the school as educational space. However, the reality is that few teachers use the school in that way, because they are not used to[101].

Due to the small scale of the school, another reason to design a compact floor plan was the aim of creating a sense of unity between all the users. As all the classrooms are close to each other, the teachers can feel the situations of the nearby classrooms, even if they are in their free time walking around the school, and help each other, working as a team. In addition, using a wide section allows to combine different spaces in the same plane, creating richer relationships[102].

Because of this flexibility of functioning, the school has a wide range of different spaces, in order to adapt to any situation making children feel comfortable.

3. Indoor Environment[103]

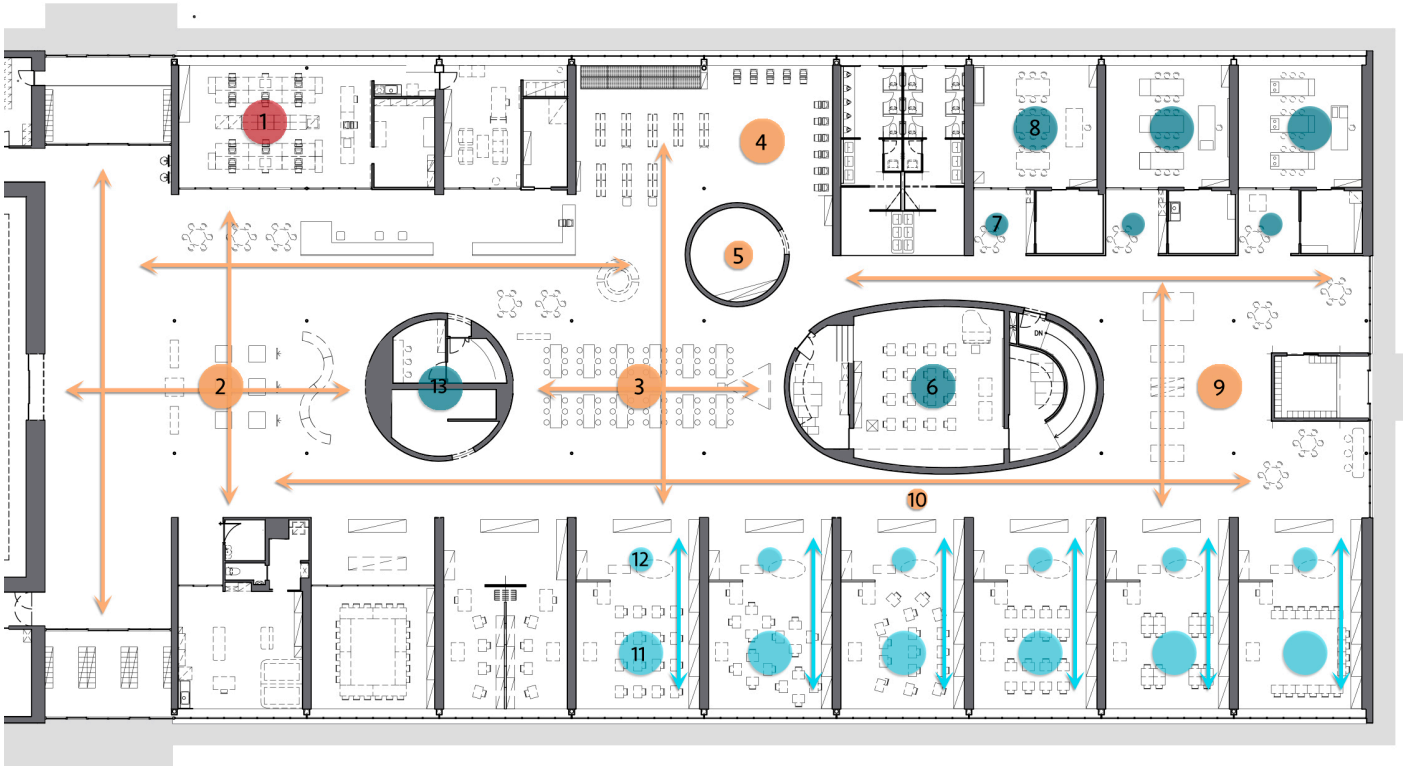
The quality of the indoor environment of this school was designed not only with the assumption of making the users feel comfortable but with the purpose of reducing as much as possible the energy consumption of the building. As educational facilities have few ways of consuming energy (basically heating and lighting) it was easy to plan a good energy reducing system.
In order to achieve this purpose, the section was very important. Firstly, they designed the north-south section trying to obtain the most indirect light as possible, because it's the appropriated light for classrooms and increases less the heating load than the

F113 Indoor space of the multi-purpose area.

F114 Indoor space of the multi-purpose area.

F115 Indoor space of the multi-purpose area (library).

101 KATOH M. (July 23rd, 2018) *Personal interview conducted by the author*, chief designer of Itoi Elementary School and member of Atelier.
102 Ibid.
103 Ibid.



F116 Floor plan explaining the different uses.

1- Teacher's room

2- Multipurpose space 1 (Used as a hall, for events, meetings, etc.)

3- Multipurpose space 2 (Workspace and presentation room linked with the media space)

4- Media space (Books and PC's)

5- Children's association corner

6- Music room (Closed room considering soundproof performance)

7- Special classroom lounge (Space linked to the special classroom to do works and exhibitions)

8- Special classroom

9- Multipurpose space 3 (Mainly used as extension of normal classrooms)

10- Exhibition gallery (Space under natural light to see the works of children)

11- Classroom

12- Worspace (Space that complements the classrooms with sinks and shelves)

F117 Indoor space of the multi-purpose area.

direct light. Therefore, based on that they study how the sunlight is going to enter to the building. While north light is indirect, south light needs to be reflected by designing elements that give some shade, such as eaves, so there is no need to use blind or curtain in the school. Then, after designing this section, the building expands in the east-west direction.

However, by placing the classroom in the north-south position, the multi-purpose space of the centre has no windows. As a result, they designed roof skylights. The skylights are an architectural element commonly used in the Hokkaido area, because with the same amount of glass area in a skylight and in a normal window, the brightness given by the skylight will be three times greater. Furthermore, if the glass area to achieve a bright space can be reduced by a skylight, the lose of heating through it will also be reduced. Although during winter the quantity of snow if high, the climate of Hokkaido still allows to use natural skylights and therefore, the light enters to the building by them and is reflected by the horizontal timber joists.

