DOCTORAL DISSERTATION

A comparative study of placemaking methods

for regenerating abandoned schools

between Taiwan and Japan

March 2024

Yu Ling Tsai

Graduate School of Environmental Engineering

Dewancker Bart Lab

The University of Kitakyushu, Japan

ACKNOWLEDGEMENT

ABSTRACT

With the rapid development of globalization, industrialization, urbanization, and informatization, numerous economic activities are aggregated in cities, resulting in uneven resource distribution between urban and rural areas. The falling fertility rate has also caused many abandoned education-related architectures in both regions. When an architectural space is non-operational, it delivers neither the fundamental spatial value nor contributes any interaction with its neighbors. This research conducts 15 school architecture analyses on their regenerative programs to evaluate the relationship between space order, territory differentiation, user behavior reaction, and user perception of the built environment. A study of establishing a linkage to the local community is also the research mission to achieve.

This research investigated the potential impact on design creativity using the basic theory of space syntax methodology in the early design stage/process of regenerative design school building design. Also, the research design consists of comparative studies between the spatial hierarchy and space accessibility, and territory zoning property related to the user's behavior experience; furthermore, the characteristics of the locality are investigated in the hope of gaining a deeper understanding of how different revitalization approaches might lead to diverse interaction patterns in the areas, which focuses on the transformation from space to place and the genius loci creativity. Besides, the study extends the creativity research to reviewing design behavior and space cognition to investigate the advantages and disadvantages of using school space to create an intermedium place to provide and support the local community. The main focus of the study mission is the regeneration design progress to know and improve the solver's performance throughout the regeneration design process, which can also be called the placemaking process. Furthermore, in the first part of this study, findings show that different spatial order and characteristics can affect how people perceive the public space and private space in a school building, which reflects the way they interact with the space by using the space syntax method and analyzing the space order in the different meaning of space symbols. During the beginning of space design, design participant usually thinks this design phase is just inserting the user needs into the space, and the space features can be defined later. However, the result indicates that the spirit of the space is hardly followed up after each level of space symbol has been decided upon; the regeneration design creativity at the beginning without thinking denser of the space hierarchy will affect the place's phenomenon and identification.

In addition, a school place to achieve social impact as a social infrastructure in the built environment, territorial differentiation is the second phase mission during the design thinking and creativity process of the school regeneration design project. The second part of this study findings that a territory zone includes the public, shared, and private properties, significantly supports the creativity process during the initial school space reused process and is connected substantially to space order,

access situation analysis in the production of space element numbers, variety, and uniqueness. The result indicates that adequate redesign progress should enhance space utilization and human-environmental interactions since it can promote regional development and overall environmental sustainability. Thus, abandoned architecture can be a potential element to invigorate the local community either economically or emotionally.

In the design cognition review, a comprehensive of space order, territory zoning, user behavior needs, and the school regeneration achievement can be applied to investigate the ongoing regenerative design process with a guideline to assist the school regenerative design project as all participants could use the guideline to consult and communicate to create a placemaking action together to reconstruct the school building as the finest social infrastructure in the community in a long-term consideration. Besides, this design cognition and school transformation process has finally assisted people, whether they have professional architecture knowledge or have the common sense of the space design technique, in learning to arrange and recognize the space element in a place. This guideline also helps them focus on creating the design strategy's space rather than using the original school space layout. Thus, the genius loci can be made again even if the built environment can be changed after some time. The genius loci from the previous time and present time can keep continuity to enhance the essential value of the spirit of the place. With this advantage, this regeneration design guideline can recommend revising the reuse purpose, space characteristics, and user needs to perform a better regeneration design and evaluate their proposed ideas. This PhD research study will contribute to current school regenerative design knowledge and future school space regenerated design. Moreover, this research study assists in developing a better design strategy for a social infrastructure such as a school building and to engage the public's built environment in a community.

LIST OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

Introduction

1.1 Research Background

Nowadays, the image of the city has been changing time after time without any notice; even the living area close to our daily life circle, the citizen will not notice till the building has significantly diminished in value. When an architecture building lost its function to operate in a city, it usually stood in an empty condition for a while, waiting to be reused. Generally, during a city development process, architecture is often an individual object, unlike the street, plaza, or even a lively open space in this urban design fabric. If an architectural space becomes unused, most of the space will become a crime place or a cluttered landscape around the environment that society usually carries an overwhelming burden of. To keep the building without using the space will decline the building's value both in structural and physical circumstances; also, a private developer and government fiscal expenditures must arrange the amount of the budget to extend the building life cycle. On the other hand, many buildings will turn into the "Lost Space" very easily.

Moreover, the living environment quality and its resources are uneven distributions in many cities during the decision of planning and design. Now, due to the advent of the elderly society with fewer children phenomenon," Lost Space," especially the problem of abandoned school buildings in Taiwan, becomes more and more serious. It is important to discuss how to reuse these original places for school children or the public to attend classes and activities that change the space utilization and dynamically activate the unused spaces. To reproduce, the space becomes diverse functions such as official welfare service bases, commercial use, culture restoration hub, industrial experience place, etc. All new ideas above can establishment a new community service network to improve the region economic development.

In response to the advent of an aging society and lower fertility rate issue, the government is enthusiastically promoting the idea to reconnect the community by reusing the abandoned school space scheme to build a comprehensive community care service resource network. As the government in Taiwan has launched forward-looking infrastructure construction and plans to release the public abandoned school spaces in the present years to public and set up the diversity purpose to reutilize the unuse space in the school, there are some potential architecture programming and design method to support the abandoned school space to restore and improve the regional social benefit by multifunctional land use. The Taiwanese government is focusing on especially the social welfare care includes education learning, culture preservation, and elder care. For example, the needs of community-style long-term care institutions such as functional and group homes are more urgent. Also, many day care centers regulated in the long-term care service law, small-scale multiple service in the urban-rural area.

This study intends to explore the specific strategies and methods for transforming abandoned school buildings into different functional space service based on the design elements from the local resources, spatial arrangements, find the genius loci to reproduce the school place, different subjects of care provision, and activity design required by the city government, participants, and residences. Therefore, as to continue to promote the establishment new architectural service facilities for everyone in different scales of area in

the future, this research provides an important evaluation reference for multiple and continuous care for the generation and their living environment through architecture spatial reconfiguration planning and design.

1.1.1 Formation of World's Population

According to a global movement "7 Billion Action" that was launched by the United National, its estimation of the world's population is expected to reach from 7.7 billion currently to 9.7 billion in 2050, even to 11.2 billion (Fig.1-1). However, the age structure of the demographic of 9.7 billion's population will change into a high aging society because people surviving to reproductive age; also, majority change effect of fertility rate relates to a social environment, economic, government policy, etc. will be the consideration of having a child as well. (UNFPA, 2020)

1990 —>5.3 billion

2015—>7.3 billion

2030—>8.5 billion

2050—>9.7 billion

2100—>11.2 billion

Figure 1-1 World population projected from1990-2100

Since our world population is growing but the social population structure by Age and Sex is changing because the fertility rate is declining which will change the overall social structure (Fig.1-2 & Fig.1-3) As the result, most people know many neighborhood schools were closing from each country. These closings happened for many reasons, the main cause is the enrollment keeps decline that has forced districts to consolidate and close in the rural area, even the school building still in a good usable condition. Of course, schools located in the urban district will also face the decline enrolment condition but due to the advantage site location, school facilities usually will be replaced to transformed into other functions. Other reasons for closure can include lack of money for needed repairs and pressures to build now, rather than renovate, old facilities, as well as a lack of public support for preserving existing school buildings (Beaumont and Pianca 2000); thus, school building either is going to be abandoned or reused the school space become a significance issue in the built environment. (UNFPA, 2020). From the perspective view of a sustainable architecture life cycle, an architectural building without using it turns to be a lost space with no value at all to extend the building life cycle of the building; furthermore, it will cause many problems for the community and the urban environment. But as a building is still in a good condition with no harm, reusing the building seems to be another way to sustain. Regenerate a building life does not destroy it.
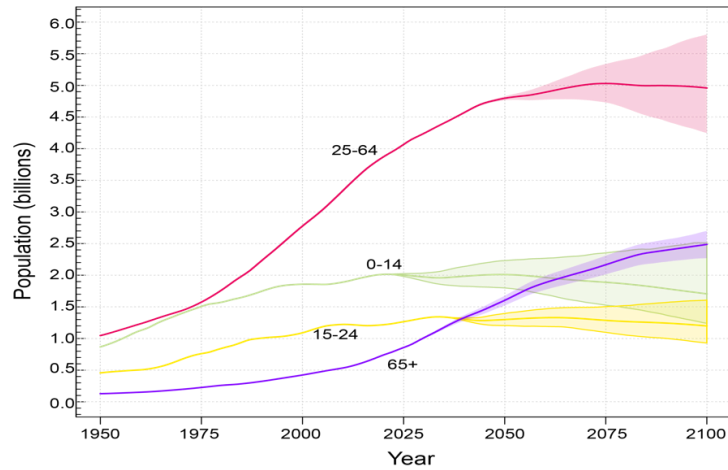
Figure 1-2 World population by broad age groups (1950-2100)
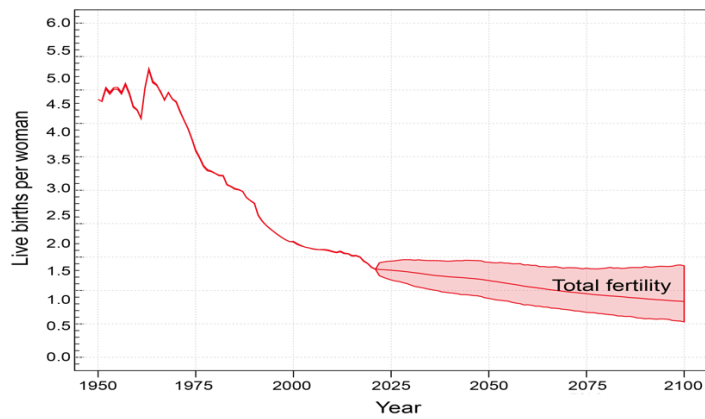
Figure 1-3 World total fertility (1950-2100)

1.1.2 Formation of Taiwan's Population

General Population Growth Profile in Taiwan shows the total population will turn to negative growth in 2020. Under the trend of declining birth rate and aging population, it is estimated that the number of births will be lower than the number of deaths in 2020, and the population will start to show a natural decline, especially the increase in the society dominated by international migration. Affected by the COVID-19 epidemic, it will rarely show a negative value, which cannot make up for the natural decrease in the number of people. Therefore, the total population reached its peak of 23.6 million in 2019 (Fig.1-4) and began to turn negative from this year. Compared with 2020, the total population in 2070 will decrease by about 27% to 39%. In 2020, the total population will be about 23.57 million; by 2070, the high estimate (assuming that the total fertility rate will increase to 1.5), the middle estimate Under the hypothetical scenarios (assuming that the total fertility rate rises slightly to 1.2 people) and underestimation (assuming that the total fertility rate drops to 0.9 people), the total population will drop to 17.16 million, 15.81 million and 14.49 million, respectively, approximately They are 72.8%, 67.1% and 61.5% in 2020 respectively.

3
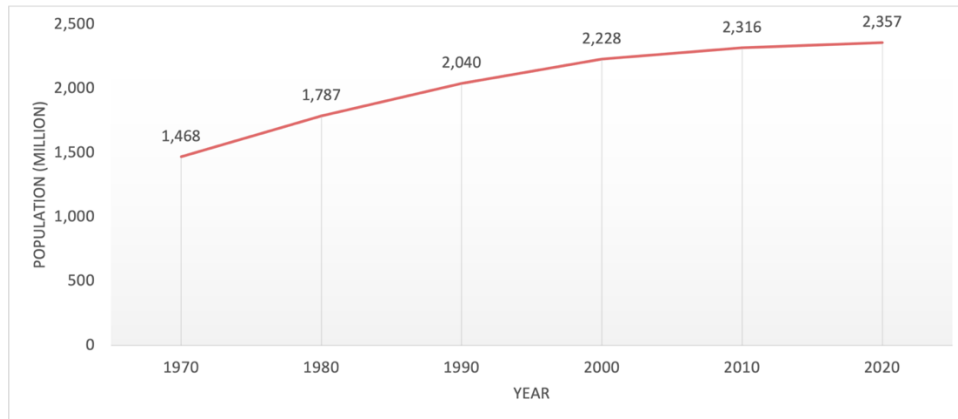
Figure 1-4 Demography in Taiwan (1970-2020)

The situation and impact of declining birth rate become one of the social issues for the society in Taiwan. Although the number of women of childbearing age is decreasing, which restricts the future fertility of the country (Figure 1-5). If the total fertility rate can rise to a high estimate of 1.5%, the decline in the number of births will be reduced. In 2020, the number of births is estimated to be between 160,000 and 170,000, affected by the decrease in the population of women of childbearing age aged 15-49, under the assumption in the middle estimate scenario (the same below), the number of births will drop to 120,000 by 2040, one generation apart, and will continue to drop to 120,000 by 2070. 80,000 people. If the total fertility rate can rise back to 1.5 in the high-estimation scenario, the number of births in 2040 can reach 160,000 (a decrease of 10,000 or 5.9% from 2020), and it will drop to 120,000 in 2070 (a decrease of 50,000 or 27.9%). This shows that the past year the number of deaths is increasing every 20 years, but the number of births is declining faster than what the society's expect. Especially, the year of 2000 to 2010, the yellow line is dropping down from 31 million to 17 million in Taiwan.
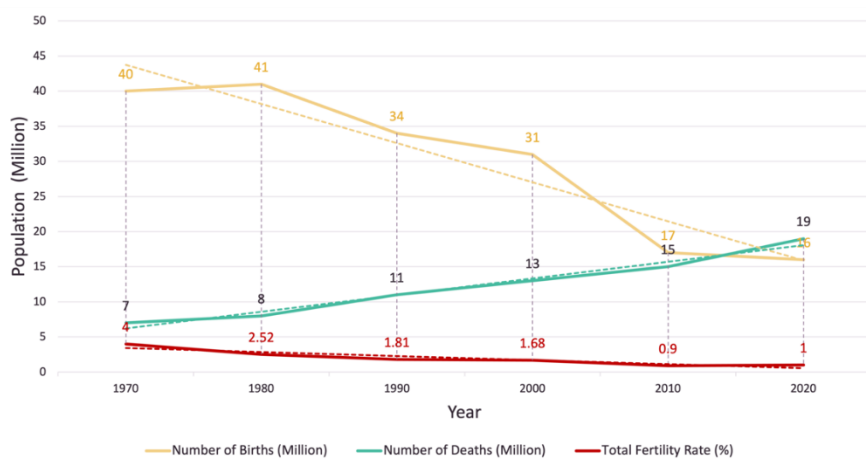
Figure 1-5 Total fertility rate in Taiwan (1970-2020)

In the 2020-2031 school year, the number of students at all levels of schools will be reduced by about 1.5 to 30% compared with the 2008-2019 school year: in the 2008-2019 school year, 6 years old (elementary

school), 12 years old (junior high school), 15 years old (high school) and 18 years old There are 210,000, 260,000, 290,000, and 310,000 age-old (university) school-age populations respectively. According to the estimated results, it is estimated that in the 2020-2031 school year, the school-age population at all levels will be reduced to 180,000., 200,000, 200,000, and 210,000 people, the decreases were 14.2%, 22.1%, 28.9%, and 32.0% respectively (Table 1-1). (DATA.GOV.TW, 2021)

Table 1-1 Centennial Population Important Indicators (1970-2021)

Year	Populations (Million)	Number of Births (Million)	Number of Deaths (Million)	Total Fertility Rate	Average Life Expectancy (Age)	School Age Population 6-21 years old (Million)	Proportion of Working Age Population Aged 15-64 (%)	Proportion of Population Aged 65 and Over (%)	Dependency Ratio (%)
1970	1,468	40	7	4.00	69.1	580	57.4	2.9	74.2
1980	1,787	41	8	2.52	72.1	618	63.6	4.3	57.3
1990	2,040	34	11	1.81	73.8	613	66.7	6.2	49.9
2000	2,228	31	13	1.68	76.5	560	70.3	8.6	42.3
2010	2,316	17	15	0.90	79.2	474	73.6	10.7	35.8
2015	2,349	21	16	1.18	80.2	415	73.9	12.5	35.3
2019	2,360	18	18	1.05	80.9	366	72.0	15.3	39.0
2020	2,357	16	19	1.00	80.9	358	71.4	16.0	40.1
2021	2,354	16	19	1.01	81.0	352	70.8	16.8	41.2

In 2070, the working-age population will be halved compared with 2020, and about half of them will be 45-64 years old: the working-age population aged 15-64 has been decreasing year by year since reaching its peak in 2015, and will drop to 13.28 million by 2040, compared with In 2020, it will decrease by 3.55 million people or 21.1%; by 2070, it will further decrease to 7.83 million people, a decrease of 9 million people or 53.5%. The proportion of the working-age population aged 45-64 will increase from 42.1% in 2020 to 48.1% in 2070, indicating that nearly half of my country's future working-age population will be middle-aged and elderly people aged 45-64 (Table 1-2).

Table 1-2 Prediction of Centennial Population Important Indicators (2025-2070)

Year	Populations (Million)	Number of Births (Million)	Number of Deaths (Million)	Total Fertility Rate	Average Life Expectancy (Age)	School Age Population 6-21 years old (Million)	Proportion of Working Age Population Aged 15-64 (%)	Proportion of Population Aged 65 and Over (%)	Dependency Ratio (%)

2025	2,344	15	20	1.01	81.6	327	68.1	20.0	46.8
2030	2,320	15	22	1.10	82.3	301	65.2	24.0	53.4
2040	2,218	12	28	1.19	83.4	254	59.9	30.2	67.0
2050	2,037	11	33	1.20	84.3	225	54.1	36.6	84.9
2060	1,814	9	34	1.20	85.0	194	51.0	40.0	96.1
2070	1,581	8	33	1.20	85.6	168	49.5	41.6	102.0

Another impact is the aging society becoming the main population structure in the social environment. Taiwan will enter a super-aging society in 2025. Taiwan has entered an aging society in 1993 (the elderly population accounts for more than 7% of the total population) and will become an aging society (more than 14%) in 2018 (Figure 1-6). It is estimated that it will be 2025 become a super-aged society (more than 20%). Moreover, the degree of aging continues to increase more than what people expected. In 2020, the proportion of the elderly population over 65 years old will be 16.0%, which will rise to 30.2% by 2040, and will continue to increase to 41.6% by 2070, and more than a quarter of them will be over 85 years old senior citizens (Figure 1-7).