Regarding the heating loss, another reason of designing a compact volume is to reduce the exterior wall area and reducing the surface that the heat has to go from inside to outside. By doing this we can easily accumulate the heating in the indoor space, reducing the energy used for the heating system.

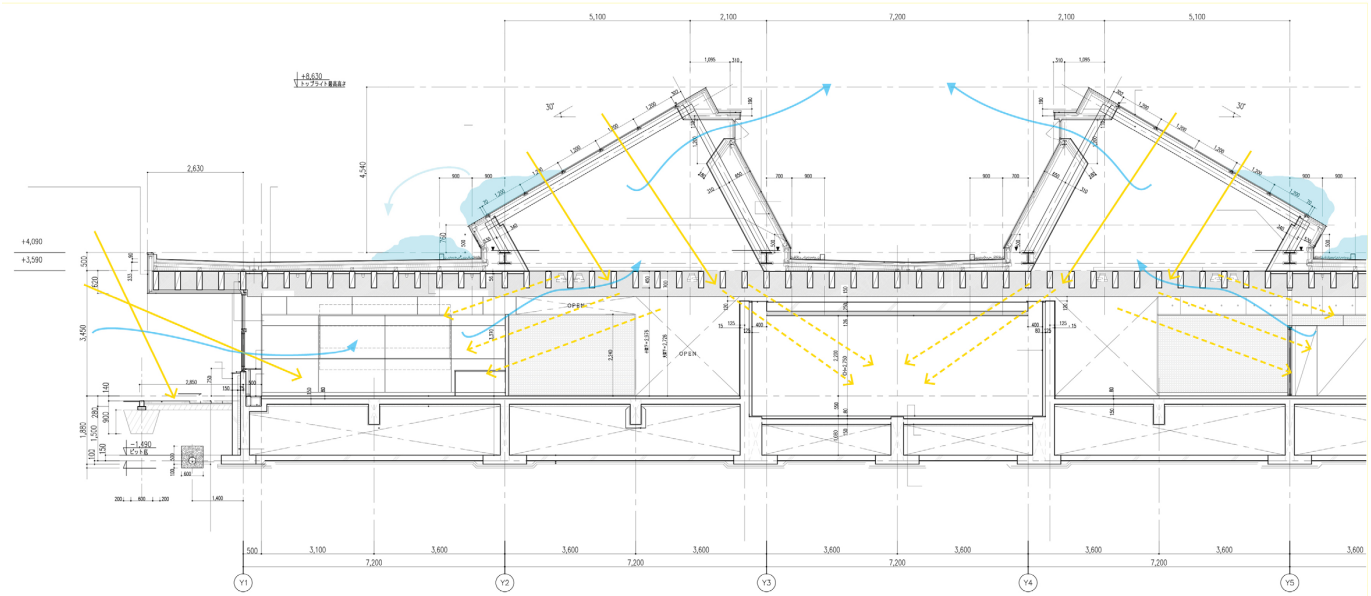
Moreover, by using that section two more issues can be solved: ventilation and snow accumulation. The shape of the section allows cross-ventilation in the building. In addition, as the wind blows along the east-west valley, the bilaterally symmetrical cross-sectional shape makes the wind run naturally along it, reducing the accumulation of snow. On the other hand, the 30 degrees angle of the roof is designed to avoid the accumulation of snow, as well as the temperature difference between the outdoor and indoor due to the ability of accumulating the heating inside, that helps the snow to be melted.

Finally, in relation to the acoustic design, as it has been mentioned the development of new materials have solved the initial problem. The use of acoustic perforated plywood panels for the ceiling of the classrooms improves the quality of the sound as well as contributes to keep it inside the space. In addition, the

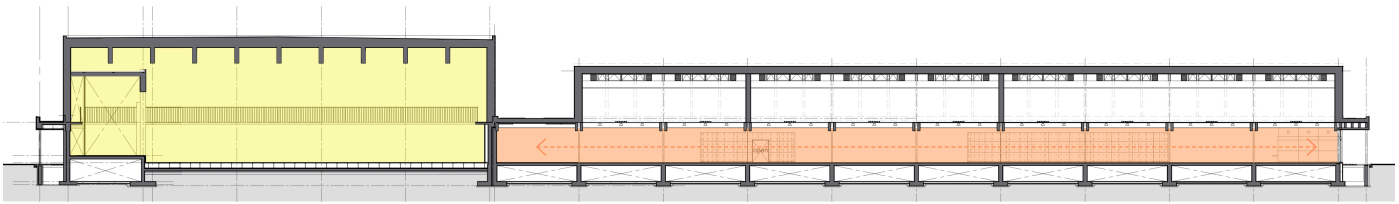
F118 Indoor space of the multi-purpose area.

F119 North-South façade.

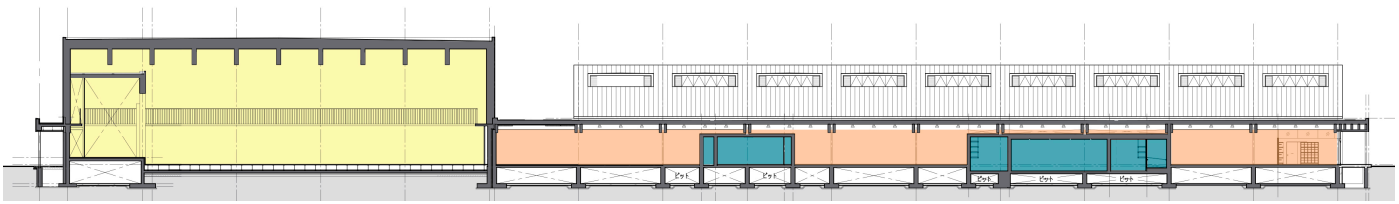
- bathroom
- special classroom
- classroom
- multipurpose space / work space
- courtyard / terrace
- sports ground
- teacher's space
- warehouse / other facilities
- access



F120 Constructive section indicating airflow and lighting.



F121 East-West section indicating uses and visuals.



F122 East-West section indicating uses.

cross-section also helps to avoid the sound to spread from the classrooms to the multi-purpose space, and vice versa, because the height of classrooms is quite short compared with the other. Nevertheless, spaces that are expected to use producing a high amount of sound are designed closed and soundproof, such as music classroom and broadcast room.