In addition, as the elderly population increases, the estimated number of deaths will increase from 190,000 in 2020 to 280,000 in 2040 and 330,000 in 2070. In 2070, the dependent population has surpassed the young and middle-aged population, the number of dependent people to support per 100 young and middle-aged population will increase from 40% in 2020 to 102% in 2070, exceeding the number of young and middle-aged people themselves (Table 1-1 & 1-2). The main reason for the increase in the dependency ratio is the rapid increase in the burden of supporting the elderly. In 2020, every 4.5 young and middle-aged population will support one elderly population, and by 2070, it will be reduced to every 1.2 young and middle-aged population that needs to support one elderly population.
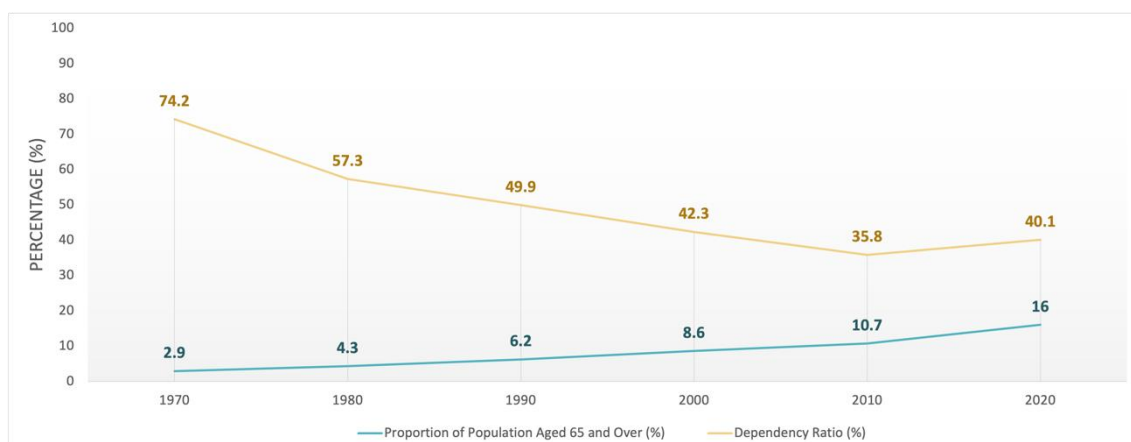
Figure 1-6 Aging society in Taiwan (1970-2020)
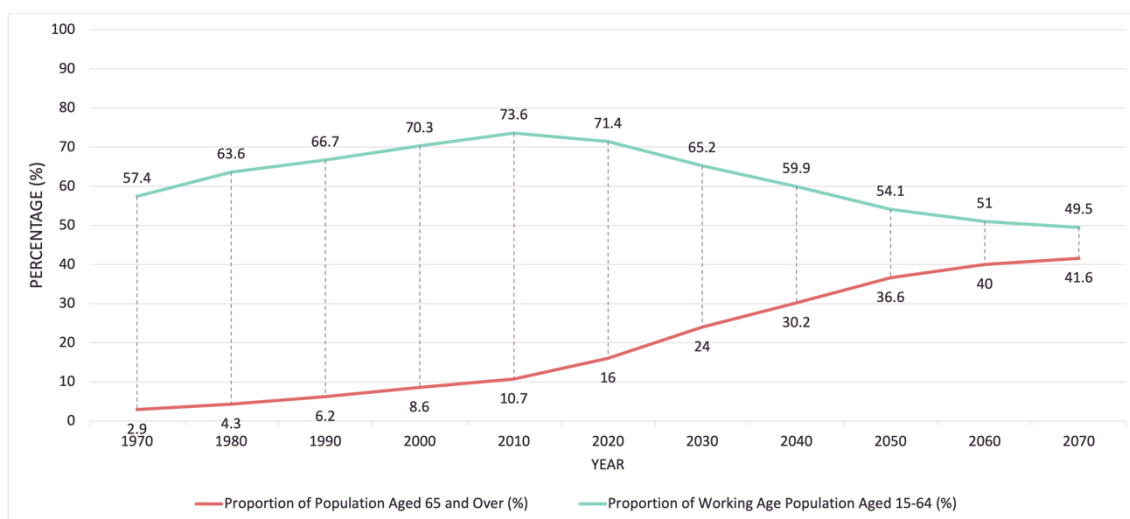
Figure 1-7 Aging society working prediction in Taiwan (1970-2070)

1.1.3 General Demography Development in Taiwan

Under the impact of declining birth rate and aging population, the number of abandoned school buildings is increasing and the demand for using diverse purposes in every city in Taiwan is also increasing year by year. This section sorts out the origin and history of the development of the revitalization of abandoned school buildings and different utilization of the school buildings in Taiwan. Moreover, the study is including the policy or future plan development relate to the develop task of Taiwanese government. The goal of government's plan is not only care about the children educational care but also the lifetime care needs of the elderly in the community.

In 2019, the number of registered births in Taiwan was only 1,471 people more than the number of registered deaths. It is estimated that the number of deaths will exceed the number of births this 2020, and the population will begin to decrease naturally (MINISTRY OF THE INTERIOR, 2022). It is expected that the increase in the number of people in a society dominated by migration will be difficult to maintain a positive number. Therefore, it is estimated that the population of Taiwan has reached its peak of 23.6 million in 2019, and it will turn negative growth in 2020 (Fig.3.1). In addition, if the future fertility level cannot be effectively improved such as an underestimated scenario, the negative population growth rate will be greater and the population reduction rate will be faster; according to different fertility level assumptions, in 2070, Taiwan's population will drop to 1,449 10,000 to 17.16 million, about 61%~73% of 2020 (Table 1-3).

Table 1-3 Total Population Profile - High, Medium and Low Estimates

Level of Estimates Population	Year of 2020	Total Population below 23 million	Year of 2070
High Population	2,357 million	2,2942,357 million (2036)	1,7162,357 million
Compare to year of 2020	-	-62.92,357 million (2.7%)	-641.6 million (27.2%)

7

Medium Population	2,357 million	2,2992,357 million (2033)	1,581 million
Compare to year of 2020	-	-58.2 million (2.5%)	-775.7 million (32.9%)
Low Population	2,357 million	2,297 million (2031)	1,449 million
Compare to year of 2020	-	-59.6 million (2.5%)	-907.7 million (38.5%)

Thus, from the population prediction findings, the trend will lead the overall social population into a difficult situation, not only the social economy problems are increasing but also the social resources will uneven distribute. This social phenomenon is not only affecting the government's policy but also the living environment. Even though the inhabitant is aware the environmental change, without a guideline or instruction to know how to protect the living environment, neither the high population nor low population condition, the living environmental condition still can't not be developed well to ready to face the environmental crisis in the
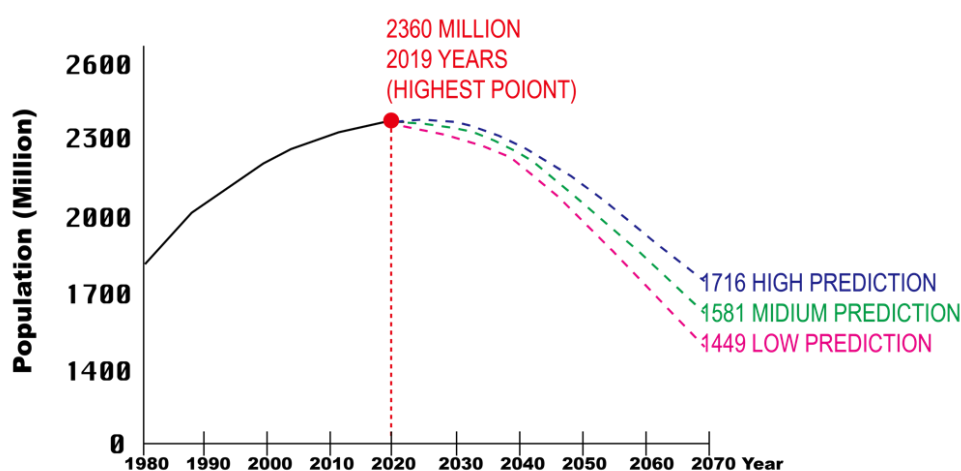
Figure 1-8 Population prediction in Taiwan from 1980-2070.

The growth of Births, deaths and population in the present Taiwan population are showing a tremendous hidden problem that draw a big attention in different filed of the industry and business. First of all, in this study the trend of birth in the past, Taiwan's fertility rate has continued to decline for a long time, resulting in a decrease in the number of women of childbearing age, which will affect the number of babies born in the future. When the total fertility rate has risen sharply to the high estimate of 1.50, the number of births will increase in the short term, but ultimately still in 2040, one generation later, the number of births will still drop from 166,000 in 2020 to 156,000 and will further decrease to 120,000 in 2070. When the total fertility rate rises slightly to the mid-estimation level of 1.20, the number of births in 2070 is expected to drop to 80,000. If the total fertility rate continues to decline to the low-estimation level of 0.90 in the future, the number of births will decrease the number of births in 2070 is estimated to be only 47,000, a decrease of more than 70% compared to 2020 (Table 1.4).

Table 1-4 Profile of Total Birth - High, Medium and Low Estimates

Level of Estimates Population	Year of 2020	Year of 2030	Year of 2040	Year of 2070
High Population	16.6 million	16.8 million	15.6 million	12.0 million
Compare to year of 2020	-	+0.2 million	-1.0 million	-4.6 million
Medium Population	16.4 million	15.0 million	12.4 million	8.0 million
Compare to year of 2020	-	-1.4 million	-4.0 million	-8.5 million
Low Population	16.2 million	12.5 million	9.4 million	4.7 million
Compare to year of 2020	-	-3.7 million	-6.8 million	-11.5 million

Secondly, under the assumptions of high, medium, and low fertility levels, the estimation results of death-related indicators are not significantly different. Due to the continuous improvement of Taiwan's living standards, medical technology, and public health, Taiwanese people's concept of health preservation has gradually become popular. It is estimated that the death situation of all age groups will continue to improve in the future. The standardized death rate calculated based on the population structure in 2020 shows that the standardized death rate in 2020 is 7.9‰, and it is estimated to drop to 5.0‰ by 2070. Although it is expected that the death rate of Chinese people will decrease in the future, due to the substantial increase in the elderly population, it is estimated that the number of deaths will increase year by year until 2060, reaching a peak of 336,000 people. Afterwards, affected by the shrinking total population, the number of deaths will slightly decrease. As far as the long-term trend is concerned, the number of deaths will still increase significantly in the next 50 years, estimated to increase from 186,000 in 2020 to 328,000 in 2070 (Table 1-5).

Table 1-5 The Profile of Total Deaths - High, Medium and Low Estimates

Level of Estimates Population	Year of 2020	Year of 2030	Year of 2040	Year of 2070
High Population	18.6 million	22.2 million	28.1 million	32.9 million
Compare to year of 2020	-	+3.6 million	+9.5 million	+14.3 million
Standardized rate of death	7.9‰	6.9‰	6.2‰	5.0‰
Medium Population	18.6 million	22.2 million	28.1 million	32.8 million
Standardized rate of death	7.9‰	6.9‰	6.2‰	5.0‰

				+14.3 million
Compare to year of 2020	-	+3.6 million	+9.5 million	+14.3 million
Low Population	18.6 million	22.2 million	28.0 million	32.8 million
Compare to year of 2020	-	+3. 6 million	+9.5 million	+14.2 million
Standardized rate of death	7.9‰	6.9‰	6.2‰	5.0‰

Consequently, the trend of Taiwanese population in the past, the natural increase in the number of births was greater than the number of deaths, which was an important driving force for the continued positive growth of Taiwan's population. However, when the natural increase approaches 0, the population of different nationalities registered as Taiwanese nationality will have an impact on the increased number of people. An important key to the negative population growth point.

According to the past trend, although Taiwan's social growth will bring more than 10,000 people per year in the future. It is expected that due to the impact of the COVID-19 epidemic in these two years, the international migration will stagnate, and the number of deaths in 2020 exceeded. The number of births and the population began to decrease naturally, resulting in the negative growth of Taiwan's total registered population of past year; it is estimated that with the increase in the elderly population and the number of deaths in the future, the negative population growth trend will be difficult to reverse, as shown in Table 1-6

Table 1-6 The Factor Decomposition of Population Change Estimates (Unit：Million People)

Estimates Population	Year of 2019	Year of 2020	Year of 2020-2040	Year of 2020-2070
Increase of Total Population (A-B+C)	1.4	-3.2	-139.5	-775.7
Natural Increase (A-B)	0.1	-2.1	-165.8	-844.2
Population of Birth (A)	17.8	16.4	289.7	588.0
Population of Death (B)	17.6	18.6	455.6	1,432.2
Social Increase (C)	1.3	-1.0	26.3	68.4

Therefore, based on the estimated results, the total population will decrease by 7.757 million from the year of 2020 to 2070. The population of children under the age of 14 will decrease by 1.552 million, and the population of young adults aged 15-64 will also decrease by 9.002 million. There will be an increase of 2.796 million people that the population of children and young adults is decreasing, on the other hand, the population of the elderly is increasing. The society population structure will become increasingly declining and aging (Fig.1-9).
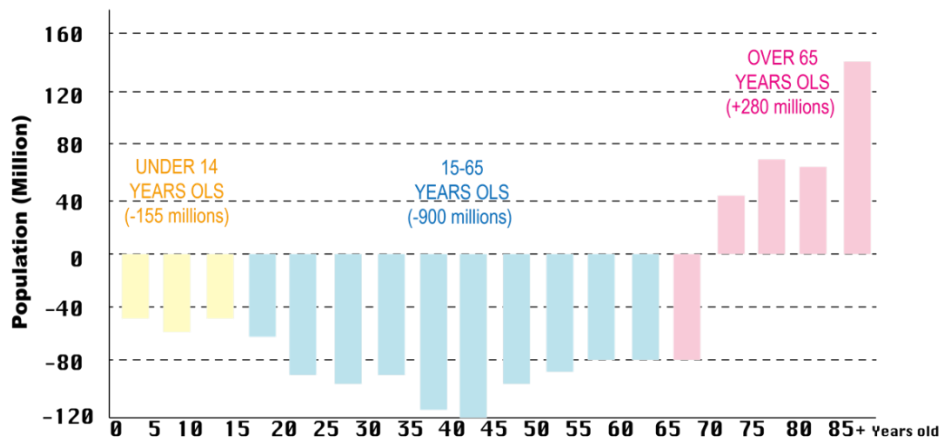
Figure 1-9 Number of all age populations in Taiwan

Regardless of the fertility scenario assumptions, the population of children and young adults will decrease in the future, while the population of the elderly will increase. Observing the ratio of the three-stage age population from childhood to adulthood to the total population in 2020, they will be 12.6%, 71.4% and 16.0% respectively. Based on the estimated results, in 2040, the proportion of the elderly population will exceed 30%. At the same time, the proportion of the young and middle-aged population will fall below 60%. By 2070, the proportion of the population of different ages will change to 8.9%, 49.5%, and 41.6%. The population structure will change to 11.3%, 50.4%, and 38.3%. If the fertility policy has no effect and the total fertility rate continues to decline to a low estimate assumption, it will change to 6.5%, 48.1%, and 45.4%, and the proportion of young and middle-aged population only slightly higher than the elderly population (Table1-7).

Table 1-7 Estimate Three Groups of Age and Population Structure Change

Category of Population	Year of 2020		Year of 2070		Number of People Change in 2020-2070	
	Population (Million People)	Number of Total Population (%)	Population (Million People)	Number of Total Population (%)	Population (Million People)	Rate of Change (%)
Young population (0-14 years old)	296	12.6	141	8.9	-155	-52.4
Young & middle-aged population (15-64 years old)	1,683	71.4	783	49.5	-900	-53.5
Elderly Population (over 65 years old)	378	16.0	658	41.6	280	74.0

Observing the changing trend of the age population in the three stages (as shown in Fig.1-10), according to the estimated results, the population of young adults aged 15-64 (also known as the working-age population) has begun to decline since reaching its peak of 17.37 million in 2015. It is estimated that the number will drop to 7.83 million in 2070, a decrease of 9 million (or 53.5%) from the number in 2020.

The population of children aged 0-14 has gradually declined since 1984, and it is estimated that it will continue to decrease to 1.41 million in 2070, a decrease of 1.55 million (or 52.4%) compared to 2020. The elderly population over the age of 65 has increased due to the increase in the average life expectancy of Chinese people. In 2017, it surpassed the young population, and as the post-war baby boomers gradually entered the old age, it is estimated that it will continue to climb until after 2050 and begin to decline slightly. It is estimated that in 2070 The estimated elderly population is approximately 6.58 million, an increase of 2.8 million (or 74.0%) compared to 2020. It is also worth noting that since 2043, it is estimated that for at least 23 years, the elderly population will maintain a scale of more than 7 million people, and the peak can reach 7.46 million people. In the future, there will be a large number of elderly care needs and social insurance payment costs. It is a topic worthy of the government and all walks of life to face up to and respond to it in advance.
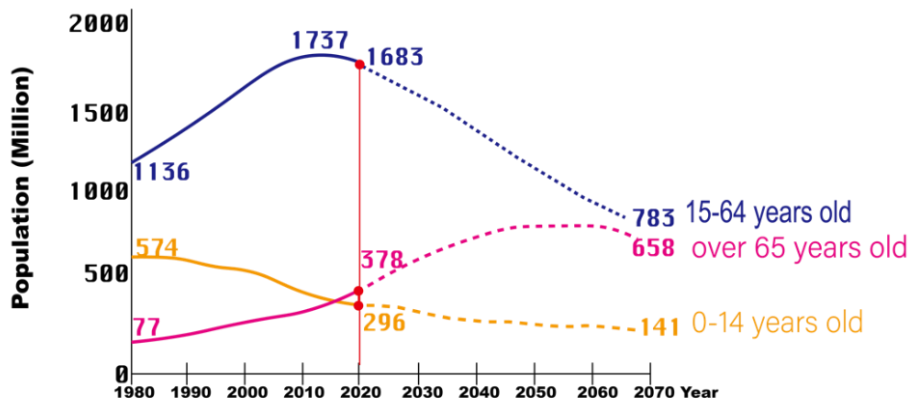
Figure 1-10 Population of three age groups from 1980 to 2070

An overview of event from the year of 1984 to 2020 and a brief list of population prediction from the year of 2025 to 2060. In Table 1-8, it shows the total fertility rate was lower than the population replacement in 1984 and the society has slowly exchanged to an aging society in 1993. After more than 10 years of social environment effect, the society officially entered the aging society in 2018. Furthermore, a super-aged society will show up in 2025 that is only two years from now (M.O.I, 2022).

Table 1-8 Population Indicators Chronicle of Events (1984 - 2060)

Year	Important Events in Taiwan Social Environment
1984	The total fertility rate dropped to 2.055 people, which was lower than the population replacement level of 2.1 people.
1989	The total population exceeded 20 million, and the median age was 27.0 years old.
1990	The working-age population aged 15-64 accounts for more than two-thirds of the total population; the dependency ratio is less than 50%.
1993	The elderly population over 65 years old accounts for more than 7%, and Taiwan has officially become an aging society.
1997	18 years old (university entrance age) population up to 410,000 people.

2010	The total fertility rate fell to a low record of 0.895.
2015	The working-age population aged 15-64 reached a peak of 17.37 million.
2016	The 18-year-old (university entrance age) population starts below 300,000 people.
2017	When the aging index is greater than 100, the elderly population in Taiwan surpasses the young population and becomes the main support object of the young and middle-aged population.
2018	The elderly population over 65 years old accounts for more than 14%, and Taiwan has officially entered the aging society.
2019	The total population reached a peak of 23.6 million.
2020	The number of deaths exceeds the number of births, the natural increase rate turns from positive to negative, and the total population begins to grow negatively.
2025	The elderly population over 65 years old accounts for more than 20%, and Taiwan has entered a super-aged society.
2027	The 18-year-old (university entry age) population fell below 200,000 for the first time.
2028	The working-age population aged 15-64 accounted for less than two-thirds of the total population; the dependency ratio exceeded 50 %.
2031	More than half of women are over 50 years old.
2034	One out of every two people in the country is over 50 years old (median age is 50.4 years old).
2040	The proportion of the elderly population over 65 years old has exceeded 30%; the proportion of the young and middle-aged population aged 15-64 has fallen below 60%; every 2 young and middle-aged population supports 1 elderly population.
2045	1 out of every 3 people is over 65 years old.
2050	The population of people over 65 years old reached the peak of 7.46 million.
2052	The total population starts below 20 million people.
2054	The number of births began to fall below 100,000.
2060	The number of deaths reached a peak of 336,000, 1.8 times that of 2020.

1.1.4 Elderly Population and Aging Society Situation

During the estimation period of this study, since the number of elderly populations over 65 years old is not affected by the assumptions of high, medium and low fertility rates, the proportion of the elderly population is slightly different due to the difference in the total population under different assumptions. The

following is only a staged analysis of the estimated results of the forecast. In 1993, the ratio of the elderly population of the total population in Taiwan reached to 7%. Another words, the time of aging period has begun to affect the social structure in Taiwan slowly through the change of the social environment. When the demographic has entered an aging society that means many social policy, welfare, and idea must reflect the phenomena of aging strategy. In 2018, it further exceeded 14%, turning into an aged society. It is estimated that by 2025, the proportion of the elderly population will exceed 20%, becoming a member of the super-aged society (Fig.1-11). This trend can lead the society for participating the placemaking action for an aging population in the future. On the other hand, through the design method can assist the elderly generation to have a different retire life and they can also share their life experience to the next generation. Different generation start to have a place to engage more with each generation (M.O.I, 2022).
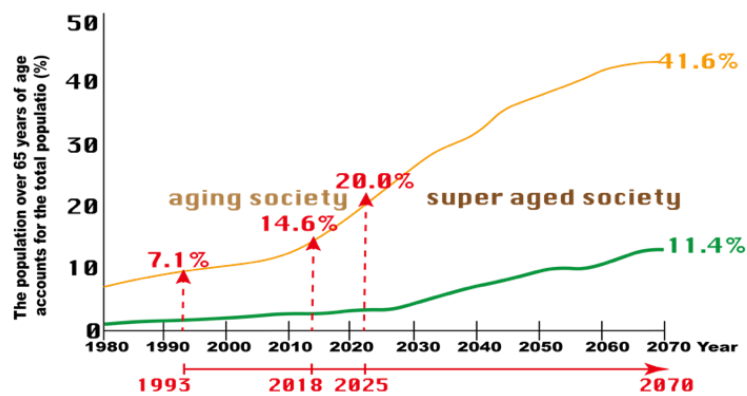
Figure 1-11 Number of ageing society prediction from 1980-2070

As shown in Table 1-9, the proportion of the population over 65 years old in the total population will increase year by year in the future. It is estimated that it will rise from 16.0% in 2020 to 41.6% in 2070, that is, about 4 out of every 10 people are 65 years old Elderly persons above the age of 85, and one of these four persons is a super-elderly person over the age of 85 (Fig. 1-12). In addition, the elderly population has surpassed the young population in 2017. The aging index (the ratio of the elderly population to the young population) is estimated to be 127.6 in 2020. By 2070, the aging index will reach 466.4, which means that the elderly population will be 4.7 times that of the young population. Furthermore, the median age of Taiwan's social population exceeded 40 years old in 2016, entering the age of forty. It is estimated to be 42.7 years old in 2020 and will exceed 50.0 years old in 2034. At that time, about half of the country's population will be over 50 years old. By. As the elderly population begins to shrink in 2051, the median age will also reach a peak of 58.5 years in 2062 and then begin to decrease, and it is estimated to be 58.2 years in 2070.
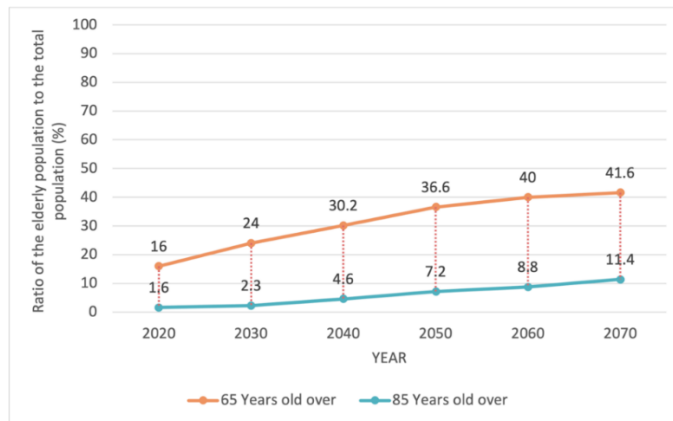
Figure 1-12 Ratio of elderly population in 65 and over 85 years old from 2020 to 2070

Table 1-9 Main Indicators Estimate of Aging Population

Year	Ratio of the elderly population to the total population (%)		Aging Index	Average Age (Years old)
	65 Years old over	85 Years old over		
2020	16.0	1.6	127.6	42.7
2030	24.0	2.3	222.5	48.4
2040	30.2	4.6	305.9	52.7
2050	36.6	7.2	393.5	56.0
2060	40.0	8.8	446.4	58.5
2070	41.6	11.4	466.4	58.2

The age structure of the elderly population as shown in Table 1-10, Taiwan's elderly population is also moving toward an older age. According to the estimated results (Fig.1-14), the ratio of Taiwanese aged 65-74 to the overall elderly population will drop from 62.3% in 2020 to 36.5% in 2070 (Fig.3-10). During the same period, the proportion of the population over the age of 85 rose from 10.3% to 27.4%, indicating that out of every 10 elderly people, nearly 3 people are over 85 years old.
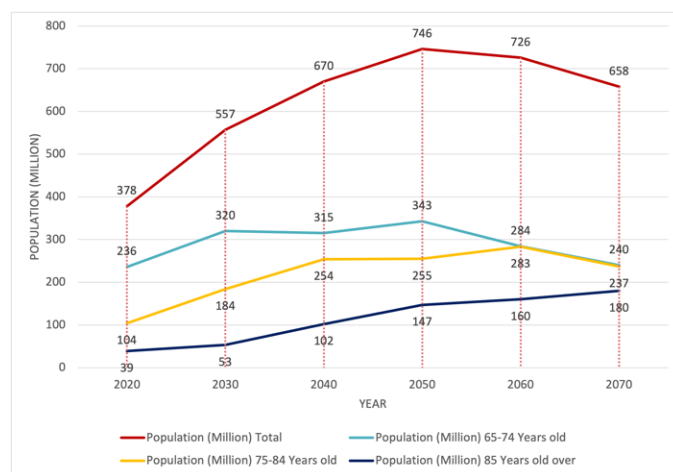
Figure 1-13 Estimate population of elderly population in three groups

15
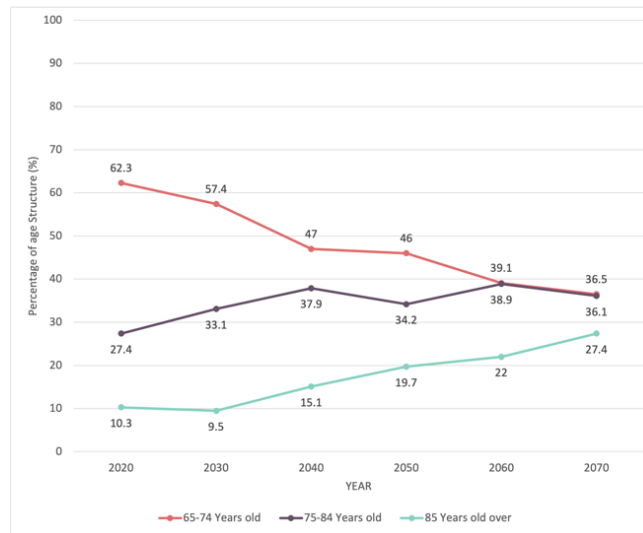
Figure 1-14 Estimate percentage of elderly population in three groups

Table 1-10 Age Structure Estimate of the Elderly Population

Year	Population (Million)				Percentage of age Structure (%)			
	Total	65-74 Years old	75-84 Years old	85 Years old over	Total	65-74 Years old	75-84 Years old	85 Years old over
2020	378	236	104	39	100.0	62.3	27.4	10.3
2030	557	320	184	53	100.0	57.4	33.1	9.5
2040	670	315	254	102	100.0	47.0	37.9	15.1
2050	746	343	255	147	100.0	46.0	34.2	19.7
2060	726	284	283	160	100.0	39.1	38.9	22.0
2070	658	240	237	180	100.0	36.5	36.1	27.4

1.1.5 Population Structure in Taiwan

The population pyramid of Taiwan in 1975 was a pyramid shape with a wide base and a top, and the population consisted mainly of young people under the age of 30. In 2020, it will be transformed into a lantern shape with a large middle and two small ends. It is a period of abundant labor supply for young and middle-aged people. It is estimated that by 2070, it will turn into an inverted golden bell shape with an elderly population, and the population of young adults and young adults will decrease significantly.

Comparing the high, medium and low estimated population pyramids in 2070, as shown in Figure 1-15, 1-16 and 1-17, under the consideration of different levels of total fertility rate, except for the population over 51 years old because it belongs to the existing population, it is not affected by the high, medium and low estimates. In addition, people under the age of 50 can clearly see the impact of different levels of total fertility rate on the future population size, the lower level of total fertility rate, the more obvious the inverted golden bell pattern of the population pyramid will be, the total population will also

increase and shrinking (TESAS, 2019).

Male   Female
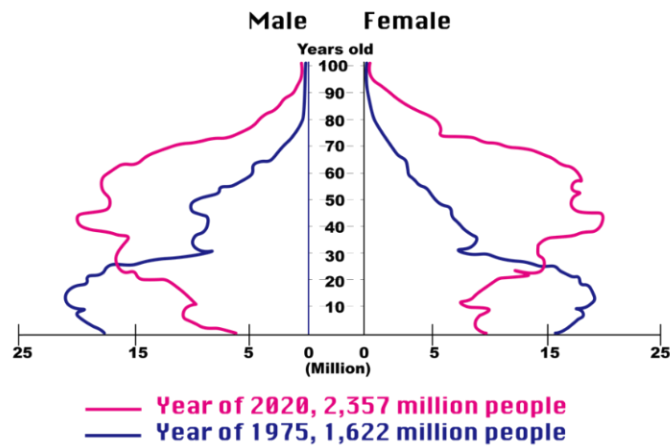
Figure 1-15 Population pyramid in 1975 and 2020

Taiwan's total population has reached its peak of 23.6 million in January this year (2020) and will turn negative in the future. In addition, given the unsatisfactory marriage and childbearing status of the people in recent years, it is estimated that Taiwan will enter a super-aged society as early as 2025. Although the demographic dividend period has been postponed for one year until the end of 2028, the main reason is that the proportion of the working-age population has increased relatively due to the declining birth rate.

Male   Female
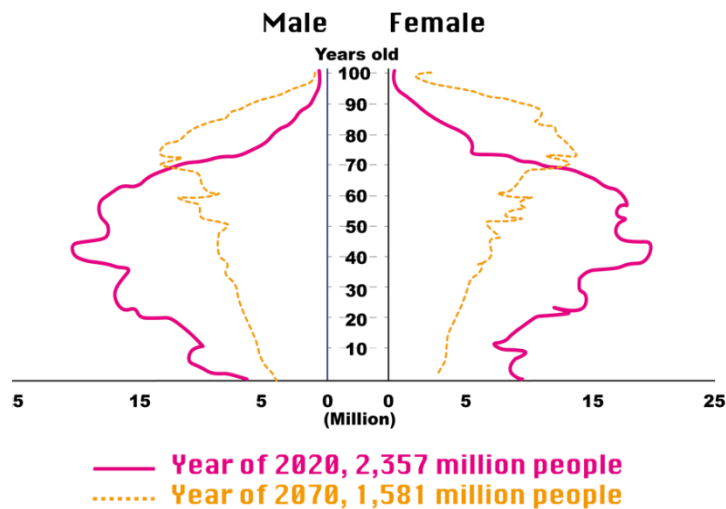
Figure 1-16 Estimate of the population pyramid in 2020 and 2070

The results of the above estimations all show that the trend of Taiwan's declining birth rate among the elderly is obviously more serious than the previous estimation. To face with the impact of the change in the age structure of the population, the government and all relevant committees should aggressively to deal the problem. In addition to continuing to implement the existing policies, it is even more urgent to jump out of the existing framework and develop innovative methods. The demographic situation gives this study puts forward issues related to population structure and countermeasures on the three major aspects of declining birthrate, labor force, and aging population as follows, also provide the social background and

context for the next study step, which is use the abandoned school buildings as the intermedium to revitalize the lost space and reconnect to the surrounding neighborhood.
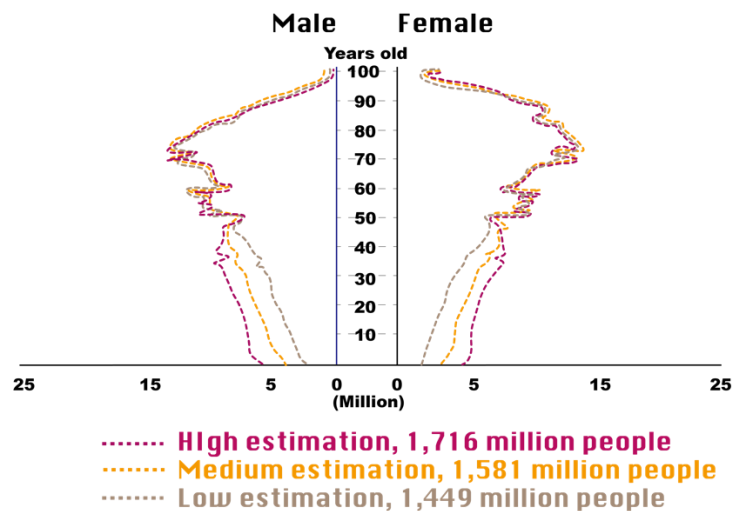
Figure 1-17 Estimate different levels of the Population Pyramid in 2070

       The first thought of the overall social demography situation is increasing the fertility rate and curb the speed of population decline and aging environment. The social structure of Taiwan is estimated that by 2031, more than half of the women will be over 50 years old. Future fertility will inevitably be restricted, and the speed of population aging will be accelerated. Therefore, it is very important to increase the fertility rate to slow down the aging rate and maintain a stable population structure. The Taiwan government will speed up the implementation of the "countermeasures plan for the degeneration of children in our country", increase childcare subsidies, and expand affordable education and insurance services to reduce the burden of childcare for the public. At the same time, from multiple aspects such as youth employment, economy, marriage, housing, etc., in another words, the overall living atmosphere should construct a perfect reproductive environment to increase the fertility rate.

       Following, the education environment should strengthen talent cultivation and recruitment, and enthusiastically improve labor productivity and labor force participation rate. Taiwan's working-age population has been decreasing since 2016. Facing the phenomenon of shrinking labor and gradually aging population, the government will strengthen cultivation and recruitment of talents. It is important to set up supplementary professional colleges for industry and university co-education, train local digital talents. Also, many foreign workers come to Taiwan to work, with the training education and progress of foreign professional talent recruitment and employment action, it is critical to strengthen the recruitment of foreign talents to improve labor productivity too. At the same time, create a friendly workplace environment, implement the act on promotion of employment for middle-aged and elderly persons. Especially, the society had entered to an aging society, the elderly generation should be promoted to as a family assistance measures for friendly employees. Likewise, the working environment should encourage middle-aged and elderly women to be employed to increase the labor participation rate in the future industry production.

Accordingly, due to the present society environment in different filed of the industry, the environment has been struggling to deal the change of the social population structure. To construct an inclusive and independent and elderly society in response to the diverse needs of the aging society is urgent. In 2025, Taiwan will enter a super-aged society, at that time, the demand for medical institutions and care facilities, the number of people suffering from major diseases, and the cost of social insurance benefits may all increase significantly. However, with the development of science technology and the improvement of medical standards, the elderly population is no longer necessarily the object of care. On the contrary, the Taiwan government provides comprehensive tax deduction for different subject of the industrial, especially the day care, welfare association, and long-term care, etc. In order to continues to enrich the inhabitant welfare, community service, and increase the local resources to meet the diverse needs of the public. On the other hand, the policy and strategy form planning to approach the balance in the living area, this study is researching and accelerating the implementation of abandoned school buildings to use as a social welfare mission and reuse the architecture resources. Along the same line, the study is aiming to improve the well-being of the public include the elderly generation, inhabitants, and children. The result of this research hope to build a co-living environment for young and silver and promote an aging society where all generations live in a harmony life.

1.2 Research Questions

Currently, school architecture's environment has been facing an extraordinary crisis which is influenced by our new social formation. According to a global movement "7 Billion Action" that was launched by the United National, its estimation of the world's population is expected to reach from 7.7 billion currently to 9.7 billion in 2050. However, the age structure of the demographic of 9.7 billion's population will change into a high aging society because people surviving to reproductive age; also, majority change effect of fertility rate relates to a social environment, economic, government policy, etc. will be the consideration of having a child as well.

Besides, many cities' phenomenon has been increasing of urbanization and accelerating migration from a rural area to a suburban, due to this specific development situation, many schools have been closed, destroyed, or lost. Because of the circumstance, each country's government has built up a project to encourage either private or public enterprises, organizations, firms, etc. to participate in it. The applicant will be supported by proposing an appropriate concept to reconfiguration the plan layout, renovate the function, facility, and equipment; the most important thing is to preserve the building without destroying it. Overall regenerate process gives the rebirth of the abandoned school, school architecture transforms into a variety of programs which involved into withering social practice or placemaking, its new architectural function from above not only ensures the building life cycle continues to be more sustainably, but also redevelop the connectedness for the local region.

1.2.1 Reused Condition of the Abandoned School in Taiwan

The use of spare space in schools has been derived from the degeneration of children. In order to guide local governments to supervise the multiple use and revitalization of campus or dwelling space in their affiliated primary and public schools, the Ministry of Education and the National Education Bureau have formulated "Public National Secondary Schools and National Primary School Campus (Dwelling) Space Diversification and Revitalization" Matters needing attention" clearly stipulates 14 uses such as kindergartens, social education institutions, social welfare facilities, tourist service facilities, and sites that meet major policies of local governments, community needs and do not involve commercial activities, and urge local governments to uphold Cultural and educational public welfare, campus safety, information openness and transparency, signing administrative contracts, taking into account of multiple needs, community participation in to a dialogue platform, and implementation of sustainable development are the principles of unuse space activation in an abandoned school.

Since, local governments have actively promoted the activation and use of spare spaces in elementary and middle schools in response to the trend of the number of children and considering relevant policies and social needs, which has achieved considerable results. An example of the reused case in Chiayi County, after the school was abolished in the remote Zhuqi Elementary School Wenguang, the Chiayi County Government sought adoption from Formosa Plastics in 2012. In 2013, the Wenguang International English Village was built and officially opened. Fifth grade students in the county were arranged for 5 days and 4 nights. English teaching and transformed the English village classroom into situational classrooms such as airport entry and exit, waiting room, CHECK IN check-in counter, luggage check-in and security check line, business class and dining car, so that students can experience the situation themselves and trigger self-determination.

The motivation of learning, through the contact and communication between foreign teachers and students, and thematic teaching experiment, students can speak English naturally and establish an international outlook. For instance, Banli Elementary School in Beigan Township, Lianjiang County, entered history after being merged into the adjacent Tangqi Elementary School in the 107th school year. In order to make respectable use of the Banli campus, the National Taiwan Ocean University established the Matsu Campus, which establish the university and an opportunity for regional industrial economic development connections. With the joint efforts of the county government and the school, the school will be closely integrated with Matsu's industry after the school architecture has been redesign. Through the injection of innovation and vitality by teachers and students of the sea, the development of marine tourism, aquaculture industry, marine engineering, etc. Also, the merger of the Banli school and the settlement of the university will serve the company if the program is continuing to develop with the local resource and residence. Jiangxian Education has set a new milestone to give an example of how the lost space can restore the spirit of the school place. Moreover, the school place becomes the social intermedium object to keep the community and land value to growth in a sustainability way.

Even though there are some cases are transformed successfully, the amount of the abandoned schools still increasing every year, especially in suburban and rural area in Taiwan. During the regeneration decision of school architecture functions, the overall outcome of the redesign program should improve the regional environment and local industrial grow into a certain level of development. Meaning the rebirth of school architecture should carry a responsibility to exert the influence or inspiration in the local society and residence's living environment.

1.2.2 Social Participation and Policy Communication of the School Architecture

Recently, represent the social value of school architecture is a major policy of Taiwanese government. The government have been committed to supervising local governments to deal with the abandoned school revitalization of abandoned school space in multiple ways. Currently, there are cases of revitalization of abandoned school buildings into kindergartens, camping areas, care facilities for the elderly, service institutions for the physically and mentally handicapped, and childcare for children and teenagers. Many campuses unused spaces are transformed into different forms and multiple service functions return to serve the community again. The State Department of Education emphasized that the revitalization of abandoned school space has always been the goal of the government's efforts, hoping to improve the efficiency of campus space utilization and reactivate and reuse educational resources to help the local community development. (M.O.E, Study In Taiwan, 2021)

In addition, the local government also manages the revitalization of abandoned school space in combination with the regional cultural characteristics. For example, the old campus of Zhanghu Elementary School in Yunlin County was borrowed by the Zhanghu Community Development Association in 2013 to promote tea, bamboo shoots, and indigo dyeing. In other creative industries, the elders in the community usually come to learn, drive local development, and switch to another way to continue the spirit of learning. Now the old campus has become an indigo dyeing base, and a large wall on the playground is even collaged with indigo dyeing images.

From the perspective of social system, the school is an "open social system". The school regards the community as a public of life, the school releases software and hardware equipment and resources to the community. Residents in the district share and learn together and create a lifelong teaching environment that is conducive to promoting community participation in learning and education activities. At the same time, the school architecture which is considering as the strengths and needs for the local community, only through social participation way. Public policy, public investment, and the development of measures that are in line with the general sentiments of the people. Therefore, when the Ministry of Education is promoting this plan, it is holding a discussion meeting with local governments to discuss with various voice from different group of people. Reach a consensus on the promotion direction, according to the needs of the municipalities, county (city) governments, their issues of concern to the general public, summarizing the work items and content of this plan.