4. Furniture and equipment[104]

The furniture has been an important aspect in this project, being properly designed for this school. It adapts to the size of the children, having the same design in bigger size for the teachers and staff as well. The project included a plan of the furniture layout regarding the light distribution inside the spaces, having in mind also how this distribution change depending on the time of the day and the seasons. Moreover, following the curved lines of the furniture design, the walls of the closed spaces that are placed along the multi-purpose space are designed also curved, to be conceived as furniture. On the other hand, as a recent addition, the users of the school have placed many different types of plants all around the multi-purpose space, creating their own outdoor space inside the school building.

Regarding the equipment, new technologies have arrived to the elementary schools nowadays, so like any other elementary school, Itoi Elementary school has also a space dedicated only to computers and a screen in each classroom, although is true that technology is not a main tool of learning.

F123 Indoor space of the multi-purpose area.

F124 Indoor space of the multi-purpose area (secondary access + art space).

F125 Indoor space of the multi-purpose area (at lunch time).

104 KATOH M. (July 23rd, 2018) *Personal interview conducted by the author*, chief designer of Itoi Elementary School and member of Atelier.

5. CONCLUSION

F126 Gymnasium.

F127 Indoor space of the multi-purpose area (reception).

F128 Classroom.

5.1. Behind the contemporary open-plan school design

To conclude the whole previous analysis made, summarize the reasons why the design of open-plan schools is different depending on the project and understand how this typology affects to architects and users, the interview conducted to Makoto Katoh[105] (chief designer of Atelier BNK) is condensed in a text below, because his point of view answers all these aspects.

Which was the main idea or concept in the design of Itoi Elementary School?

We had in mind two important topics: environment and program. Regarding environment, the school has a small exterior wall area by making it as a compact volume, so the heat has less area to go from inside to outside and we can save more energy. By considering the energy saving and designing this compact volume, the program can also be developed in a very close distance, making a very compact program.

For example, although we use C+A's project as a reference in some of our schools, their method is making various spaces with various shapes and in Hokkaido this type is not good, because by doing this we have a big exterior wall area and a big heating loss. In addition, they use outside space, but in Hokkaido we only can use outside space half a year, so it's not useful. Having in mind these aspects, we plan that all activities can be done inside during whole year, that's also why we design a compact volume.

C+A's example, Kibi Kougen Elementary School, and our school, Itoi Elementary School have almost same floor area (about 4000 m^2), one storey, one class per grade and wooden roof. But Kibi Kogen is designed by C+A's method, so both have very different shape. Similar concept but different result. I like Kibi Kogen Elementary School, but this way of planning is not good for Hokkaido area.

105 KATOH M. (July 23rd, 2018) *Personal interview conducted by the author*, chief designer of Itoi Elementary School and member of Atelier.

Is the educational method/system in these school different as in an ordinary elementary school? How equal/different?

The educational system is equal in all the schools in Japan, but in this typology it's a little different according to space. There are two types of schools in Japan: public and private. In public school the educational system and curriculum is the same for all. However, in the private school they will have more time for English or religion, for example.

In Itoi Elementary School, as it is a very small-scale school (one class per grade) there are few teachers, so it's important that all the classrooms are close to each other, because by doing so the teachers can feel the situation of the other classrooms. All teachers control all students, they work as one team. Even in their free time, when they walk around the school, they can know which classroom needs additional help, so they can cooperate.
In lunch time, each student can choose their favourite place to have lunch and some teachers participate also. So, the situation can change every day, also according to the light and the wind, because they will choose a different place. In the library the sunlight it's important.

Now basically in the class time each subject is held in one classroom, but the ideal situation in the school was though differently. The idea was that according to different class the students and the teachers can choose the place where they want to have the class, not only in the classroom. This kind of use is possible in this school, but in the present situation only few teachers use the school like this.

Small school can use this system (open-plan), in big-scale schools is more difficult to use it properly. The open-space area for each student in a small-scale type is higher, so they can enjoy more the open-space. But in a big-scale school it's hard to plan a very luxury open-plan, because the share facility is almost decided, even in large-scale school maybe they have the same area of search facility for some spaces, like gymnasium or library, so it's more difficult that this typology functions well in this type of schools.

F129 Transition between classroom and multi-purpose space in Shinseikan Elementary School.

F130 Transition between classroom and multi-purpose space in Itoi Elementary School.

F131 Transition between classroom and multi-purpose space in Numata Elementary School.

F132 Detail of plants in the multi-purpose space of Itoi Elementary School.

F133 Classroom of Itoi Elementary School.

F134 Indoor space of the multi-purpose area (library) of Itoi Elementary School.

Utase Elementary School is a large-scale type, but the space has a very good composition, that's why open-plan school works very well in this example.

Which are the main aspects to consider while designing open-plan schools in Japan? And the main difficulties?

I think that the important things are program and environment (as he explained before). And the main difficulties are government and teachers.

Are there any points that can be better but couldn't have been achieved in the project?

Honestly, I don't know if the space is the best for children or not, but we like to design spaces for children that they can use freely. And if the current educational system fits this typology or not is something that I'm not completely sure. I think that the Japanese educational system is not good enough. Even though, I would say that our schools work well with the current system, it is not the best system for this plan. We still must research more on these things to continue improving.

Can you tell any feedback from the users?

The feedbacks are positives. The director of this school changes every two or three years. The current direct said thar this school is a good space for children. They also have set a lot of plants in the open-space, I've heard.

How do you think this typology will be in the future?

I think that open-plan school will be good typology in future, but architects must think a good concept for this plan. Maybe the concept of open-plan will also change, so if the idea changes the design will also change. We think that architecture

shouldn't be closed, but open. Not only for the educational space, but also in other type of facilities. Now the trend is from closed to open, from very limited function or space to more free space, so people can use the space as they like, they have more freedom and possibilities. Based on this kind of trend, in school there are still many possibilities to design the open-plan. Maybe before the idea was more functional, they made the room for each function, but now we create various spaces, so people can choose the place they like and do their activities finding their own way to use the space.

For example, in Toyotomi Community Centre, we have many different uses, but we plan them open. We design open-plan for different kinds of architecture, not only schools.

5.2. Towards the future: Higashikawa Elementary School

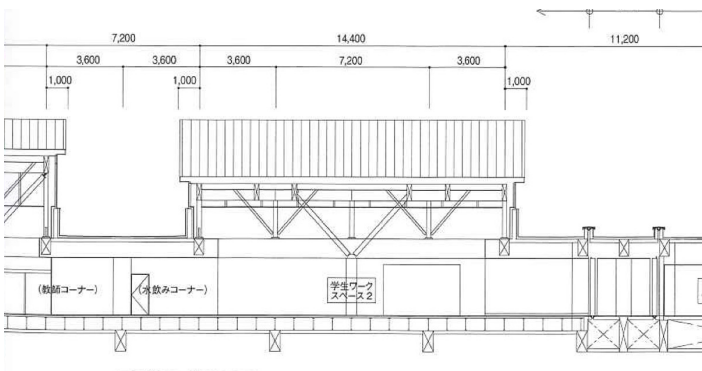
In order to understand better in which direction is the typology going and what could be expected in the future, I personally conducted an interview to Takao Ozasa[106], an architect and professor at Hokkaido University who has a lot of knowledge in open-plan schools. He designed in 2016 Higashikawa Elementary School, an open-plan school in collaboration with Atelier BNK. In the interview, written below, he explained their design decisions, what should be taken into account when designing this type of schools and how could the typology be improved in the future.

Why have you chosen open-plan school typology in your educational projects? Which are the advantages of this typology compared to others?

As you can see in the floor plan, all the space is completely open but divided with mobile furniture. So, if teachers want more classroom space, they can move the furniture. That is very interesting for teachers. For example, one teacher is very unique using this space. Usually the teacher sits in front of students using blackboard and teaching children, but this teacher sits in one of

F135 Higashikawa Elementary School.

F136 Higashikawa Elementary School.

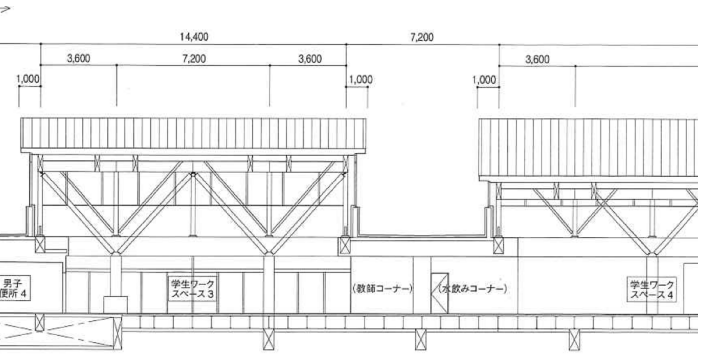


F137 Longitudinal section.

106 OZASA T. (July 17th, 2018) *Personal interview conducted by the author*, architect and professor at Hokkaido University.

F138 Indoor space.

F139 Transition between classroom and multi-purpose space in Higashikawa Elementary School.



the sides of the classroom, doing so the space of the classroom is wider. Usually there are classrooms and a corridor, and both uses are always used in one fixed direction, but in this case is not like that. This is very interesting, especially for elementary schools, because they do many different activities, and it's very easy to accommodate each classroom to each activity and to different teaching methods. In conclusion, we have chosen open-plan typology because of its flexibility.

Which was the main idea or concept in the design of Higashikawa Elementary School?

The school is in the countryside and it is surrounded by farm land. There is a kind of greed, because the first people to come to this area, around 150 years ago, made a road and also the farm land (in Japanese 'tanbo': rice fields) and they used this greed, making a beautiful scenery. So, with this former farm land, we wanted to make some greed following it, the project has some lines connecting it with the landscape and dividing it as the same way as the farm land. Also, there is a very good scenery because of the mountains in north, so the classrooms face to south because of the light, but at some points the project also faces to the north, because of the scenery. It's kind of a unique system.

How climate affected the design of Higashikawa Elementary School?

As we wanted to make an open-plan school and wanted to face the north side with big windows, so that's how the section was designed. We designed a big roof using the local materials and creating a wooden truss. But due to the amount of snow in winter we also use reinforced concrete and steel to support the roof. Making a hybrid system combining three ways of structure.

Another aspect of climate that it's special in Hokkaido area is that, regarding the ventilation system, the section of the project allows to have fresh air by opening the windows of both sides (crossed ventilation), so there is no need of fans, only using natural air.

Also, under the floor there are air conditioning systems and, using electricity, they blow warm air through under the floor. There is no heating system apart from the air conditioning system under the floor, but the gap between the areas of the school in not so big because there is only one total space. We check the areas temperatures during the winter season (the coldest day is -20ºC) but the indoor temperature with this system is comfortable enough.

Does the furniture adapt to the children scale? How?

In this type of schools there is a lot of open space, and this space can have so many different functions. That's why in this project, furniture is very important, we designed it because buying furniture directly from furniture companies is not so good for open-plan schools. We have to design the project not only for architecture, but also for furniture. For example, we designed a big bench and it's very good for children because they make that bench become their own *'Ba' (*場*)*[107] , their own space. We have to achieve making this open-space a comfortable place for children, this is a very important point of designing open-plan schools.

We have tried to adapt children's scale to the children's furniture. Asahikawa town is very famous for that and they held an international furniture design competition, but as in Higashikawa there is a lot of free land they have the atelier and factory in this area. We tried to make the children furniture using wood and take advantage of the furniture industry in Higashikawa. The problem is that furniture industries doesn't have so many options and scales for the furniture for the children, but we designed many different types of chairs and desks. Also, teachers have same design as children but in a bigger scale.

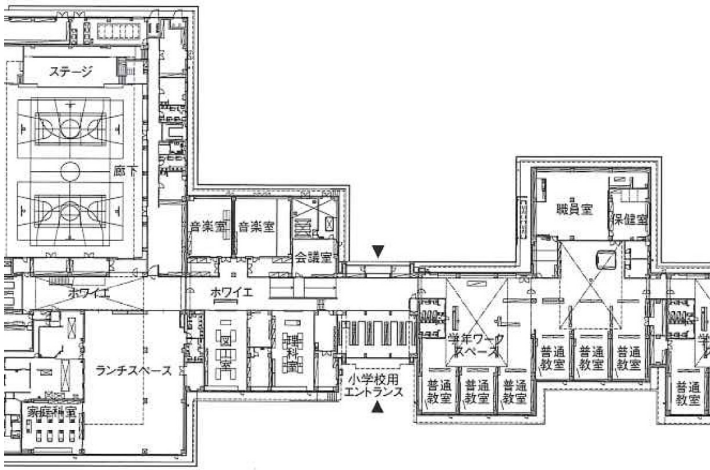
I'm very happy with the results of the furniture of this project because we had the experience of co-working while designing the furniture.

Is the educational method/system in these schools different as in an ordinary elementary school? How equal/different?