Thus, this study raises the observation issue of the space for school architecture repair, reinforcement,

redesign, demolition, reconstruction, etc. The new function of the school architecture space such as to expand sports and leisure stations at the campus, community reading stations and other processing bases to create a diverse learning platform to provide the residence with learning, multiple services such as community learning and LOHAS sports, to improve the social life of community residents. Therefore, the rebirth of school architecture can become an impact node to create the network to achieve the linkage between the new building facility and the community.

1.2.3 Hidden Problems in the Present Social Environment

There are few Hidden problems in the present social environment in Taiwan that everyone need think about the consequence of the problem. It becomes the major task to prevent and improve the situation ahead as well. For example, due to the total social population is being affected by the total fertility rate, the number of future births in Taiwan also depends on the number of women of childbearing age (generally referring to the female population aged 15-49). When the recovery of the total fertility rate is less than the decline of women of childbearing age, the number of births will be difficult to stop the decline.

At present, the number of women of childbearing age in Taiwan has continued to decrease since 2001. As shown in Table 1-11, the number of women of childbearing age in Taiwan will decrease from 5.68 million in 2020 to 1.92 million to 2.72 million in 2070, a reduction of about half to one third two. During the same period, the proportion of women in the total population will drop from 47.8% to 25.3% to 30.7% (M.O.E, K-12 Education Asministration, 2021). In addition, considering that female fertility is affected by age, the age structure of women of childbearing age is also an important factor in determining the overall level of fertility in Taiwan in the future. However, the number of women of childbearing age in Taiwan will not only decrease in the future but will also show an aging trend. In 2020, women aged 25-39 accounted for the highest proportion of 43.8% of women of childbearing age. Under the medium and low estimation scenarios, the proportion of this age group decreased; on the other hand, except for the high estimation, women aged 40-49 The proportion will increase. According to the low estimation results, the proportion in 2070 is even quite similar to that of 25-39 years old (Fig.1-18).
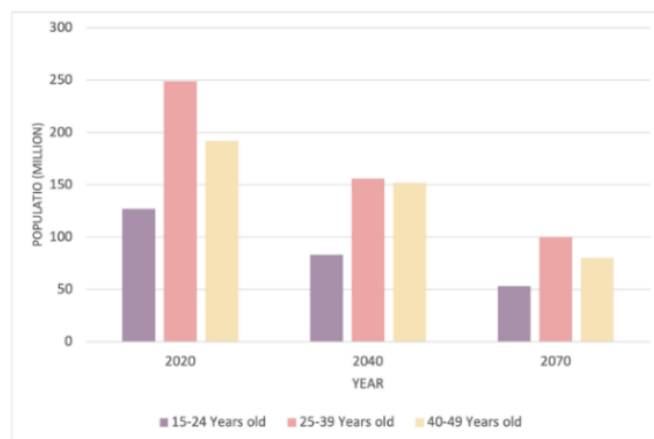
Figure 1-18 Population of women in childbearing age (2020-2070)

Table 1-11 Estimate of Women in Childbearing Age Structure

Category of Population	Year of 2020			Year of 2040			Year of 2070		
	Population (Million)	Ratio of total female population (%)	Ratio of women childbearing age (%)	Population (Million)	Ratio of total female population (%)	Ratio of women childbearing age (%)	Population (Million)	Ratio of total female population (%)	Ratio of women childbearing age (%)
Total	568	47.8	100.0	391	34.2	100.0	233	28.4	100.0
15-24 Years old	127	10.7	22.3	83	7.3	21.3	53	6.5	22.8
25-39 Years old	249	20.9	43.8	156	13.6	39.9	100	12.2	42.9
40-49 Years old	192	16.2	33.8	152	13.3	38.8	80	9.7	34.2

Table 1-12, another consideration is the population of working age, the working-age population of Taiwan's overall society that is the young and middle-aged population in the three-stage age population have reached its peak in 2015 and then began to decline. It is estimated that it will continue to decline from 16.83 million in 2020 to 6.97 million to 8.64 million in 2070 people (Fig. 1-19). In addition to the decrease in the number of people, Taiwan's working-age population structure is also aging. Since 2007, the number of people aged 45-64 has surpassed that of 15-29 and 30-44, becoming the main age group of the working-age population. As shown in Table 3.11, the ratio of the working age population aged 45-64 will increase from 42.1% in 2020 to 43.9% to 53.4% in 2070. In the future, 40% to 50% of Taiwan's working-age population will belong to the middle-to-higher age group of 45-64 (M.O.I, 2022).
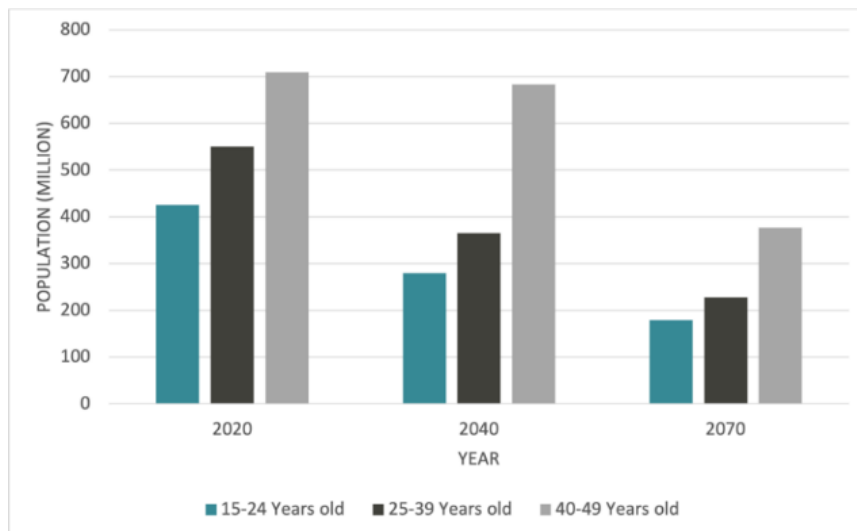
Figure 1-19 Population of working age (2020-2070)

Table 1-12 Estimate of Working Age Population Structure

Category of Population	Year of 2020			Year of 2040			Year of 2070		
	Population (Million)	Total population (%)	Proportion of working-age population (%)	Population (Million)	Total population (%)	Proportion of working-age population (%)	Population (Million)	Total population (%)	Proportion of working-age population (%)
Total	1,683	71.4	100.0	1,328	59.9	100.0	783	49.5	100.0
15-24 Years old	425	18.0	25.2	280	12.6	21.1	179	11.3	22.8
25-39 Years old	550	23.3	32.7	365	16.5	27.5	228	14.4	29.1
40-49 Years old	709	30.1	42.1	683	30.8	51.4	377	23.8	48.1

Overall, in the future, Taiwan's working-age population will show a downward trend in the proportion of those with a lower age group and an increase in the proportion of those with an older age group, and the labor capability will become more aging.

To understand the hidden problems in both working age and women with childbearing age structure formation. As the population structure ages, Taiwan will face a new problem, that is, the challenge of increasing the burden of social support. If the working-age population aged 15-64 is defined as productive persons, and other age groups are defined as non-productive persons or dependent population, then the total dependent population burdened by every 100 working-age population can be used to simply measure society burden level.

As shown in Figure 1-20 and Table 1-13 (MINISTRY OF THE INTERIOR, 2022), the total dependency ratio reached its lowest point of 34.7 in 2012 and it increased to 40.1 in 2020. Afterward due to the year-by-year increase in the elderly population, it will increase to 102.0 in 2070, which is 2.5 times that of 2020. Another observation is the ratio of producers to the elderly population. In 2020, every 4.5 producers will bear one elderly population, and by 2070, it will be reduced to every 1.2 producers that will need to take one elderly population.
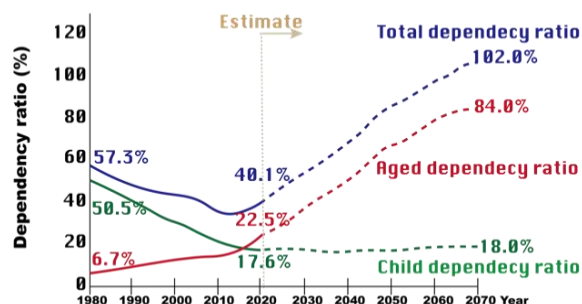
Figure 1-20 Number of dependency ratio from 1980 to 2070

Consequently, the dependency ratio reflects the relative ratio of the population structure, not the actual "dependence" observed from an economic point of view. If the education time is extended or the retirement time is postponed, it will affect the actual number of producers and the number of dependent people who need to be supported. If delayed employment and delayed retirement are taken into consideration, producers in the dependency ratio indicator can be defined as the the population aged 20the -64 and population aged 20-69, and their impact on the burden of support is shown in Figure1-21.
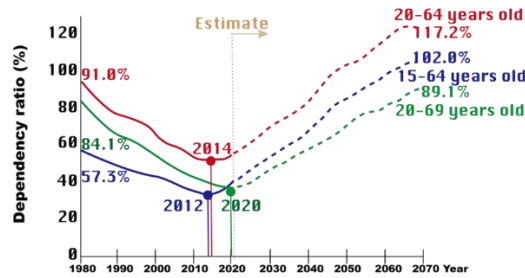
Figure 1-21 Total dependency ratio with different variation age

Table 1-13 Estimation Dependency Ratio from 2020 to 2070

Year	Dependency Ratio for 15-64 years old			Dependency Ratio for 20-64 years old			Dependency Ratio for 20-69years old		
	Total	child dependency ratio	old age dependency ratio	Total	child dependency ratio	old age dependency ratio	Total	child dependency ratio	old age dependency ratio
2020	40.1	17.6	22.5	50.4	26.3	24.1	37.6	24.0	13.6
2030	53.4	16.5	36.8	64.9	25.3	39.6	47.1	22.6	24.5
2040	67.0	16.5	50.5	77.6	23.9	53.7	57.4	21.2	36.3
2050	84.9	17.2	67.7	98.1	25.6	72.5	69.9	21.9	47.9
2060	96.1	17.6	78.5	110.5	26.2	84.2	79.8	22.4	57.4
2070	102.0	18.0	84.0	117.2	26.9	90.3	89.1	23.4	65.7
Year	Ratio of producers to older population								
	15-64 Years old ：Over 65 Years old			20-64 Years old ：Over 65 Years old			20-69 Years old ：Over 70 Years old		
2020	4.5	：	1	4.1	：	1	7.4	：	1
2030	2.7	：	1	2.5	：	1	4.1	：	1
2040	2.0	：	1	1.9	：	1	2.8	：	1
2050	1.5	：	1	1.4	：	1	2.1	：	1
2060	1.3	：	1	1.2	：	1	1.7	：	1
2070	1.2	：	1	1.1	：	1	1.5	：	1

Due to the relatively broad definition of the dependent population, the dependency ratio is relatively highest for those aged 20-64. Before 2018, the dependency ratio was the lowest at the age of 15-64, and since 2019, the dependency ratio at the age of 20-69 was the lowest; in addition, the time to reach the lowest point was in 2012 when the dependency ratio at the age of 15-64 was the earliest. The dependency ratio at age 69 is delayed by 8 years. Although the calculation results of the dependency ratio vary due to different definitions of the scope of producers, it is certain that the dependency ratio will continue to rise in the future

and the social burden will increase day by day.

1.3 Research Objective and Purpose

In recent years, as the social phenomenon of the number of children has not been relieved, when the school can reorganize the use of school space, the Taiwan government has formulated a "campus community transformation plan" in conjunction with forward-looking infrastructure construction, making good use of the school space and giving new tasks, for instance constructing a safe, appropriate, and healthy learning field. Moreover, it is also created multiple community-based services to facilitate community residents' childcare, learning, sports or communication fields, such as increasing public kindergartens and various communities where parents care for their children services and other measures to make the school as the center of the community residents' life. In addition, local authorities at all levels can also cooperate with the old school building when the old school building is abandoned or demolished, after reaching a consensus with the school and the community, the organization can also raise a funds to cooperate with the community to create new uses together. Furthermore, the task target is to create a community environment that facilitates local people's lives.

Among the scheme from the complete society development, "ensure social security and justice" and "educational culture and multi-ethnic groups" are two visions for the development of Taiwan's built environment. Therefore, the overall research documents are collected from the data of the wide viewpoint of social population basics, including the lack of earthquake resistance and safety concerns. Structural reinforcement or reconstruction will be carried out for the school buildings in order to protect the people's living rights. Provide multiple and continuous services for local aging from supporting families, homes, communities to institutional care, and construct a comprehensive social safety net. Enrich and improve the sports facilities of schools below the national junior and high school level and develop the atmosphere of LOHAS sports to improve national health and sports development. Expand the publicization of early childhood education and childcare, reduce the burden of parental childcare, and improve the education and childcare service system. Build an academic information network in an all-round way, bridge the educational gap between urban and rural areas, and improve students' digital learning capabilities. To promote local primary and secondary schools to provide various community services, use the community living space as a learning environment, and take root in local culture and many other education-related strategies or measures. All above social welfare or human needs are the research purpose to help the build environment a batter living. The research study starts to analysis the transformation process of a public-school architecture with redesign strategy.

1.3.1 Goals of the Intermedium Hub

The purpose of this research is not only to evaluate the campus community renovation project in Taiwan's school architecture environment but also through the study to creates a safe and healthy school environment through architecture space reconfiguration method. Therefore, the participants who are join

the redesign school process can be easy to evaluate their own space needs and adjust the space function in the potential option. This study composes the abandoned school space with a new mission, an intermedium platform. The rebirth of the school architecture becomes an easy-to-use space for community residents and the participants in the future. The intermedium platform is reaching the following planned goals (Fig.1-22):

1. Provide community members with opportunities to learn, communicate and share through multiple program styles and interaction platform.

2. Use the school as a base to create multi-service spaces for the neighborhood and build an interdisciplinary network system among the government, communities, and inhabitants.

3. Increase a convenient, living environment for the residents, also to discover the genius loci of the local area.

4. Establish the balance between public demand and public interest.

5. Preserve the value of the local resource, culture characteristic, and sustainable communities' environment. Also, the research result to assist the region revitalization into an appropriate planning.
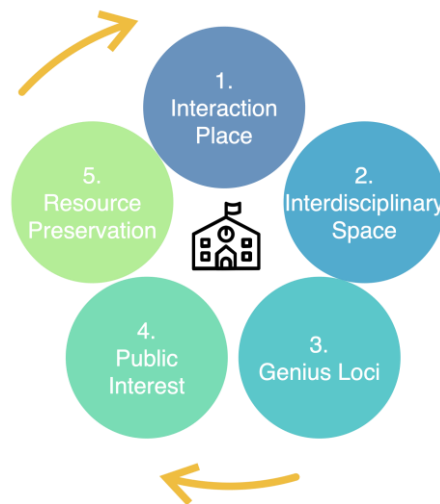
Figure 1-22 Goals of intermedium platform

1.3.2 Transformation Process of the School Redesign Strategy

In order to revitalize the abandoned school architecture and its campus, several different fields of professional expert have suggested various viewpoints to reuse the school space. Not only to provide the service but also to achieve the appropriate profit for the existing community. As far as this research concern is learning the transformation process and outcome to extend the architectural lifecycle in certain design methods and opportunities (M.O.E, Policies, 2022). Thus, the redesign school strategy can be start from an idea of elaborating the community service, there are five thoughts of redesign strategies in this study that show as the following content (Fig. 1-23).
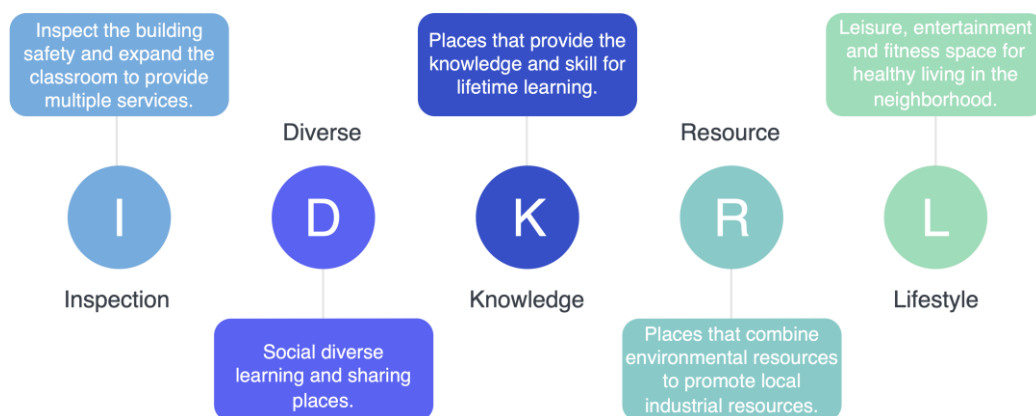
Figure 1-23 Purpose strategy approach to redesign school space

The purpose to approach to redesign school space, the description as follows:

1.Inspect the building safety and expand the classroom to provide multiple services.

In the past, the school buildings have been built for at least 30-50 years. The old school buildings on the campus should be demolished and rebuilt. Due to the society effect by the phenomenon of declining children, the number of classrooms in most old school buildings is more demolished than built. Most of the classrooms on the first floor are mostly planned for the use of lower grades or special education students. The original design layout that is a bit difficult to obtain community stands, in another words, it cannot meet the space required to provide various community services. Therefore, if there is any possibility to expand classrooms space during the redesign process and strive for funds at the same time, the transformation process will bring the various advantages for community services and multiple functions. It will help to energize the unused space in school environment, what is more benefit for the school transformation design is serving as a platform for community residents to nurse and learn together.

2. Social diverse learning and sharing places.

The transformation of the redesign process changes the abandoned school become a convenient living place for community. Encourage the present schools that is dealing the crisis of declining children to consider the needs of residents to use the school building space. This rebirth space can combine local characteristics, industrial culture, and community resources, then set up training courses and activities such as lifelong learning in the new architecture program. also, establish a co-learning system between young generation and elder generation, an intergenerational learning system that provide the benefit through daily life. In addition, subsidize the required funds for teaching equipment and equipment repairs according to actual needs from the local. So that the redesign campus space will become a multi-learning base for the community and the elderly to use and learn nearby beside staying at home.

3. Places that provide the knowledge and skill for lifetime learning.

The school committees that are facing the transformed use or school closures, the committees should cooperate with enterprises or civil organizations to promote local industries as a priority goal. Apply for the establishment of relevant local industry information stations and open school spaces to provide industrial

training. It can also be combined with the original school library, multi-functional audio-visual room, etc., and choose a space to open up the setting of industrial production and equipment. According to the basic architecture function of school space, school is a place to provide the learning knowledge and skills for not only students but also the residences. At the same time, it drives the wave of community learning, attracts community and public who are willing to get close to and like to use public library resources. The reuse space greatly enhances the willingness of students, community residents and parents to participate in sharing and learning new knowledge and new skills. Also, when the school space has been reusing, the advantage of this transformation outcome shortens the participation and learning time of urban-rural for the community residents and parents. It also achieves the specific goal of shortening the resource gap between urban-rural areas, which is the specific goal of education and learning gap. Therefore, this redesign strategy will subsidize schools to renovate or reconfiguration the new school layout and transform schools into community shared reading stations. To expand the opportunities for community residents to love and approve the school space nearby.

4. Places that increase opportunities to promote local industrial resources.

Giving a chance to those school units that are facing transformation or school closures. The school can cooperate with enterprises or non-governmental organizations to apply for the establishment of relevant local industry information stations and open school spaces to provide industrial training with the common goal of promoting local industries. And combined with the original school library, multi-functional audio-visual room, etc., choose a space to open the setting of industrial production and equipment. At the same time, in addition to clearly defining the management methods for the use purpose of this space, it is also necessary to guide the public to make good use of existing resources and jointly maintain local precious resources. This transformation mechanism is to increase opportunities for the public to understand local environmental resources and cultural assets and to assist in joint learning, maintenance and promotion. It can also provide parent and child learning together and respect and cherish the environmental resources in which they live.

5. Leisure, entertainment and fitness space for healthy living in the neighborhood.

In order to assist schools to promote the development of community sports, leisure, and entertainment, schools with the highest usage rate by community residents will give priority to subsidizing their new renovation project funds and reinforce the night lighting features and safety equipment for all community residents, especially nighttime usage and safety. The opening hours are based on the principle of the use efficiency by the residences, and the "LOHAS Sports Station" and "Youth LOHAS Space" are promoted from the perspective of adaptive physical activity education, taking into account the difference in exercise needs of people in different ages, genders, physical and mental disabilities. Fun and attractive are the scheme to bring the fresh living environment, the architecture program can be suitable for gymnastics, physical fitness, fun ball games, folk sports, martial arts, sensory integration, dance and other characteristic development sports facilities for indoor physical education courses.