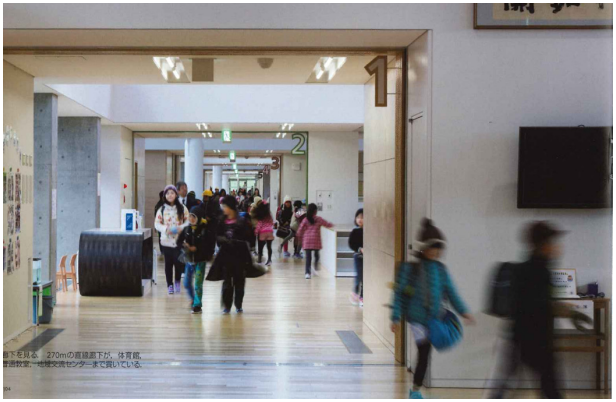
107 *'Ba' (*場*)* means 'place'.

F140 Indoor space of the Community Center.

F141 Indoor space (plaza).

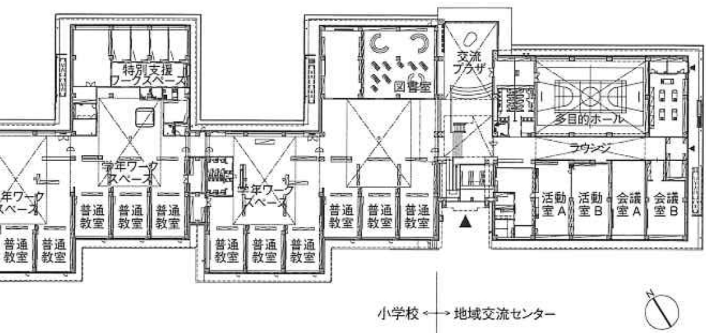


F142 Floor plan of Higashikawa Elementary School.



F143 Indoor space.

F144 Indoor space (plaza).



Yes, it's a bit different. For example, there is one classroom with no use. In this area there are three more elementary schools, but as the population in Japan is keeping decreasing, in the future these schools will probably be demolished and all the children in this area will attend Higashikawa Elementary School. When that happens there will using the three classrooms, but at the moment the classroom in the middle has no fixed use, it is more like an assemble space. So for example, if the teachers wants two classrooms gathering together, they will move to this class. Furthermore, the number of teachers of this school has increased since the beginning of the project, almost each subject has two teachers, in Japan this is called team-teaching. This is very good for making a good teaching method for children. Also, if one class wants to make some noise, like in the music subject, the other class will move to another one to have more silence, or to do some sports, etc. Children are used to change between different spaces and I think this is very different to an ordinary elementary school.

There is also another unique point about this project that there is not only an elementary school, but also a community centre, and they are totally connected. After school, some parents can't attend their children because they have to work, so from 3pm to 6pm children go to the community centre, not only the students in Higashikawa Elementary School, but also students from other schools, because there are some after-school activities. These activities are not about studying, they play, they have also like a home subject, they eat sweets and like that. And that is an interesting combination.

Apart from the elementary school site, there is also a sports field, a park, rice fields, farms, cherry blossoms area, etc. surrounding the school. So, taking advantage of this they teach children how to make rice, how to make vegetables, fruits, etc. They even use the rice from the rice fields for making the lunch in the school. That's very useful for teaching children new experiences and I think that this is a unique point of this elementary school.

Which are the main aspects to consider while designing open-plan schools in Japan? And the main difficulties?

The main difficulty while designing open-plan schools is the sound. In this case, this school has a lot of open-space. As you can see in some C+A's projects, the open-space area is so different, with many different wides. In our case, this project has two, three, or even four different area for that purpose, having a lot of space to create 'places'.

Which are the main good points of this educational project? Do you think it is a successful project?

Yes, I think it is a successful project. We have spent a lot of time making the planning with all the people involved, not only teachers, but also parents and children, so there have been a lot of people discussing about everything and I think that it is a good point of this project.

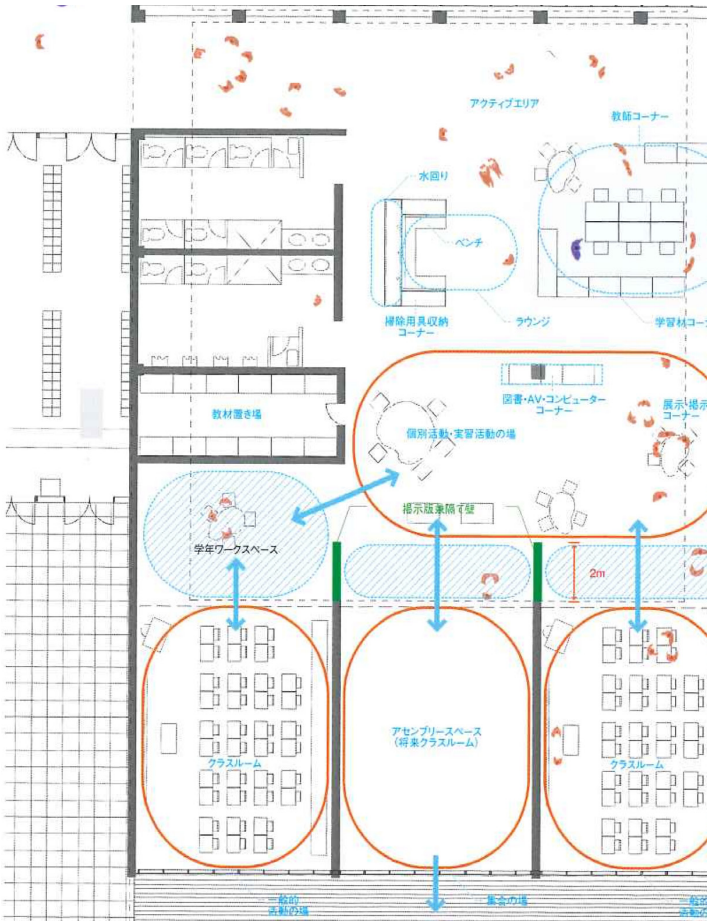
Can you tell any feedback from the users?

We did many workshops for the designing process of the school in that period, hearing the opinions of teachers and parents. The location of the school is very close to a kindergarten, almost every child of the kindergarten will go to this elementary school, so we wanted to hear the opinions of these parents and teachers and try to fit every suggestion to make a system that can be good for everyone. One problem was that there were some teachers that were not in favour of this open-plan system because they have no experience in teaching in an open-plan school, and also because they were very concerned about the concentration of the children. We tried to make a big model that everyone can easy understand and various pattern of how to move the furniture.

Do you consider some parameters more relevant than other while designing open-plan schools? Why? Do they affect children's learning?