1.3.3 Purpose of Research

Research objective is focus on understanding the redesign process relate to four aspects, there are space reconfiguration, architecture programming, social interaction, and creative the region consciousness (Fig.1-24):
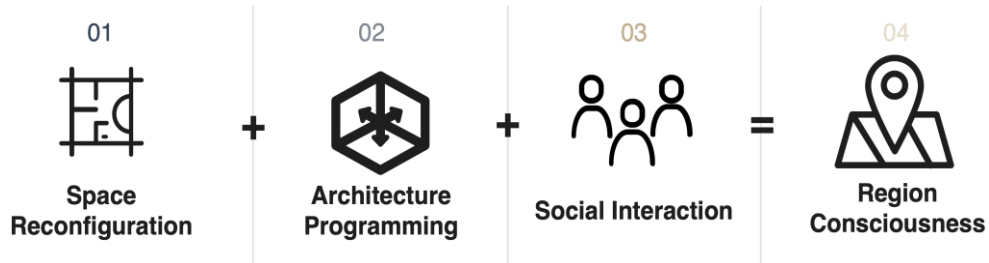
Figure 1-24 Abandoned school redesign objectives

1. Architecture spatial perception: space reconfiguration. Spatial redesign strategy in the overall built environment relate to the user behavior. Space is the opposite of the entity. Users may often ignore the space itself, but the space still influences the user's behavior and emotions invisibly. A building is composed by many kinds of objects. When the building is regarded as an object, users will gradually feel many different spatial elements, such as scale, line, color, light, material, circulation, and consider the relationship between space and surrounding environment space. Architecture is made up by a form as well as a space. However, the sense of space in a building is sometimes more important than the spatial elements. The sense of space can affect user's emotions and behaviors. For example, the sense of space may create a small and safe space, or a space that feels oppressive. Every difference will change every user's perception of the space. A space of the same size, full of decorations or no decorations, will feel completely different. Regardless of the form of the interior space, the emotions aroused by users are always stronger than the appearance of the building. Also, everyone's feelings about the architectural space will be different. Space just like a guiding role, which is discussing what space is essentially deliberating the meaning of using space. In other words, it is the procession experienced in feeling every spatial relationship.

2.Architecture programming: content decision of program's development direction. Decision making of the future programming will influence the space design, furthermore, school management and operation planning are also the important task to maintain the school building continue to attractive the audience. In view of the year of 2015 in Taiwan's society, although the total fertility rate has increased to 1.175%. According to the population estimation report of the National Development Commission in 2015, if the total fertility rate maintains the current situation, the number of births will be reduced by more than half in the future. Even if the total fertility rate picks up, the number of births will hardly increase like before. Therefore, one of the goals in the overall social education policy is to "reduce the burden for parents", and its policy direction is to "expand the publicization of childcare and provide childcare services with reasonable prices and guaranteed quality, so as to reduce the economic burden for parents. It is an important

act to reverse the crisis of declining birth rate. (M.O.I, 2022) (N.D.C, 2023)

It is one of the top tasks of the central and local governments to formulate and improve the education and childcare service system. However, at present, 40% of public kindergartens (including non-profit kindergartens and public kindergartens) that provide children from 2 years old to elementary school education have not reached 40%, and there is an urgent need to make good use of abandoned school and its campus or one of the old school buildings that have not been destroy. To build new kindergartens or nursery facility can cost lots of money and time. To set up a public kindergarten, so that parents can choose an affordable and high-quality education and protection field for their children in their living neighborhood. This is a social phenomenon in which an educational space is urgently needed in Taiwan's current social problems. Therefore, the abandoned school space can also solve the urban problem of becoming a lost space, and at the same time help to alleviate the space demand of the education and childcare service system.

3.Social interaction linkage: activity and event design create the cooperation and connection system in the local community. An idea of sharing and learning together to create the social connection to improve the living environment become a friendly, sustainable, and responsible society. The school is a support base for the movement, life, learning and interaction of the community. Through the reinforcement of old school buildings or the opportunity of demolition and reconstruction, it can provide a campus environment more suitable for residents' activities. At the same time, it is necessary to give full play to the effectiveness of campus space and set up various community services, such as community multi-learning centers, community information stations, sports and leisure stations, leisure stations, or school community shared reading stations, etc., so that the campus space can become a public space for residents. Shared ownership makes the campus space a public space platform for community learning. It is open to the public as an interactive communication platform after classes during the week, holidays or winter and summer vacations. In addition to establishing the daily life and exercise habits of students and community members, it is also possible to learn information courses nearby too. And use the school resources like an internet or space to increase learning opportunities and interaction between parents and children, residents and visitors, middle-aged and elderly people to intermingle and communicate.

4.Region consciousness: establish the local identity and the genius loci of the local region. Hence, if the demand for school teaching space is no longer tight due to the lower student enrollment, either the school space can be planned and co-constructed across units in accordance with relevant laws and regulations or schools with dense population in urban areas can cooperate with the demolition and reconstruction of old school buildings. The school and the community can be consistent consensus and establish the local identity and its genius loci in the neighborhood.

In the previous school construction plan, the Taiwan government was promoting "expanding classrooms for various community services". According to data collection, the Taiwan government has approved a total of 311 classrooms in 14 counties and cities that was expanding classrooms for various community services, also change the existing campus to the purpose of kindergarten class extension. In

addition, there are several spaces were reused as community multi-learning centers, community information stations, sports and leisure stations, school and community shared reading stations, etc. It was estimated that 1,790 school spots will be set up in 4 years, and 1,802 school spots had been approved by the end of May 2019 (M.O.E, Policies, 2022).

According to Table 1-14, it shows from 2017 to 2020, the Community Multi-Learning Center had approved 103 courses and activities suitable for all ages in the community by reusing the school space and established a community multi-learning space where community residents and seniors can use, learn, and communicate around their daily living environment. Moreover, it enhanced life-long learning opportunities for the public. Also, more than 1,300 events were held from 2017 to 2020, with 30,000 participants per year. The year of 2020 adjustment of the community information station that was promoted by distribution service stations, and the promotion efficiency was improved by sharing information equipment and courses with neighboring schools (N.D.C, 2023).

Table 1-14 Condition of expanding classrooms for various community services (2017-2020)

Name of the projects	Number of Gods in 2017-2020	Number of Achievement In 2017-2020
Community multi-learning center	100	103
Community information station	300	300
Sports and leisure station	550	569
Shared reading station	720	751
Total	1670	1723

In terms of sports and leisure stations, from 2017 to 2020, it had been approved to build a renovated runways and rainy courts for elementary and junior high schools' campus in 569 schools, which included to add night lighting features and safety facilities and equipment. These transformed projects were achieved to assist schools in setting up "LOHAS Sports Stations". Considering the suitability needs of school students and the community, it was open to the community for use after classes during the week, holidays, or winter and summer vacations. As of the end of December 2018, the number of beneficiaries who used the facilities within half a year after the completion of the Sports and Leisure Station came up to total 3,358,971 people. The opportunities for school and teachers, students, and community members to participate in sports had been improved, and the opening and usage of the sports leisure station had also increased the emotional connection and interaction between students, parents, parents and children, and community residents.

The space in an abandoned school was converted into a community shared and reading station. Since 2016, it has cooperated with the Taiwan government's infrastructure construction policy to subsidize the school to revitalize the existing or empty space. So that the school staff and students can read convenient and also open the school to stimulus community learning and reading trend. By the end of 2019, 751 schools had been approved and the subsidy funds for 2010 to 2020 were 820,432,000 Taiwanese dollars, and the budget execution rate for 2017 to 2019 was above 94%. At the same time, in order to provide an excellent example of shared and reading stations, it makes the concept of "shared reading" and aesthetics more

popular and visible, the "Most Beautiful Shared Reading Station" selection was held in 2018 to promote exchanges and reward schools with outstanding planning.

1.3.4 Research Hypothesis

Concept of Regeneration Design System. Facing the trend of accelerated aging, in this research's opinion, people should have more positive thinking and countermeasures in terms of adequate allocation of educational resources and building a friendly aging society (Plaut, Dunbar, Wackerman, & Hodgin, 2012). One reason behind this is to maintain the overall competitiveness of the country. Therefore, the future direction of the cooperative development of schools and communities is as follows: to provide diverse learning space and establish a connection between the school and the community by renovating the abandoned school building and recreating the genius loci in the entire campus (Fig 1-25). The school space is in compliance with the laws and regulations. It is also feasible to provide a learning field for the elderly in the community. According to the estimated results of the population, the dependency ratio of young adults aged 15 to 64 will increase from 36.2% to 94.2% in 150 years. Facing the aging society that is coming in the near future years, it is crucial for the community to measures such as life care for the elderly, that is, the school opening up public resources to achieve the needs of the community and provide space for middle-aged and elderly people to learn and exercise. The middle-aged and elderly can interact with students to jointly create a healthy and active aging society too.
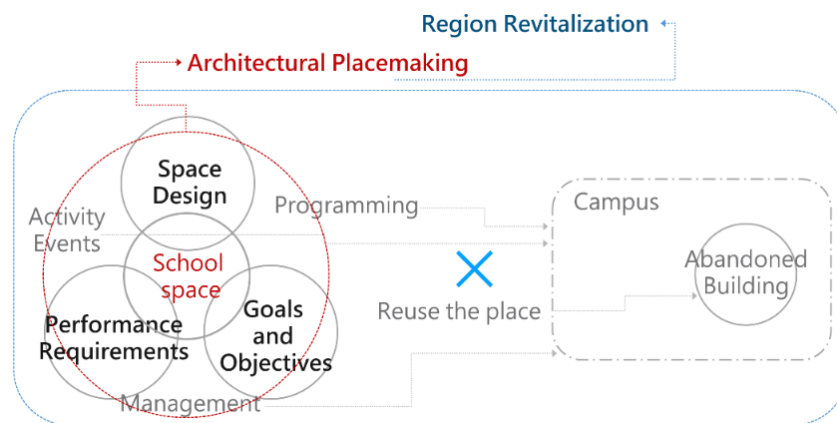
Figure 1-25 Concept of Abandoned School Redesign Process

In recent years, with the development of the Internet and the rapid development of computer technology and resources. The network society structured by information technology has become an inseparable part of the lives of ordinary people. It is a part of the division, and its additional functions change the way of thinking and behavior of human beings, in addition to helping the elderly to learn modern digital technology through the learning platform. Provide grandchildren, parents and children, and community members to establish interactive models to change interpersonal relationships. It also has a significant impact on family and social functions, and the school is located in people's daily social life

environment (Rosasco & Sdino, 2023). In the district, while opening up school resources, it will also introduce different characteristics of the district to visitors and local residents. District resources become the school's driving force to achieve the goal of social interaction between place and people. The regeneration process of the abandoned school is coordinating measures to cope with the transformation of an aging society. It is another revitalization method that many studies are trying to use to assist the human environmental society in a sustainable approach (Blanco, Pedersen Zari, Raskin, & Clergeau, 2021).

1.4 Research Subject

1.4.1 Abandoned School Value Formation in Taiwan

In Taiwan, through public policy and public investment, the government creates new economic momentum which makes the economy more dynamic and resilient. To establish a new situation of people's living environment in a community, each city government must ensure the social equity and environmental stability that lay the foundation for the regional economic development stability, and appropriately invest in public construction according to the current urban and rural life conditions to improve the quality of the living environment, as well as the construction design that can be completed within short term of planning and can be widely appreciated by the people.

Preschool and School-age Population Development in Taiwan. Due to the continuous decrease in the number of births, except for fluctuations in a few years due to the zodiac effect, the population of school age in the long run, the population of school age at all levels has shown a continuous downward trend. According to the estimated results, the 2020 school year 6-year-old (elementary school), 12-year-old (junior high school), 15-year-old (high school) and 18-year-old (university) enrollment age population is estimated to be 210,000, 200,000, 210,000 and 250,000; by the 2040 school year, it will be reduced to 140,000, 160,000, 160,000, and 150,000 respectively (Fig. 1-26 & 1-27).In addition, affected by the zodiac of the year of birth, the population of primary school enrollment age will be in the 2028-2030 school year (born in 2022-2024); the junior high school enrollment age population will be in the 2022-2024 school year; Year; University enrollment age will fluctuate dramatically in the 2028-2030 academic year (both born in 2010-2012).
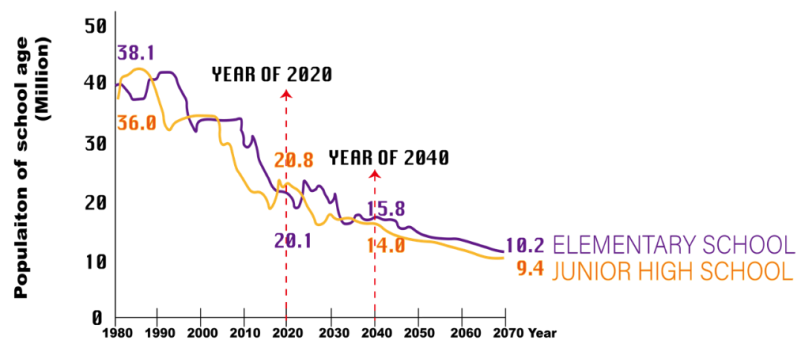
Figure 1-26 Number of elementary and junior high school students in Taiwan from1980 to 2070
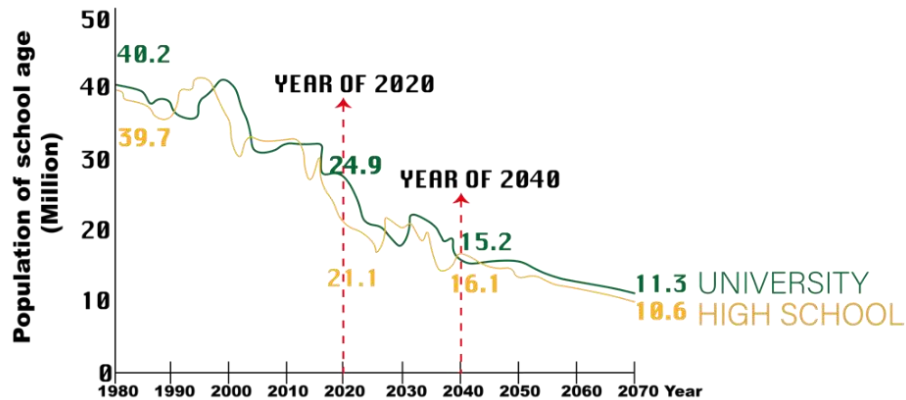
Figure 1-27 Number of high school and university students in Taiwan from1980 to 2070

The Ministry of Education formulated the "Campus Community Reconstruction Plan" in conjunction with forward-looking infrastructure construction, and it was approved by the Executive Yuan on July 10, 2010 (M.O.F, 2010). The project implemented by the Ministry of Education includes two major work items "creating a friendly child-rearing space" that belongs to child reduction Construction, the work project "Activation of campus space and expansion of community services" belongs to "Urban and Rural Construction" to make decent reuse of school campus space and give new tasks to build a safe, appropriate and healthy learning field and diverse community services to benefit community residents, sports activity or communication arenas. This concept is making the abandoned school as the center of community residents' life once more to represent the spirit of the place.

According to the "Campus Community Transformation Plan", the two major work projects implemented by the Ministry of Education, the government continues to plan the action of campus community transformation 2.0 plan which is continuing to promote the comparison of the needs of municipalities, counties (cities) governments and schools. An idea of the project mention called "activating abandoned campus space and expanding community services" that is creating not only a friendly education space for the social environment but also continuously is promoting through the appropriate countermeasures plan for the present and next generation.

This phenomenon is effect by the Chinese tradition culture, it is an interesting factor that will influence the willing of giving a birth or not during the year of each zodiac. In order to exclude the influence of the birth and zodiac factors on the enrollment population of the year, another period of 12 years is used as a basis for comparison with the data of the past 12 years. In the 2008-2019 school year, the enrollment age population of 6, 12, 15 and 18 years old was 210,000, 260,000, 290,000, and 310,000 respectively. The number of enrolled students at the first grade will be reduced to 180,000, 200,000, 200,000, and 210,000, respectively, with a reduction rate of 14.2%, 22.1%, 28.8%, and 32.0%, respectively, and the source of college students will decrease by more than 30%.

Thus, the overall population in Taiwan has also causing the number of the enrollment of each education level, which is the school building in every educational level can face the challenge of either

continue the school function or close the school. According to the prediction number of each education level, more and more school architecture may also become an abandoned school in the community, this school architecture will have more potential to rethink the relationship between the school space, the public, and the neighborhood. On the other hand, different educational level of the school architecture can become a new social infrastructure for the civic engagement or community building. However, the role of the Scholl building in different types of educational level can also have the challenge to redo the school space and the placemaking action (NDC, 2023). Furthermore, the school building can also play a new role to connect the public, students, and community, which is also the placemaking educational concept to make the society more friendly and vivid phenomenon in the built environment.

The population of preschool and school age, from the observation of the changes in the preschool and school-age population at all levels (Table1-15), in the school year of 2020, the 0-year-old to 5 years old preschool population is 1.17 million. According to the estimated results, the school year in 2070 will drop to 530,000. A decrease of 640,000 (or 55.0%), the population aged from 6-11 years old will reach a peak of 1.27 million. Also, in the 2023, the school year and the number begin to decline. In terms of long-term trends, it will drop from 1.21 million from the school year of 2020 to 580,000 until the school year of 2070, which will decrease 620,000 people (or 51.7%). In addition, the junior high school, high school, and university, the population of the school age from 12-17 years old and 18-21 years old will continue to decrease in the future. Since the school year of 2020, the number of the population were 1.28 million and 1.1 million, it will drop to 630,000 and 460,000 people in the school year of 2070, a decrease of 650,000 (50.4%) and 630,000 (57.7%).

Thus, the most important thing is to think how to reuse the unused school space to save the social resource and transform the space function, program, and design element to reduce the decline trend in school age population. Even though, there are always have children to enroll the school, but there are always having the school space that is unused and the school architecture become a terrible space in the built environment. Under this circumstance, the unused school architecture can become a new role in the future that transfers to a community based or industrial development learning facility. It is better to reuse the school space without leaving an empty place in the community. A new function can be applied into the abandoned school architecture that is also to reestablish the senses of the place in the area (Ramezani & Hamid, 2010).

Table 1-15 Population Estimate of Preschool and School Age

Category of Population	Academic Year				Compare to year of 2020		
	2020 Academic Year	2030 Academic Year	2040 Academic Year	2070 Academic Year	2030 Academic Year	2040 Academic Year	2070 Academic Year

0-5 Years old	117	94	82	53	-24	-36	-64
6-21 Years old	358	301	254	168	-57	-104	-190
6-11 Years old (Elementary)	121	99	91	58	-21	-29	-62
12-17 Years old (Junior / High School)	128	123	96	63	-5	-32	-65
18-21 Years old (University)	110	79	67	46	-31	-42	-63

1.4.2 Present Condition of Regeneration School

Since the government has realized the consequence cause by the declining birthrate issue and the first impact of this circumstance is the school architecture, especially the elementary school located between sub-urban or rural area. According to the research finding, there are 106 schools have completed to regenerate the school space in Taiwan. Most schools' cases are distributed in south-central cities such as Chiayi County, Kaohsiung City, Pingtung County, and Hualien County. These cities are the top five that have the successful school regeneration cases in Taiwan (Fig.1-28 and 1-29).
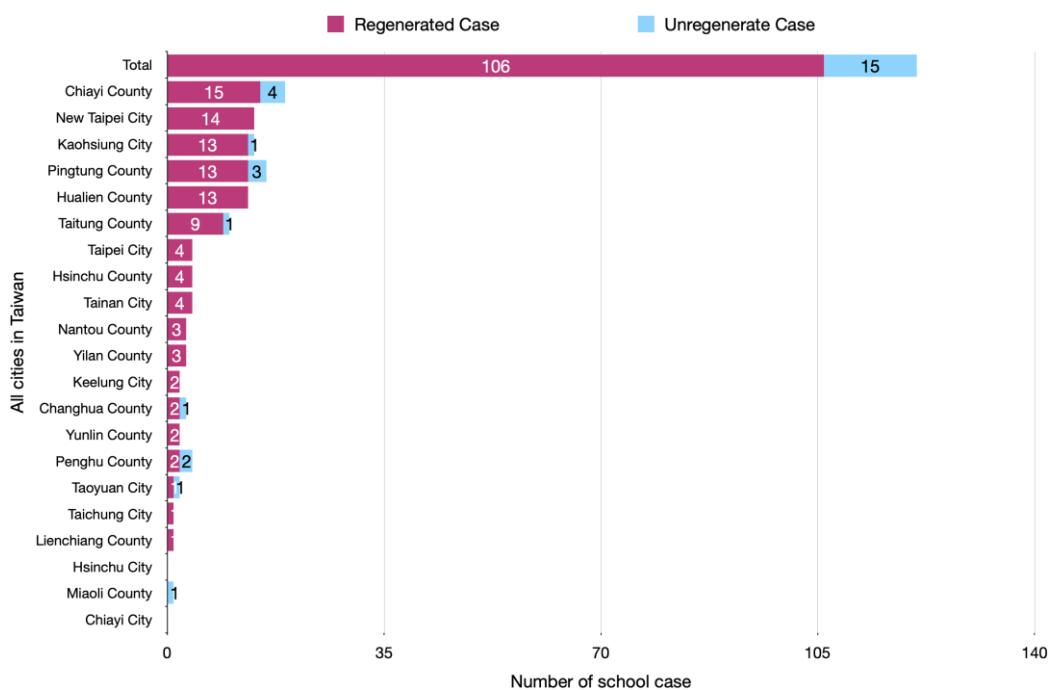
Figure 1-28 Regenerated condition of school in Taiwan

As a result, the unregenerate cases are still existing around more than a few counties that is distributed in southern and eastern part of Taiwan. These counties are also facing the population immigrate to other big city which is provide more work resources or better living conditions. Besides, there are 6 special municipality (Taipei city, New Taipei city, Taoyuan city, Taichung city, Tainan city, and Kaohsiung city) that have more job opportunities and social welfare support the residence by the local government. Still, it is hard to cover all area in each city, neither the municipality nor city. Therefore, Uneven resources distribution can also reflect the city or county need to solve the unused space in the school building immediately to remain the city economic development (DATA.GOV.TW, 2021).
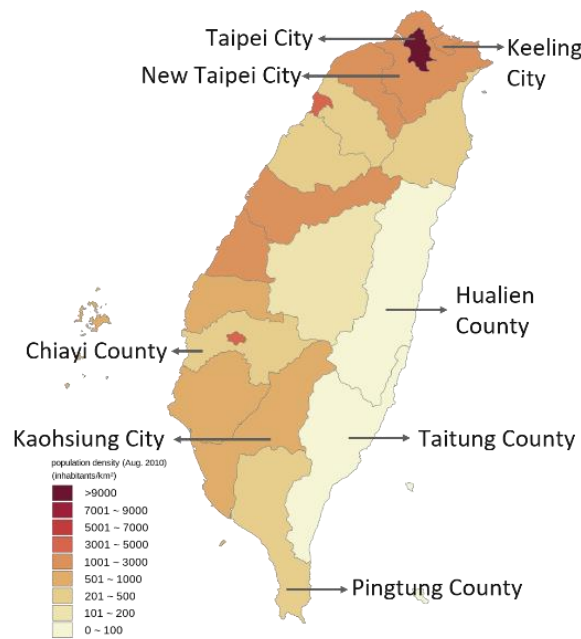
Figure 1-29 Population density of Taiwan

In previous literature study, it is known that the government is also thinking many projects to assist the school facility or building in a better and safety condition. Many school buildings have been established more than 50 years above in Taiwan, the physical condition of the building may have caused a serious damage if there is a nature disaster or the strength of the structure system. This brings up the concern about how the building's condition in every aspect is. The most concern is the safety of the school building that is why the government require every school need to evaluate the overall school building in all cities and counties (Fig.1-30) (DATA.GOV.TW, 2021).
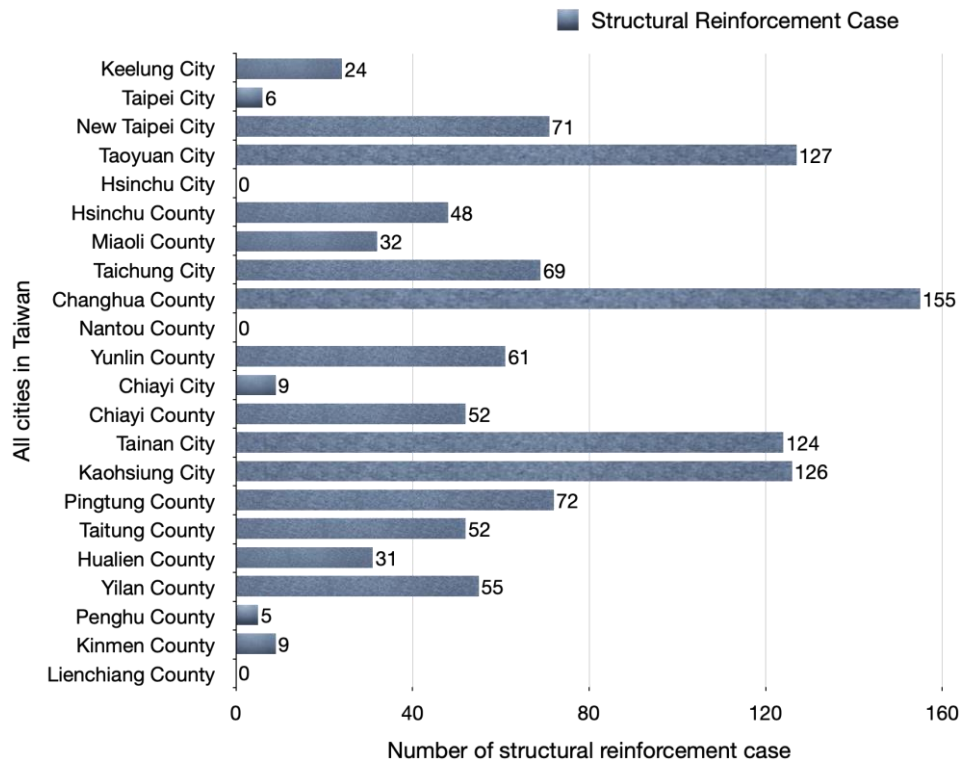
Figure 1-30 Structural reinforcement school in Taiwan

1.4.3 Utilization of the Abandoned School Category in Taiwan

In recent years, as the social phenomenon of the number of children has not been relieved, the spare space such as abandoned school building of the campus has been derived. Additionally, local governments have been urged to supervise the multiple use possibility and revitalization of the abandoned school space of the affiliated primary and public schools in Taiwan. The government has announced an action of Precautions for the Diversified Activation of Public School and National Primary School Campus (House) Space. This action establishes the regulation of abandoned school reuse purpose that shows the 14 categories of utilize purposes in an unuse school building or abandoned school. (M.O.E, K-12 Education Asministration, 2021)

All categories show below:

1. Kindergartens

2. Experimental Educational Institutions

3. Social Educational Institutions

4. Community Colleges

5. Leisure Sports Facilities

6. Social Welfare Facilities

7. Sightseeing Service Facilities

8. Arts and Cultural Exhibition Places

9. Industrial Development Institutions

10. Community Gathering Places

11. General Office Premises

12. Off-campus Dormitories

13. On-campus Facilities for Non-teaching Purposes

14. Venues required for major policies of local governments, social development, and community needs that do not involve commercial activities, etc.

Many scholars and professional designers have pointed out that schools are the center of social activities, in order to make students have pay more attention about their daily life in the overall school environment is an important design transformation task. Learning experience and knowledge can meet the needs of the community, on the other hand, it is the pulse of society can transform the acquired knowledge into the motivation to serve the community. It is necessary to strengthen the social function of the school. The development relationship between schools and communities can be summarized into three categories: 1. A community of resource sharing. 2. Partners relationship who works together. 3. Objects of mutual service.

Therefore, this plan is based on the national development vision set by the Taiwan's national development plan that can promote the characteristics of the abandoned school and community to learn together. The school is a support base for public's sports, life, learning and interaction in the surrounding neighborhood. It can provide a campus environment that is more suitable for residents' activities. At the same time, it can really play the role of school space and establish the various community services, such as community multi-learning centers, sports and leisure stations, or school community shared reading stations, etc. Consequently, the school space can be reused for community learning, local industry development, and recreation event. The school as a platform, it can be open to the general public after classes during the week, during holidays or winter and summer vacations, to establish daily exercise habits between students and community members, to learn nearby, and to increase interactive learning opportunities for parents and children, residents, middle-aged and elderly people.

1.4.4 Overall Quantity of School Building Revitalization Purpose

In recent years, Taiwan's fertility rate has been declining steadily and the low birth rate has become an irreversible social problem. In addition, from elementary schools to universities, many schools are facing closure problems. Moreover, business activities related to children in the past have gradually shrunk too. Facing the reduction of young people and consumption power in the future, it will be the economic power and productivity of the whole society that will be impacted. Facing the phenomenon of declining birth rate and declining birth rate, preschool education and education-related industries are the most sensitive. First of all, elementary school education is the most impacted. According to the Statistics Network of the Ministry of Education, in 2008, the total number of first-grade students in elementary schools was 242,676, and in 2017, the total number of first-year students in national primary schools was 182,474. The number of students in the class is also getting smaller and smaller. However, due to the impact of the declining

birthrate, the unuse school space has gradually increased, and schools in rural areas are facing the crisis of being abandoned because they cannot recruit new students (M.O.E, Study In Taiwan, 2021).

According to the research data, in recent years, the Ministry of Education has launched the "Overall Plan for Revitalizing Campus Space", which mainly combines local characteristics and humanistic characteristics to expand the school's spatial efficiency and integrate into industrial culture. Not only to avoid the waste of abandoned school buildings but also encourage schools to promote special courses. To create activities or establish community lifelong learning centers such as senior learning centers and new immigrant center schools. In order to cooperate with the policies of the Ministry of Education in each county and city in Taiwan, they actively promote the multiple activation and reuse of unused classrooms to maximize the economic benefits of space use. The processes are looking forward to giving unused classrooms more development and becoming an important social resource shared by the whole people in the future. As of 2015, there are 213 schools that have been abandoned due to school mergers, 202 schools that have been reused after counseling or released from management due to other reasons, and 11 schools that are waiting to be revitalized.

According to the types of revitalization purposes of school buildings shown in Table 1-16, the cultural and educational areas accounting for 10.4%, tourism and leisure accounting for 6.44%, social welfare institutions accounting for 2.97%, use by government agencies or organizations or self-maintenance by schools accounting for 58.42%, land return or demolition accounting for 21.78%. As the result shows, the revitalize purpose still use in a very limit option, mostly the redesign purpose still think to use for the institutional or school, this doesn't bring the advantage of the revitalization action. Among them, the use by government agencies and organizations, self-maintenance by schools, and land return or demolition accounted for about 80%. Since the transfer to a social welfare institution needs to go through procedures such as land use change and building change, it is more difficult than the school's own maintenance and land return or demolition, so the current conversion ratio is extremely low (Fig 1-31).

Table 1-16 Revitalize purpose of redesign school space.

Cultural education	Tourist	Social welfare	Institutional/school use	Land restitution or demolition
10.40%	6.44%	2.97%	58.42%·	5.44%

41
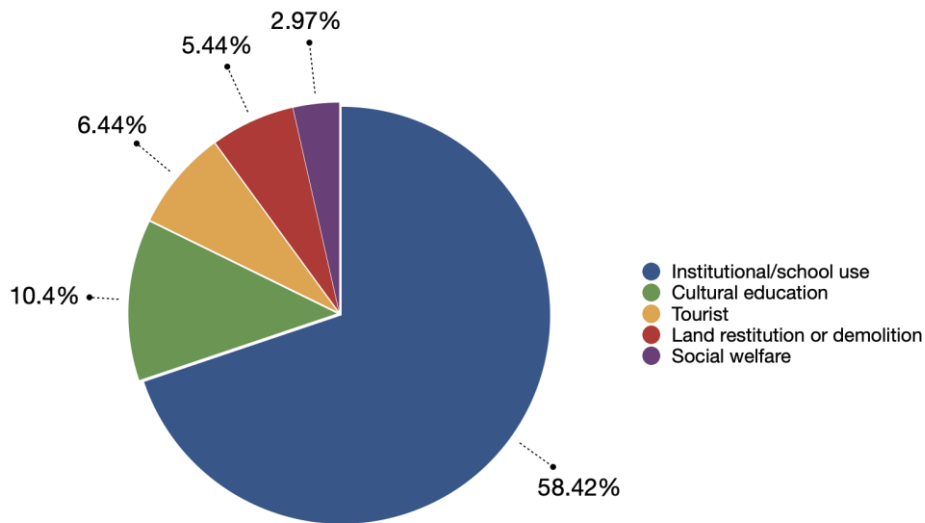
Figure 1-31 Revitalize the purpose of redesigning school space.

1.4.5 Survey of School Regeneration Cases

This research evaluates several abandoned schools in Taiwan (Appendix 1). However, because the population in different time and area are unevenly distributed (TESAS, 2019). For instance, in southern part of Pingtung County, Taiwan. With nearly a quarter of the population lives in Pingtung city and the remaining, which mostly is elder people, resides in suburbs. Despite the leading industries in every city involve a variety of industrial production and nature scenery, more importantly, it is needed to attract people to visit or live in the region. In this research, the interdisciplinary cooperation of the local residents in interaction with the new participant is another study theme to discuss in later chapters (Fig.1-32).
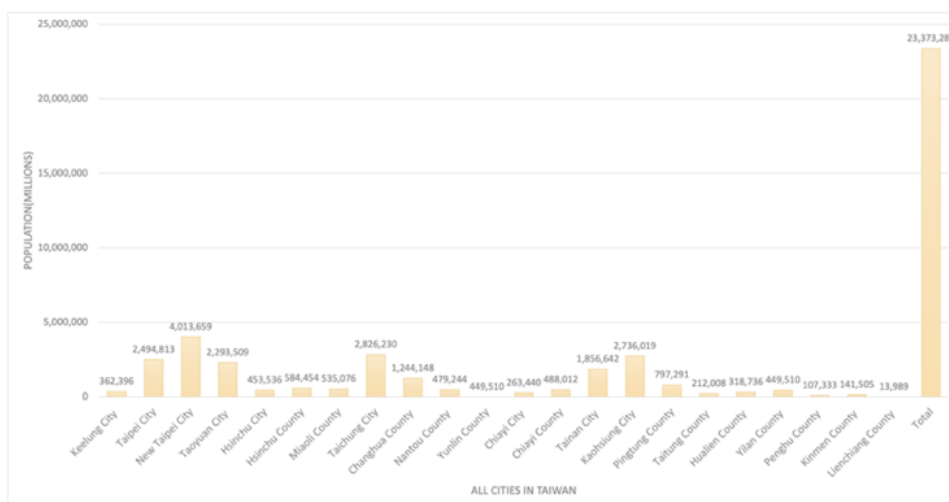
Figure 1-32 Overall populations in each city in Taiwan (North to South)

In these five cases study, which mostly is located in the southern part of Taiwan. According to the distribution of administrative regions, there are divided into four part which are the north part includes from Keelung City to Hsinchu County, middle part includes Miaoli County to Yunlin County, south part includes Chiayi City to Pingtung County, and east part includes Taitung County and Hualien County in the main Taiwan island. Except for the northern region, the proportion in other regions has declined, and the population continues to concentrate in northern Taiwan (MINISTRY OF THE INTERIOR, 2022). Thus, the research starts to focus on the city in the southern and eastern region (Fig.1-33).
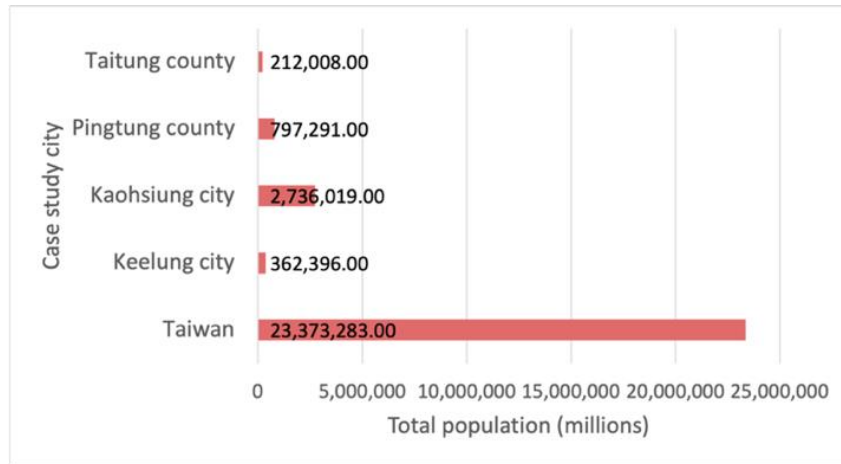
Figure 1-33 Demographic of cases survey

There is an exception case which is in the northernmost city, Keelung City. In terms of the northern administrative district, Keelung is the last city with a population distribution. But the city development's outcome has a great improvement both in community preservation and landscape design planning aspects. Therefore, Keelung city is also the analytical case in this research. A briefly geographic information in this research's case study can be seen in Figure 1-34.
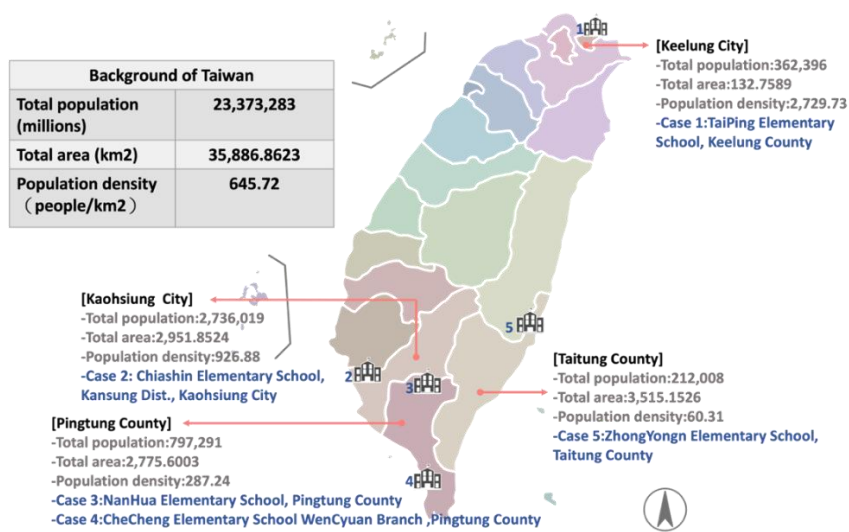
Figure 1-34 Geographic of five cases survey

Generally speaking, all five case studies have the similarity in each social environment. The finding finds out the nature increase rate has uncommonly phenomenon in all cases at the year in 2018 to 2021 (TESAS, 2019). Besides, the case in Chechen township is showing the nature increase rate is dropping down from -10.8% to -13.09 in 2020, other cases are remaining the line upward even during the covid-19 pandemic time. But after 2020, the rate in Chechen township went back to -9.64. Taitung county also shows a big different from 2020 to 2021 (Fig.1-35).
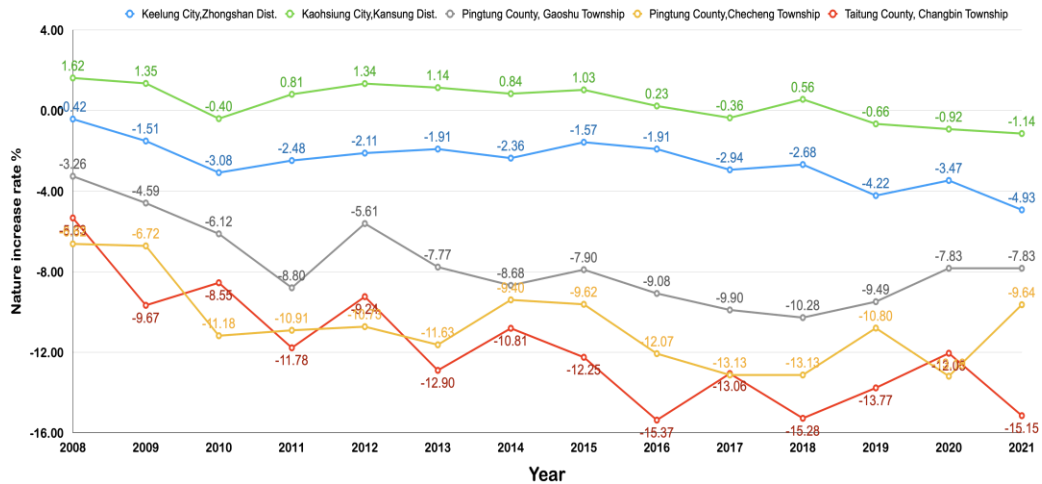
Figure 1-35 Nature increase rate in five cases region