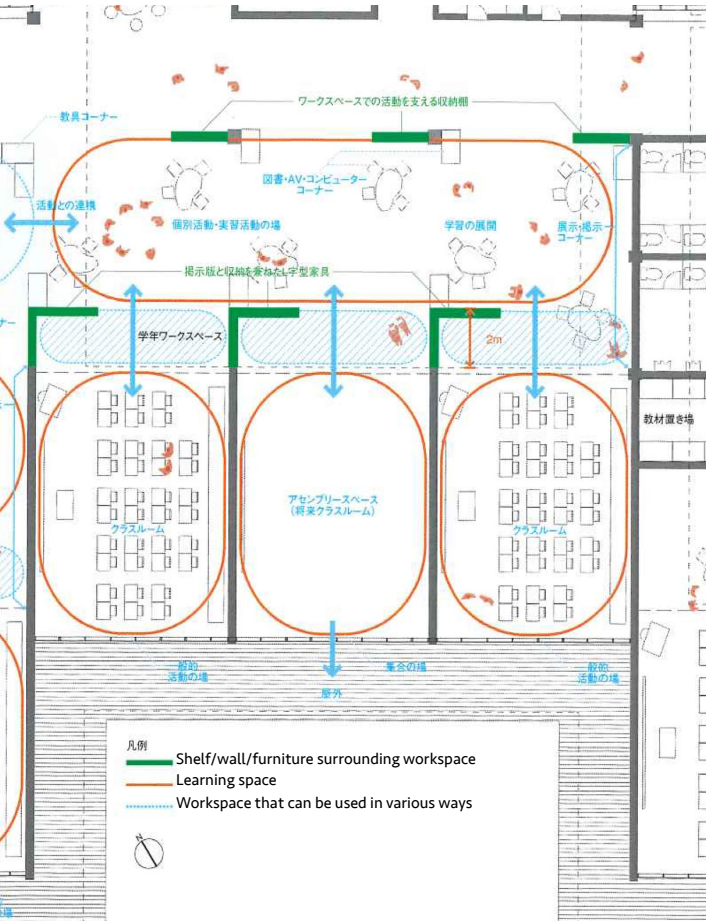
How to create openness and at the same time having a good feeling of the area. That's a very important thing while designing

F145 Indoor space (stairs and entrance).



F146 Floor plan (detail of relationship between spaces).

F147 Gymnasium.



this type of schools. In this case, the height is not so high, it's the minimal height of Japanese regulation of designing elementary school. 10 years ago there were a lot of schools designs with a very high ceiling, to make the sunshine enter through the south part of the classroom. But at the same time, there was a lot of heating in summer, so it was not very convenient, that's why we decided to use the minimum height, 2.7 metres for the classroom area. As I mentioned before, the wall of 1.2 metres high and this height of the ceiling, make it easier to conceive the space as a specific area. Otherwise, in the open-space, there is a high ceiling. Knowing how to combine these parameters is very important in open-plan schools.

How do you think that has been the development of open-plan school concept in Japan? Is there any difference between 1990s and nowadays?

Open-plan schools have been used in Japan for 40 years from now, and they have been through a lot of struggle. One reason is because of the noise, due to the open spaces, and another reason it's because there are no walls, so children can see movement outside the classroom and it can be bad for concentration. But there have been so many try and error in order to improve this typology.

In this case, there is an open space but also the classrooms are divided, so it doesn't disturb children. In the section of the classroom, the ceiling has insulation for the sound, so the noise doesn't go out. Also, the height of the wall that divides the classrooms with the open space is about 1'2 metres and is very useful to keep the sound inside the classroom.
In the past, the corridor of the school had two metres, when new type of school started to be conceived in the 1990s and 1980s, the first age of open-plan school in Japan, the only difference was that the wide of the corridor changed to 4 metres, but there is no big difference only by doing so because there is no so much usable space in that area. It has been done a progression in the school planning of this type of schools.

5.3. Personal conclusion

First of all, as open-plan schools are a typology under development, the aim of this research is not to achieve a closed conclusion, but to make a reflection on why these schools have become so popular in Japan since the 1990s, how the design has evolved to the open-plan schools that can be found nowadays and what future awaits for this typology.

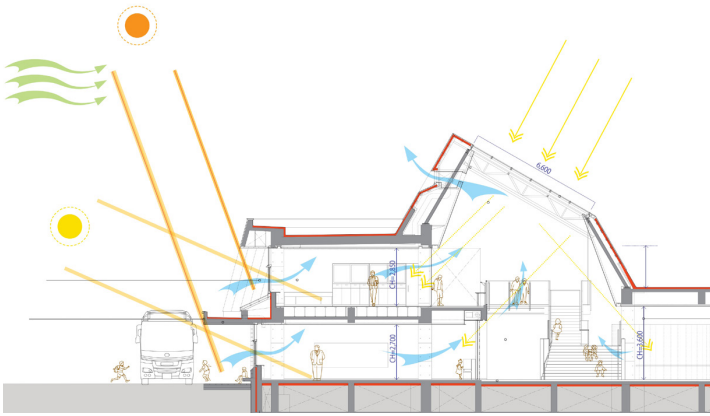
Although this typology started to emerge in the 20th century due to the influence of Western countries and as a response to the desire of changing the education system, the architecture evolved much faster than the education reform. The result were school buildings full of openess (even forgetting the human scale in some cases) but totally incompatible with the curriculum and teaching methods. In addition, teachers didn't have the time to assimilate all these changes and didn't really adecuate to the new spaces of learning. However, although open-plan schools spread all around the country due to the subsidy that the government implemented, the education system was not coherent with this new concept.

Consequently, the architecture had to involve and the education reforms accelarated their development. This moment was reached during the 1990s. Architects began to understand that learning is not only about common activities, but also about taking into account the children as individuals. As well as the new Courses of Study was implemented, new school buidings were designed remarking the flexibility of the spaces but together with the variety of spaces in shapes and sizes. The activity and the way of using each space became the main aspect.

After the 1990s, the open-plan school concept stabilized and its basic characteristics were clearly defined. Although, these schools have been still in use since then there is not a closed way of designing them, because as the activity is the main premise it would change depending on the location, the climate, the

F148 Inside a classroom of Numata Elementary School.

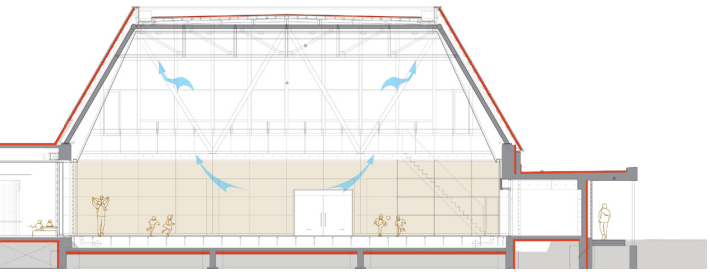
F149 Inside the multi-purpose space of Numata Elementary School.



F150 Section of Numata Elementary School.

F151 Solar panels of Numata Elementary School.

F152 Snow storage room of Numata Elementary School.



number of students and such factors. However, the flexibility of this typology could be wrong understood, because although it is true that it can be used with the current Japanse education system, this system is still rigid and should be developed more in the future in order to achieve a completely student-centered learning which will take fully advantage of the richness of the space that the design of open-plan schools offer.

Regarding the future direction, by analizing the contemporary open-plan schools it can be seen that the configuration of the space is not the main concern nowadays (although it's still the base of the design) because there have already been made a lot of researchs of this topic. Otherwise, the environmental sustainability of the spaces is becoming one of the main aspects in the design of these school, along with the configuration of the space. The most remarkable example for me concerning this is Numata Elementary School of Atelier BNK, in which the electricity is obtained by solar panels (F151) and the snow of the winter is stored in one specific room where the cool is used for the air conditioning system in summer(F152). Furthermore, contemporary architects want to listen the users' opinions and a dialogue between them is established. Not only for improving the designs, but also to inform teachers, students and parents about the functioning and advantages of this typology. Architects know that their designs are not ideal and fixed, they are open to new changes in order to adapt them to users needs.

On the other hand, I think that countries like Spain, with a similar education structure and curriculum to Japan could take these public schools as an example of good design and give the children the opportunity of learning in a rich educational space. Maybe the propagation of this typology would make governments think about the necessity of an education reform based on the students.

In conclusion, open-plan schools will continue being used in Japan for a long time, evolving with the time and the needs of the users. *Shifting the concept of schools from 'teaching school' to 'learning environment'*[108].

108 SHINKENCHIKU:1995, 7 (1995) *Utase Elementary School,* p. 153-155.

6. SOURCES

6.2. Bibliography

BOOKS - MAGAZINES - ARTICLES

ATELIER BNK (2014) *Atelier BNK 2000-2014*, Kenchiku Gahou Inc.

CHACÓN F., M. A., *Metodología y Evaluación en la educación en el Sistema Educativo Japonés, su visión Holísitica e integral*, in CIEMAC, VI, 2009.

CLAIR (2012) *J Educación* <http://www.clair.or.jp/tagengorev/es/j/01_2.pdf>

CLEVELAND, B.W. (2011). *Engaging spaces: Innovative learning environments , pedagogies and student engagement in the middle years of school*.

DEWEY, J. (2005). Democracy and education. Stilwel, KS: DigiReads.com Publishing. (Original work published 1916).

DUDEK, M. (2000). *Architecture of schools: the new learning environments.* Oxford, Architectural Press. http://site.ebrary.com/id/10603395.

GARCÍA-RAYO C. (2013) *Luces y Sombras en la Educación: Estudio Comparativo de los Sistemas Educativos de Japón y España.*

GISLASON N. (2007) *Placing Education: The School as Architectural Space in Paideusis*, Volume 16 (2007), No. 3.

GROSS, R., & MURPHY, J. (1968). *Educational change and architectural consequences. A report on facilities for individualised instruction.* New York: Educational Facilities Laboratories.

HAMILTON, D. (1976) *A Case Study of a New Scottish Open Plan School*, Edinburgh, The Scottish Council for Research in Education.

JICA Research Institute (2004) *The History of Japan's Educational Development. What implications can be drawn for developing countries today?*

KURAKAZU R. (2006) *"Open Space" "Open School" "Open Plan"?* < http://school.ouen-dan.com/sb/log/eid4.html> (Japanese).

KURAKAZU R. (2006) *Ōpun kyōshitsu no onkyō seinō* <http://school.ouen-dan.com/sb/log/eid7.html> (Japanese).

NAIR, P. & FIELDING, R. (2005). *The language of school design: Design patterns for 21 century schools*. Minneapolis: DesignShare.

NAGASAWA S. (2017) *Gakkō shisetsu seibi no dōkō to kadai* < http://www.mext.go.jp/b_menu/shingi/chousa/shisetu/044/shiryo/__icsFiles/afieldfile/2017/10/10/1396762_003.pdf>

NOJIMA N. (2011) *Kyōshitsu kyōshitsu mawari no keikaku o kangaeru*, Institute of Educational Environment (IEE) (Japanese).

NUMANO T. (2015) *Primary schools in Japan.* <https://www.nier.go.jp/English/educationjapan/>

OZAKI R. (2006) *Boundaries and the meaning of social space: a study of Japanese house plans*, Environment and Planning D: Society and Space, volume 24.

ROMAÑÁ T. (2004) *Arquitectura y educación: perspectivas y dimensiones.* Revista Española de Pedagogía, nº 228.

ROTHENBERG, J. (1989). *The open classroom reconsidered*. Elementary School Journal, 90.

SHINKENCHIKU:1995, 7 (1995) *Utase Elementary School.*

SHINKENCHIKU:2009, 9 (2009) *Itoi Elementary School*, p. 166-171.

THE ARCHITECTURAL INSTITUTE OF JAPAN (2005) *Compact architectural design documentation (Konpakuto kenchiku sekkei shiryou shuusei)*, General Architects Association of Japan.

THE JAPAN ARCHITECT, vol. 61 (2006) *Kazuhiro Kojima + Kazuko Akamatsu/ CAt.*

THE PLOWDEN REPORT (1967) *Children and their Primary Schools.* A Report of the Central Advisory Council for Education.

WALDEN R. (2015) *Schools for the Future.* Design Proposals from Architectural Psychology.

YAMANA, J. (2010 - 2011) *Japan's School Architecture as Mixture between the West and the East*, Graduate School of Education, Kyoto University.

WEB PAGES

ATELIER BNK
<http://www.atelier-bnk.co.jp/projects/200501/1149>

Coelacanth and Associates <https://ja.wikipedia.org/wiki/シーラカンスアンドアソシエイツ>

Coelacanth and Associates <http://c-and-a.co.jp/>

Gakkō-Dzukuri < http://school.ouen-dan.com/>

Myonichikan <http://www.jiyu.jp/tatemono/index-e.html>

La Educación en Japón

<http://evaristocultural.com.ar/2006/11/21/la-educacion-en-japon/>

Institute of Educational Environment (IEE) < http://www.iee-net.co.jp/24725.html>

INTERVIEWS

AKAMATSU K., *Written interview*, chief designer of Coelacanth and Associates Tokyo.