During the pandemic time, due to the social distance idea, many people are moving to the country to avoid the crowd space in the urban area. The social increase rate in these five cases show in 2021, the first three cases order are Pingtung County (includes two cases) and Taitung County. The result shows the social situation during the pandemic time. In other word, Kaohsiung City and Keelung City which are the first two cities that has more population than other two counties. The date shows the social increase rate has a significant gap in overall graph (Fig.1-36). Before 2019, the graph also shows that people are willing to stay in the country rather than in a city. Thus, the regeneration school cases in Pingtung County (includes two cases) and Taitung County may also the reason that the government is trying to reuse the school space to revitalize the local community.
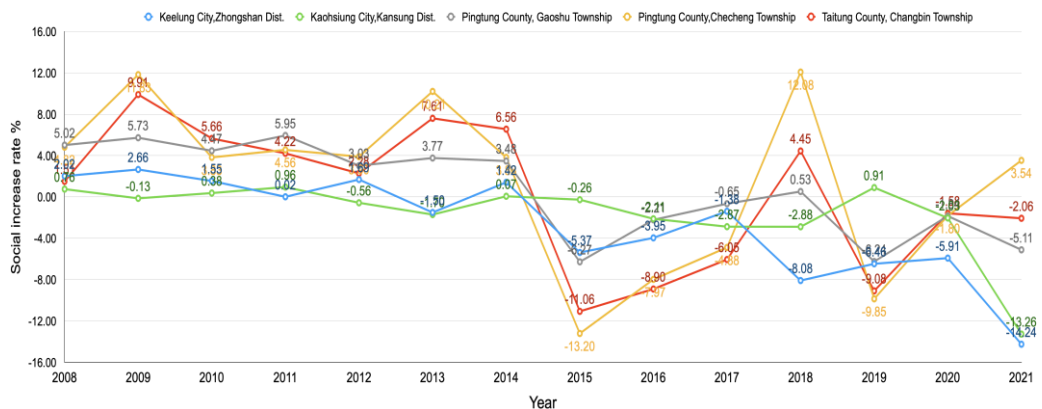
Figure 1-36 Social increase rate in five cases region

44

Although, the trendline in these five cases show the population is falling down every year (Fig.1-37). But the population rate in each city still can see the different in between, the Chechen township and Gaoshu township in Pingtung County has better number than other three cases. So, the data can presumption that there is a possibility that the region may attract a group of inhabitants to immigrate to the area. Certainly, the government notice there are opportunities to reuse the school space as a brain new place for the local community. An old school space has redesigned the space, let the campus becomes a new social subject that can also become another attractive theme to the public. Moreover, the new theme can bring the social benefit to the local region. Even though the school building has not change much but the renovation action can bring a new vision to the region.
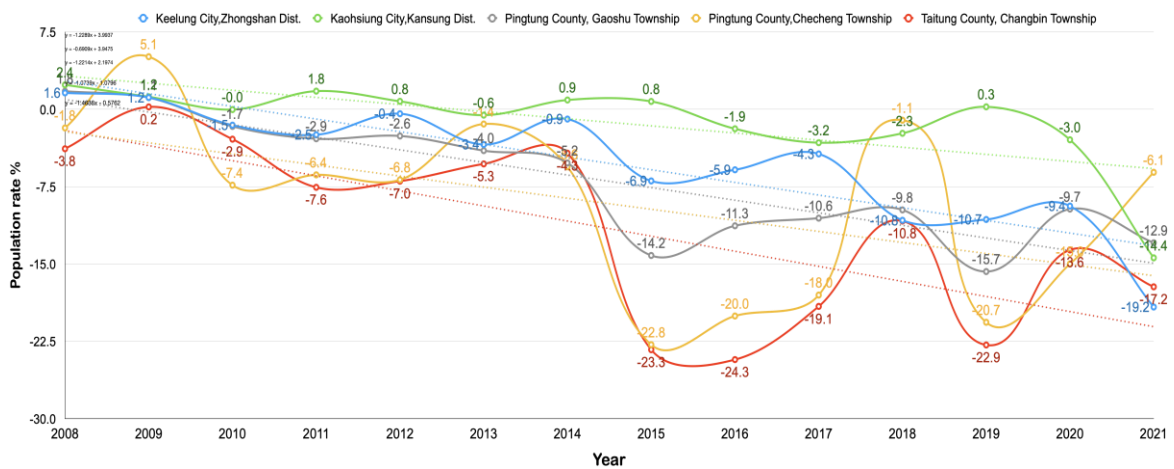
Figure 1-37 Population rate in five cases region

Beyond the research finding from above, the working status also show some different in these five cases. Both Figures in 1-38 and 1-39 present the employed and unemployed population status in these five cases which are located in four different areas. Compare these two graphs, Kaohsiung City has shown the first significant phenomenon result, the gap from the other three cities is because Kaohsiung City is the only special municipality that is established in 1978. Even though the administrative statues of Kaohsiung City have started in 1978, the unemployed population still continue a difficult time and the worker's situation nevertheless have a giant movement in the social environment (TESAS, 2019).
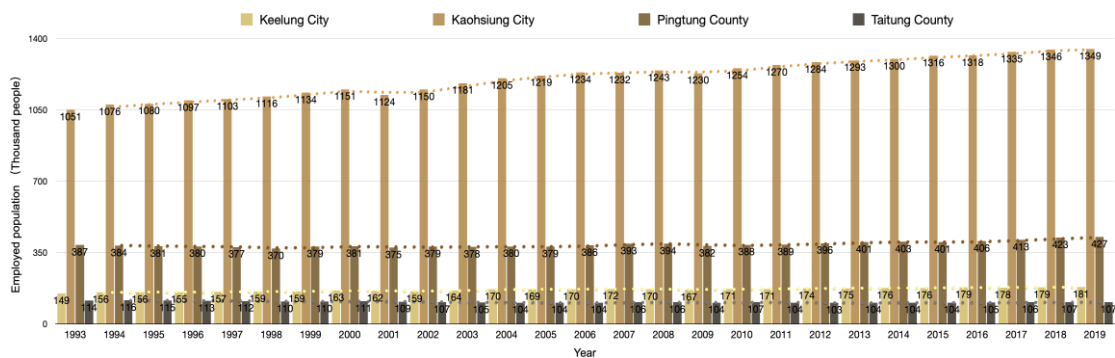
Figure 1-38 Employed population in five cases region

45
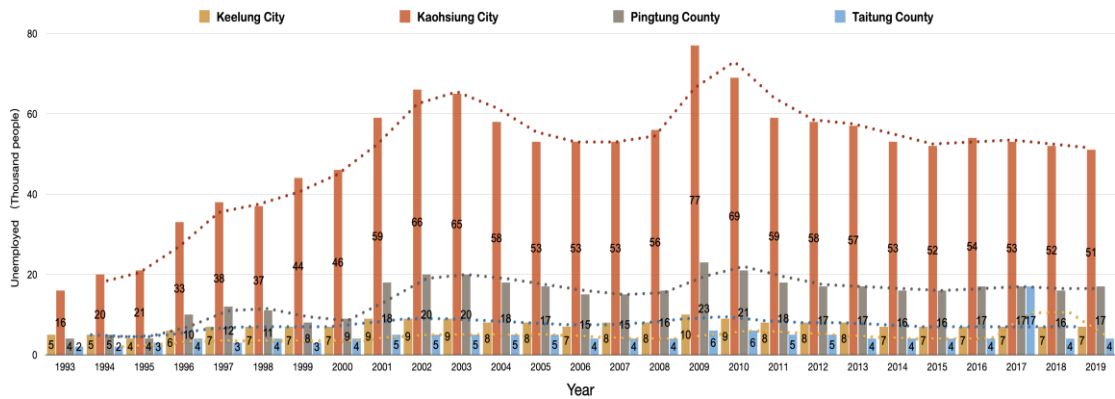
Figure 1-39 Unemployed population in five cases region

Another interesting phenomenon show that the unemployed population in Taitung County in the past year do not change much. Not like the graph line of Pingtung County has a quite up and down curve in the past year. Population density in Pingtung County is 287.24, which is almost four times of Taitung County (60.31). Even though the total area of Taitung County is bigger than Pingtung County, the resources supply in these two counties can also see the uneven distribution to offer a better working environment. At the same time, the unemployed rate trendline rank in these four cities are Pingtung County, Kaohsiung City, Taitung County, and Keelung City from the highest (Fig.1-40). Furthermore, the region revitalization should emphasize more in the southern part and eastern part of Taiwan. To arrange the resource from different policy aspects and discover the unique characteristic of the local area. In the same way, to assist the built environment makes more valuable.
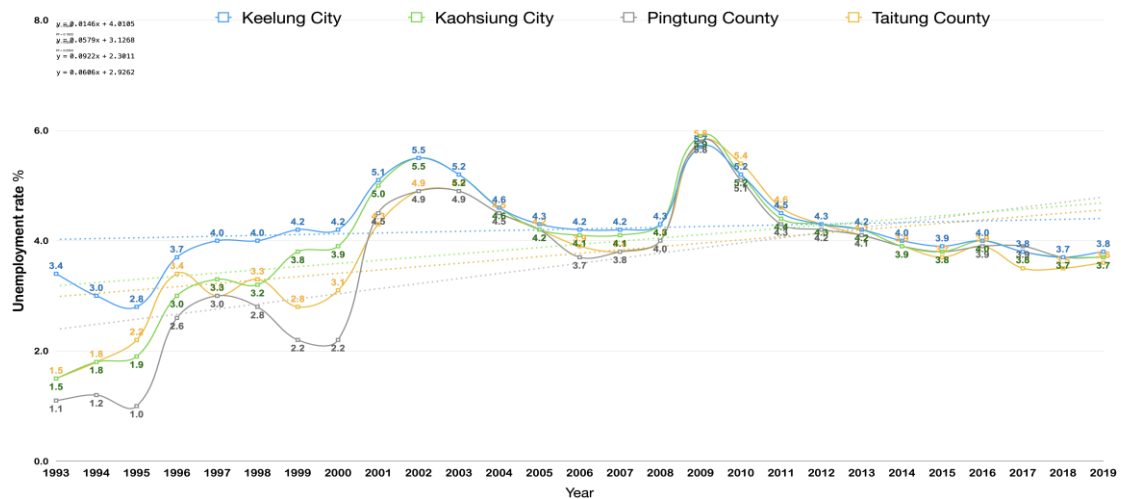
Figure 1-40 Unemployed rate in five cases region

As a result, it shows in Figure 1-41, the household in these five cases region has not much different from 2008 to 2021. But due to each city or county has many townships that is located in distinctive area, the household still shows that the Kaohsiung City has increase a little from 35570 to 35684 unit in 2021. Compared to other cases, the household are reducing slowly. To sum up, citizens are still believing the city

is better than the county. It is another research thinking that how to attract the inhabitants to move and live other city beside the municipality in Taiwan. It follows that the research hypothesis which is reuse the school space as an intermedium to reconnect the connection between the public and the local community. School regeneration and regional connection shared system can be also created during the revitalization process in the society and built environment. In these five cases, two cases in the Pingtung County, the local government has been created connection between these two regeneration cases, each of the school is playing its role to improve the regional development. Also, to share the regeneration outcome to each other.
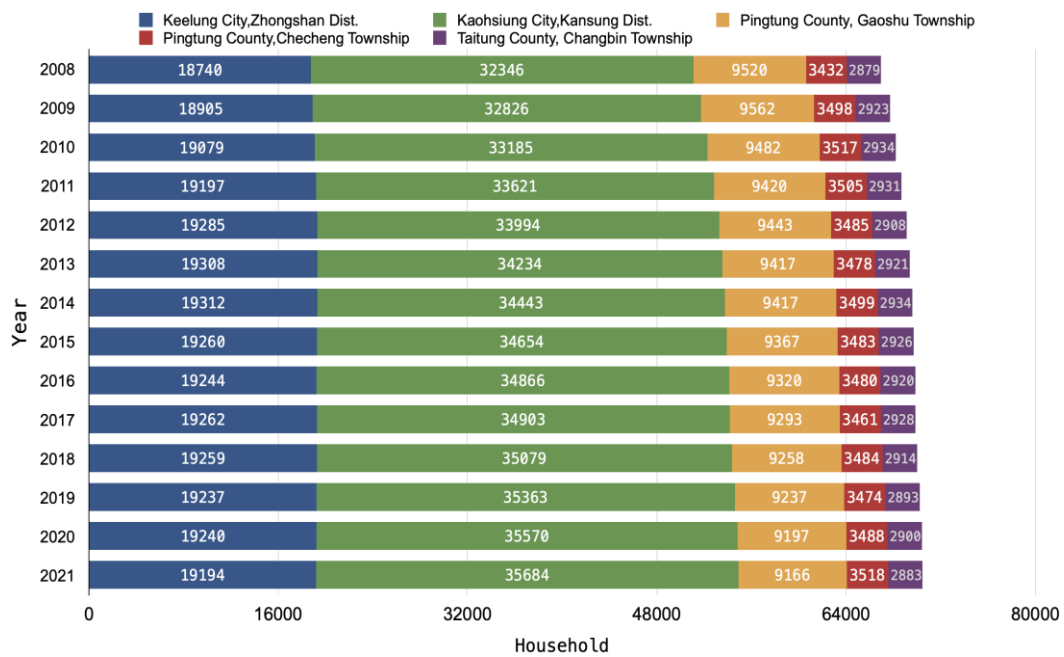
Figure 1-41 Household in five cases region

1.5 Current Status of School Environment in Taiwan

1.5.1 Profile of School Student in Taiwan

In this section, the research reviews the number of all schools level from kindergartens to collage. To give a brief review of overall school level in Taiwan's education system. The number of kindergartens in the academic year of 2022 continued to grow to 6,661 kindergartens, and the number of public kindergartens increased by more than 20% in the 5 school years. In the school year of 2022, the total number of kindergartens nationwide was 6,661, an annual increase of 154, of which the number of public kindergartens increased by 211 units, and the number of general private kindergartens decreased by 57. Moreover, the number of elementary schools was 2,626 schools, the same as the previous school year. In the last school year, the number of schools increased by 2 schools and the number of senior middle schools decreased by 5 to 509 schools. (Fig.1-42)
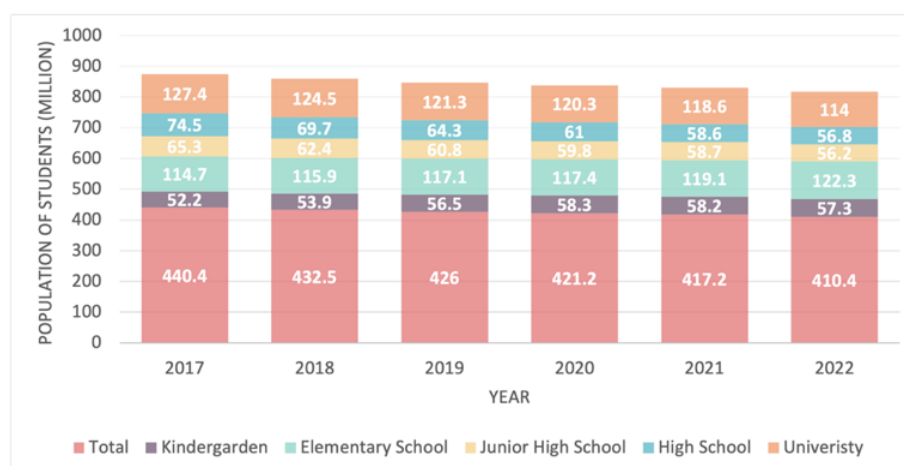
Figure 1-42 Overview student population of all school categories (2017-2022)

The total number of colleges and universities was 148 for the amount, a decrease of 1 school that is compared with the previous school year. Compared with the school of 2016, the number of kindergartens increased by 338 for the total, which is the number of public kindergartens increased by 510 as the total amount. Mainly due to the continuous expansion of the publicization of early childhood education and care services, while the number of general private kindergartens decreased by 172 as the total amount. Overall elementary schools, senior middle schools and junior high schools are decreased by 4, 2 and 9 individually. But the junior high schools increased by 4 schools while the other schools are declining because the lower fertility rate (Table 1-17).

Table 1-17 Student Population of All School Categories

Category of School	Year of 2022	Year of 2021		Year of 2017	
	Population of Students (Million)	Population of Students (Million)	Percentage of Increase / Decrease (%)	Population of Students (Million)	Percentage of Increase / Decrease (%)
Kindergarten	57.3	-0.9	-1.6	5.1	9.7
Elementary School	122.3	3.1	2.6	7.6	6.6
Junior High School	56.2	-2.5	-4.2	-9.1	-13.9
High School	56.8	-1.8	-3.0	-17.8	-23.8
University	114.0	-4.6	-3.9	-13.4	-10.5
Others	3.8	-0.2	-4.6	-2.4	-38.9
Total	410.4	-6.8	-1.6	-30.0	--6.8

Talent cultivation is the driving force for the growth of national productivity and competitiveness. In order to reflect its effectiveness, the relevant information on the focus of talent cultivation should be

reviewed on a yearly basis, as a reference for assisting schools and industries in cooperation and promoting relevant industry and university policies. In addition, the Taiwan government promotes the implementation of the Three aspects of Experimental Education and the Regulations on the Development of School Education in Remote Areas, which also creates new opportunities for the development of education in Taiwan.

Furthermore, the goal of the project is also assisting sub-urban and rural schools to develop their own characteristics to achieve the needs of the school enrollment rate to meet the basic indicators of relevant education. Also, the school itself can be become an international leader to help the student to attend the further education in and international perspective. Thus, the comprehensive process is an important statistical item to compromise in each school's education programs and curriculums. In this section of the research study review the trend of school education include a discussion on professional education, experimental education, education in suburban or rural areas and school attendance rate.