KATOH M. (July 23rd, 2018) *Personal interview conducted by the author*, chief designer of Itoi Elementary School and member of Atelier.

OZASA T.. (July 17th, 2018) *Personal interview conducted by the author*, architect and professor at Hokkaido University.

6.2. Photo credits

F1, F2, F13, F14, F15, F20, F21, F62, F16 Figure made by the author.

F3, F5, F6 La Educación en Japón: <http://evaristocultural.com.ar/2006/11/21/la-educacion-en-japon/>

F4 *What are "terakoya"?* <https://www.library.metro.tokyo.jp/portals/0/edo/tokyo_library/english/gakumon/page1-1.html>

F7 *Secondary education in Japan* <https://en.wikipedia.org/wiki/Secondary_education_in_Japan>

F8 *Inequality and Japanese Education: Urgent choices* <https://apjjf.org/-Tomoaki-NOMI/2016/article.html>

F9 *10 distinctive features of the Japanese education system* <https://brightside.me/wonder-places/10-distinctive-features-of-the-japanese-education-system-that-made-this-nation-the-envy-of-the-world-214655/>

F10 *How Global Competence Has Boosted Japan's Education System*<https://asiasociety.org/education/how-global-competence-has-boosted-japans-education-system>

F11 <http://crazynewshub.com/japans-education-system-best-world-7-crazy-facts/>

F12 *Japan's mouthwatering school lunch program is a model for the rest of the world* <https://www.businessinsider.com/japans-amazing-school-lunch-program-2017-3?IR=T>

F15 Made by the author based on: <http://www.clair.or.jp/tagengorev/es/j/01_2.pdf>

F17, F18, F19 Made by the author based on: JICA Research Institute (2004) *The History of Japan's Educational Development. What implications can be drawn for developing countries today?*, p. 183-202.

F22, F23 Made by the author based on: NUMANO T. (2015) *Primary schools in Japan.* <https://www.nier.go.jp/English/educationjapan/>

F22, F23 Made by the author based on: NUMANO T. (2015) *Primary schools in Japan.* <https://www.nier.go.jp/English/educationjapan/>

F24 *EAP 1686 Primary Education in Japan:* <http://eap1686primaryeducationinjapan.blogspot.com/2015/02/blog-post.htmlT>

F25 <https://asia.nikkei.com/Politics/Free-education-in-Japan-faces-45bn-questionT>

F26, F27 WALDEN R. (2005) *Historical Background of the Japanese School*, Schools for the Future, Springer Fachmedien Wiesbaden p. 41-50.

F28, F35, F36, F37, F39, F85, F87, F89 WALDEN R. (2005) *Historical Background of the Japanese School*, Schools for the Future, Springer Fachmedien Wiesbaden p. 41-50. (Edited by the author).

F29 SHINKENCHIKU:1952, 4 (1952)

F30 SHINKENCHIKU:1956, 2 (1956)

F31 SHINKENCHIKU:1951, 12 (1951)

F32, F33 THE ARCHITECTURAL INSTITUTE OF JAPAN (2005) *Compact architectural design documentation (Konpakuto kenchiku sekkei shiryou shuusei)*, General Architects Association of Japan.

F34 SHINKENCHIKU:1958, 5 (1958)

F38 SHINKENCHIKU:1983, 9 (1983)

F40 ROTHENBERG, J. (1989). *The open classroom reconsidered*. Elementary School Journal, 90.

F41, F42 THE PLOWDEN REPORT (1967) *Children and their Primary Schools.* A Report of the Central Advisory Council for Education.

F43 TANNER, C. K., & LACKNEY, J. A. (2005). *Educational Facilities Planning: Pearson Allyn and Bacon.*

F44 GROSS, R., & MURPHY, J. (1968). *Educational change and architectural consequences. A report on facilities for individualised instruction.* New York: Educational Facilities Laboratories.

F45 , F46, F48, F53, F54, F56, F57, F59, F60, F64, F65 NAGASAWA S. (2017) *Gakkō shisetsu seibi no dōkō to kadai* < http://www.mext.go.jp/b_menu/shingi/chousa/shisetu/044/shiryo/__icsFiles/afieldfile/2017/10/10/1396762_003.pdf>

F49, F50, F51, F52, F55, F58, F61, F63 NAGASAWA S. (2017) *Gakkō shisetsu seibi no dōkō to kadai* <http://www.mext.go.jp/b_menu/shingi/chousa/shisetu/044/shiryo/__icsFiles/afieldfile/2017/10/10/1396762_003.pdf> (Edited by the author).

F47 <http://www.anjo.ed.jp/~shonan/jp/school/gallery.html>

F66 KURAKAZU R. (2006) *Ōpunsupēsu no katsudō bamen* <http://school.ouen-dan.com/sb/log/eid7.html> (Japanese).

F67 KURAKAZU R. (2006) *Ōpun kyōshitsu no onkyō seinō* <http://school.ouen-dan.com/sb/log/eid7.html> (Japanese) (Modified by the author).

F68, F69, F70 THE JAPAN ARCHITECT, vol. 61 (2006) *Kazuhiro Kojima + Kazuko Akamatsu/ CAt.*

F71, F72 KAZUHIRO KOJIMA + KAZUKO AKAMATSU (2016) *C+a Essence Behind*

F73 GA JAPAN (2017), *Kamaishi Unosumai Elementary/Junior High School*, vol. 148, p. 62-76.

F74, F77, F80, F82, F88, F90, F91, F96 SHINKENCHIKU:1995, 7 (1995) *Utase Elementary School* (Edited by the author).

F75, F76, F78, F79, F81, F83, F84, F86, F92, F93, F94, F95 SHINKENCHIKU:1995, 7 (1995) *Utase Elementary School.*

F97, F102, F105, F110, F111, F112, F116, F120, F121, F122, F150 Drawings provided by Atelier BNK and edited by the author.

F98, F99, F100, F101, F129, F131, F148, F149, F151, F152 Photograph taken by the author.

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F135, F136, F137, F138, F139, F140, F141, F142, F143, F144, 145, F146, F147 SHINKENCHIKU:2017, 4 (2017)