School of Native Taiwanese Students Status. In the 2022 school year, there will be 139,000 Native Taiwanese students in schools at all levels, accounting for 3.4% of all students. Compared with the school year of 2017, the number of Native Taiwanese students in kindergartens has increased by 19%. The number of aboriginal students in the school year of 2022 is 139,000 students, a slight decrease of 20 people from the previous school year, accounting for 3.4% of the total number of students and an increase of 0.1 percentage points from the previous school year. Compared with the school year of 2017, the number of aboriginal students has increased year by year from 136,000 to 139,000 students in the school year of 2022, accounting for 3.1% of all students in the 2017 school year, which has increased to 3.4% in the school year of 2022 and continue year by year. In the study of the observation by all school categories, the number of Native Taiwanese students in kindergartens will become total of 24,000 students in the school year of 2022. In fact, an increase of 3,710 students (18.6%) in the past five school years. Nevertheless, the number of students in elementary schools and colleges will also increase by 3,703 (8.8%) and 710 (2.8%) individually but the number of students in junior high schools and senior high schools decreased by 2,017 (-8.7%) and 3,164 (-13.5%) individually (Fig. 1-43) (NDC, 2023).
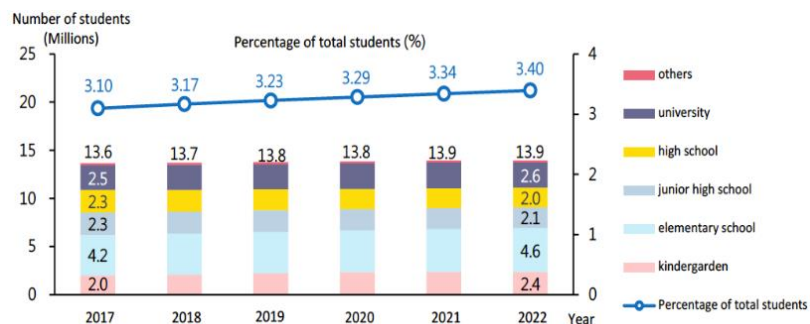
Figure 1-43 Population status of native Taiwanese students in all school categories

Graduated Student in All School Categories. During the school year of 2021, in Table 1-18 shows that the total number of graduates from schools at all school levels is 843,000 students, an annual decrease of 34,000 students (3.8%), with the largest number of colleges and universities at 284,000 students. Apparently, in the 2021 school year, the total number of graduates from schools at all school levels is 843,000 students, with the largest number of graduates from colleges and universities at 284,000 students, and the number of graduates from schools at all levels below senior high school is less than 200,000 students (Fig.1-44).
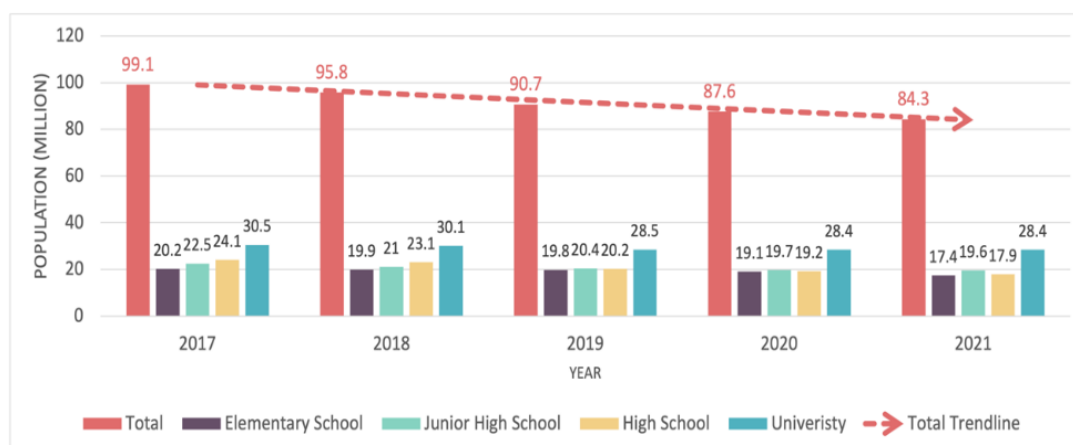
Figure 1-44 Graduation status of all school categories (2017-2021)

Table 1-18 Graduation Status of All School Categories

Population of Graduated Students (Million)

Category of School	Year of 2017	Year of 2018	Year of 2019	Year of 2020	Year of 2021
Elementary School	20.2	19.9	19.8	19.1	17.4
Junior High School	22.5	21.0	20.4	19.7	19.6
High School	24.1	23.1	20.2	19.2	17.9
University	30.5	30.1	28.5	28.4	28.4
Others	1.8	1.8	1.7	1.1	1.0
Total	99.1	95.8	90.7	87.6	84.3

Compared with the previous school year shows in Table 1-19, the total number decreased by 34,000 students (3.8%), among which the number of primary school graduates decreased by 17,000 students (8.9%). Also affected by the phenomenon of child reduction, the total number of graduates from schools at all levels is also decreasing year by year compared with the school year of 2017, with a total decrease of 148,000 or 15.0% in the past 5 school years. With junior high schools decreasing by 63,000 or 26.0% the most, and

junior high schools decreasing by 15.0%. 29,000 or 12.7% came second. (Fig. 1-45).

Figure 1-45 Comparison of graduation status in all school categories

Table 1-19 Comparison of Graduation Status in All School Categories

Category of School	Year of 2021		Year of 2017	
	Population of Students (Million)	Percentage of Increase / Decrease (%)	Population of Students (Million)	Percentage of Increase / Decrease (%)
Elementary School	-1.7	-8.9	-2.7	-13.5
Junior High School	-0.1	-0.6	-2.9	-12.7
High School	-1.3	-7.0	-6.3	-26.0
University	-0.1	-0.3	-2.1	-7.0
Others	-0.1	-12.3	-2.1	-0.8
Total	-2.4	-3.8	-14.8	-15.0

Education resources of Teacher's Condition in Overall School Categories. In the 2022 school year, there were 302,000 full-time teachers in schools at all categories, an increase of 2.8% over the school year of 2017 school year, with the most significant that it had increase of 11,000 kindergarten teachers (Fig. 1-46 & Fig.1-47).
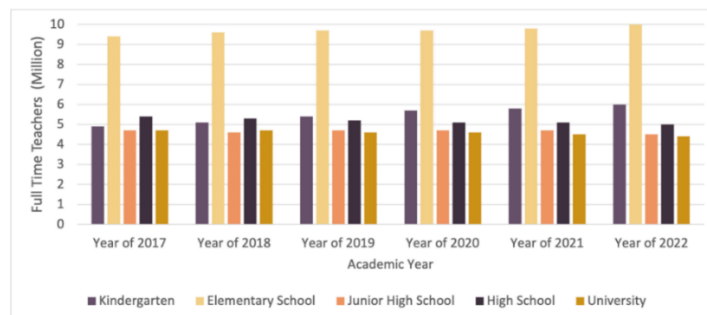
Figure 1-46 Full time teachers in all school categories
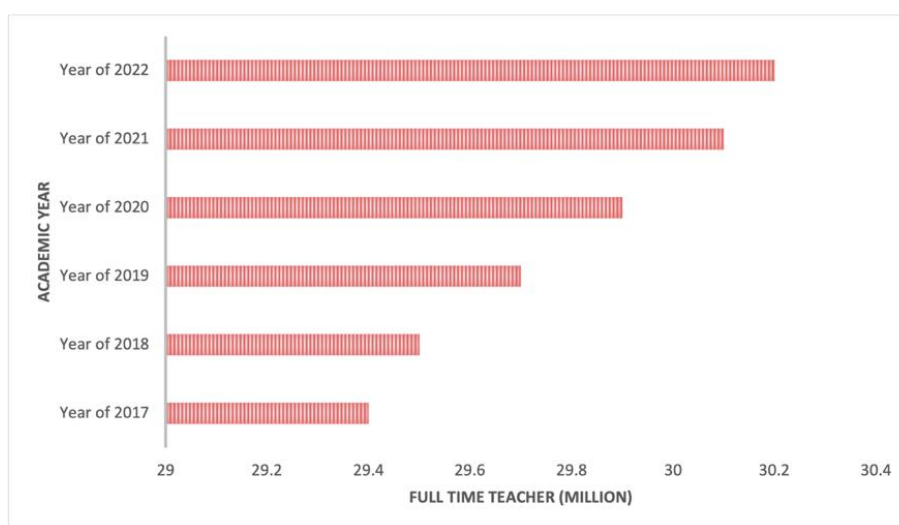
Figure 1-47 Total full-time teachers in academic year (2017-2022)

During the school year of 2022, there were 302,000 full-time teachers in all schools' categories in Taiwan with an annual increase of 1,000 teachers (0.4%). Among them, there will be 100,000 elementary school teachers, followed by 60,000 kindergarten teachers (NDC, 2023). The number of teachers in schools at all levels increased by 8,000 or 2.8% compared with the 2017 school year, among which the increase of 11,000 or 21.2% for kindergarten teachers was the most significant, followed by an increase of 6,000 or 6.1% for elementary school teachers, followed by an increase of 6,000 or 6.1%. The number of colleges and universities decreased during the 5 academic years (Table 1-20 & 1-21).

Table 1-20 Numbers of Full Time Teachers in All School Categories

Population of Full Time Teacher (Million)

Category of School	Year of 2017	Year of 2018	Year of 2019	Year of 2020	Year of 2021	Year of 2022
Kindergarten	4.9	5.1	5.4	5.7	5.8	6.0
Elementary School	9.4	9.6	9.7	9.7	9.8	10.0
Junior High School	4.7	4.6	4.7	4.7	4.7	4.5
High School	5.4	5.3	5.2	5.1	5.1	5.0
University	4.7	4.7	4.6	4.6	4.5	4.4
Total	29.4	29.5	29.7	29.9	30.1	30.2

Table 1-21 Comparison of Full Time Teachers in All School Level

Category of School	Year of 2022		Year of 2017	
	Population of Students (Million)	Percentage of Increase / Decrease (%)	Population of Students (Million)	Percentage of Increase / Decrease (%)
Kindergarten	0.1	2.2	1.1	21.2
Elementary School	0.2	2.1	0.6	6.1
Junior High School	-0.1	-1.4	-0.2	-2.9
High School	-0.1	-1.4	-0.4	-6.5
University	-0.1	-1.6	-0.3	-6.4
Total	0.1	0.4	0.8	2.8

In 2020, the ratio of female teachers in schools at all levels in Taiwan is higher than that in Japan, and the gap between junior high schools and senior high schools is relatively large. Observing the proportion of female teachers in schools at all levels in various countries in 2020, the proportion of female teachers in kindergartens in Taiwan reached 98.4%, which is about 1.5-5.5 percentage points higher than the average in the United States, Japan and OECD countries, but 0.5 percentage points lower than South Korea. It was 71.8%, 7.9 percentage points higher than that of Japan, but lower than the average of the United States, South Korea and OECD countries. Junior high schools and senior high schools account for 68.9% and 58.6% respectively, both of which are more than 25 percentage points higher than Japan, and similar to the average of the United States, South Korea, and OECD countries. Colleges and universities 36.4%, higher than Japan's 30.0% and South Korea's 35.8%, but lower than the US's 50.6% and OECD countries' average of 44.9% (Fig. 1-48) (MINISTRY OF THE INTERIOR, 2022).
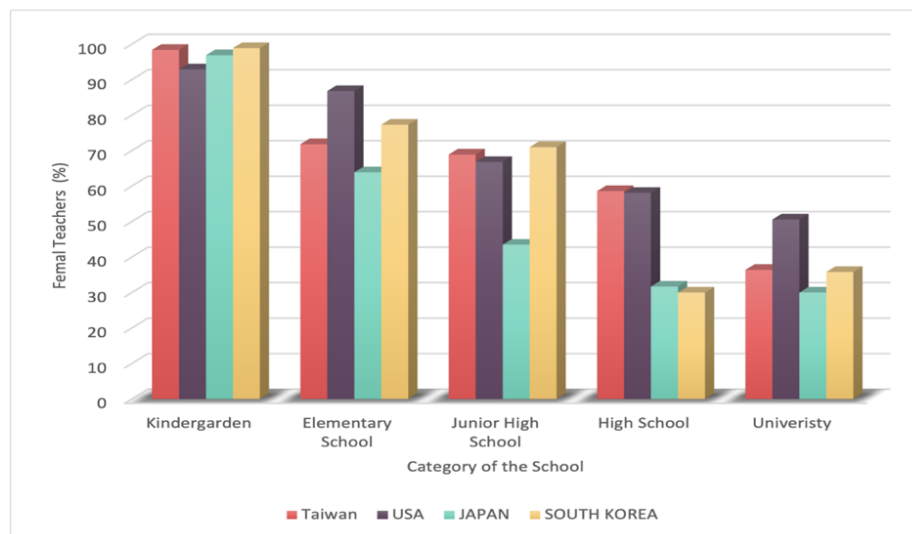
Figure 1-48 Comparison of female teachers in different countries

1.5.2 Rural School Architectural Situation in Taiwan

In terms of schools in sub rural and rural areas below high school in Taiwan's education, the number of approved schools in these areas below high school in the year of 2022, which is the largest number with 962 elementary schools, accounting for 80% of the number of schools in overall rural areas (Table 1-22). When the "Regulations on the Development of School Education in Rural Areas" was promulgated and implemented on December 6, 2017, all public schools among rural areas were classified into rural area, special rural, and extremely rural area based on transportation, culture, living functions, digital environment, and socioeconomic conditions.

On the other hand, the policy of the government project helped rural schools develop their own characteristics programs and education system. In the school year of 2022, there are 1,204 approved schools in rural areas below the high school category. In Table 1-22, it shows the detail number is 962 elementary schools, accounting for 79.9% of the approved in rural areas. Followed by 214 junior high schools (17.8%), and 28 high schools (2.3%.) In terms of all schools in the rural area, the approved numbers of rural area, special rural, and extremely rural schools are 848 (70.4%), 215 (17.9%) and 141 (11.7%) individually.

Table 1-22 School Profile in Rural Area (2022)

Location of School	Total schools	Percentage of overall schools (%)	Elementary School	Junior High School	High School
Rural Area	848	70.4%	664	162	22
Special Rural Area	215	17.9%	178	33	4
Extremely Rural Area	141	11.7%	120	19	2
Total	1204	100%	962	214	28

In rural area, the Native Taiwanese students in schools account for 18.5%, which is higher than the 3.7% of national native Taiwanese students. The number of students in schools in rural areas is 107,480 people, accounting for only 4.6% of the total number of students in the country. Because most of the schools in rural areas are located in the original township or adjacent Townships, 19,834 of the students are from Native Taiwanese ethnic which is accounting for 18.5% of the total number of students in rural areas (Fig. 1-49) (M.O.E, Study In Taiwan, 2021).

Figure 1-49 Students Status between Rural Area & Overall Taiwan

The data shows in Table 3.19, it is higher than the proportion of national Native Taiwanese students in the whole country (3.7%). In addition, the average number of students per class in rural schools is 12.6 people, which is about half of the national population of 25.5 people. Also, it shows 10.4 people are the lowest number in elementary schools and 12.8 people are fewer than the national population of 23.2 people. Similarly, the junior high school and high schools are also lower than the entire population in Taiwan.

Experimental education can be divided into school type, public school entrusted private (public and private) and non-government. There are 3 types of schools, which the number of schools that have passed the experimental education program of school types has been completed. In Table 3-19, the school year of 2022, there were 124 schools passed the experimental education plan, and the number of students was nearly 24,000 people. The number of participating students increased by 11,000 people in 5 academic years. The ratio of the number of students participating in experimental education to the total number of students has also increased from 5.0‰ to 10.0‰ year by year. It is showing a contrarian growth against the trend of fewer children. In the school year of 2022, the number of students at each stage of experimental education will be 16,000 (accounting for 65.3%) in elementary schools, 5,713 in middle schools (accounting for 2,555 (accounting for 10.7%) in high schools.

Table 1-23 Overview of Students Status in Rural Area (2022)

Category	Total classes	Average student of one class (%)	Students (A)	Native Taiwanese Students (B)	Percentage (%) ((B)/ (A)) x100%
Overall Taiwan Status					
High School	18208	31.2	567943	20313	3.6
Junior High School	21402	26.3	562230	21259	3.8
Elementary School	52771	23.2	1222538	45966	3.8
Total	92380	25.5	2352711	87538	3.7
Rural Area					
High School	539	18.8	10147	1548	15.3
Junior High School	1658	18.8	31126	5077	16.3
Elementary School	6351	10.4	66207	13209	20.0

Total	8548	12.6	107480	19834	18.5
The Ratio of Rural Area to Entire Taiwan					
High School	3.0	-	1.8	7.6	-
Junior High School	7.7	-	5.5	23.9	-
Elementary School	12.0	-	5.4	28.7	-
Total	9.3	-	4.6	22.7	-

In the past 5 academic years, the number of schools and the number of students passed by the school-type experimental education plan have grown by nearly 1.1 times of the data. Experimental education can be divided into three types: "type of school style ", "public schools entrusted by private individuals" (public and private) and "type of non-school style". It will increase to 109 schools in the school year of 2022, and the number of participating students will also increase from 5,139 to 10,721 students that is an increasing of nearly 1.1 times of the total number. The number of elementary schools is 7,524 schools, the number of middle schools is 2,709, and the number of senior high schools is 488 of total amount (Fig.1-50).
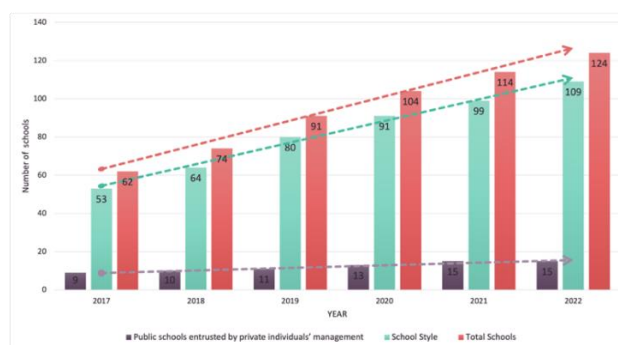
Figure 1-50 School joins the experimental education system (2017-2020)

1.5.3 School Building in Different Education levels

Present situation in elementary school building. Due to the trend of declining birth rate has led to a sharp drop in the school-age population, which has decreased by 530,000 people (-31.64%) in the past ten years. The number of classes in 2017 has decreased by 10,319 classes compared with 2008, which is about 17.02%. The average number of students per class has also dropped from 27.7 people to 22.8 people, the reduction in the number of classes has resulted in a lot of abandoned school space based on the study resources. In the past ten years, although some elementary schools have been closed, there are still many new ones of course. The approximately number of closed schools is 49 schools, a decrease of only 0.91% in the past 10 years. Therefore, it can be seen that the school is developing towards smaller classes of the student and fewer classes in one school lately. In other words, the school developing strategy has caused the school building space to become the lost space in the neighborhood environment.

As the data shows in Figure 1-51, it is interesting to see the quantity of the elementary school in Taiwan is increasing and the trend line also shows all the way up to 2022. These finding results bring the

question about why the news of the elementary school in the reality has closed or abandoned often become the issue in the social environment, but the number of the elementary schools shows keep growing from 2016 to 2022. in Taiwan, children's education system has been through three times of education revolution. Each educational revolution is 1968, 2004 and 2014. In the history of Taiwan's education, there are indeed some reforms and progress, such as the nine-year national education in 1968, which extended the six-year national education to nine years in one fell swoop.
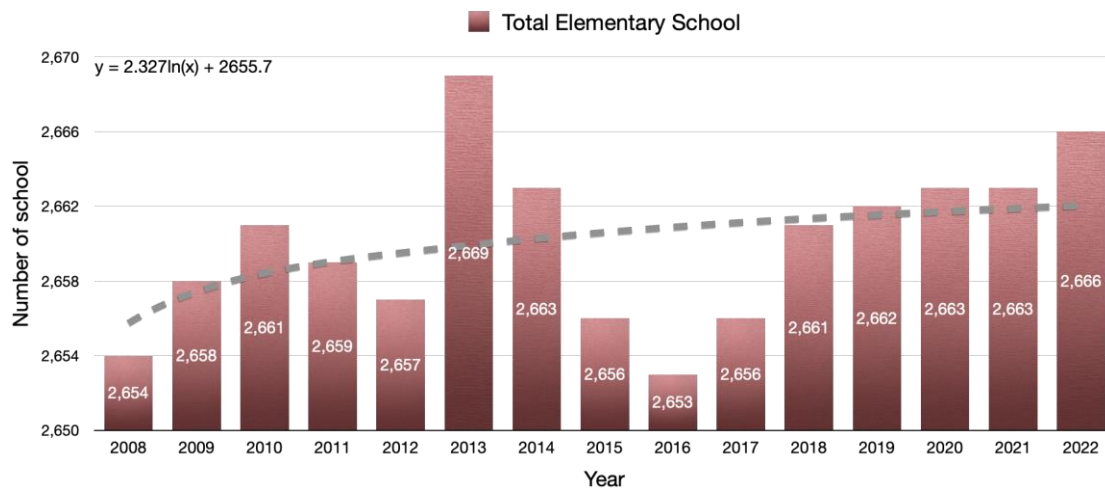
Figure 1-51 Total quantity of elementary school in Taiwan

In 2004, a nine-year consistent curriculum was promoted more comprehensively. In addition, after 20 years of hard work, 12 years of compulsory education finally hit the road in 2014. Because the education system has change which require more variety or special elementary school either public school or private elementary school at the time. Especially, the private elementary school has become a popular choice for parent to think about let their kids to receive a better education since the beginning of the child learning phase. Therefore, many elementary schools have been established together to the needs from the overall elementary educational arrangement (M.O.E, Study In Taiwan, 2021). In this condition, the elementary school in Taiwan still need to think how to make the trendline not getting worst in the future time, the elementary school either the public school or private school will become the combative group which is not a good condition in overall educational development. This, either to open the school into something cooperation planning with a different space function or the educational system need to be changed to meet the present of overall children and parent's expectation.

Along with the significance situation, the study findings have also reviewed and organized the total quantity of the public and private elementary schools. Compare two different characteristics of the elementary schools, the collecting data shows that the total public elementary schools are actually decreasing from 2008 to 2022, especially after 2012, the numbers of the schools were dropped to 39 schools (Fig.1-52). Moreover, the total schools were declining every year until 2022. On the contrary, the number of the private elementary school were increasing every year shows in Figure 1-52. The private schools were

increasing 16 schools since 2012 until 2022. Of course, the private school has the independent management and educational operation, which is less influence by the declining birthrate. Compare to two graphics show the school survives in an opposite way.
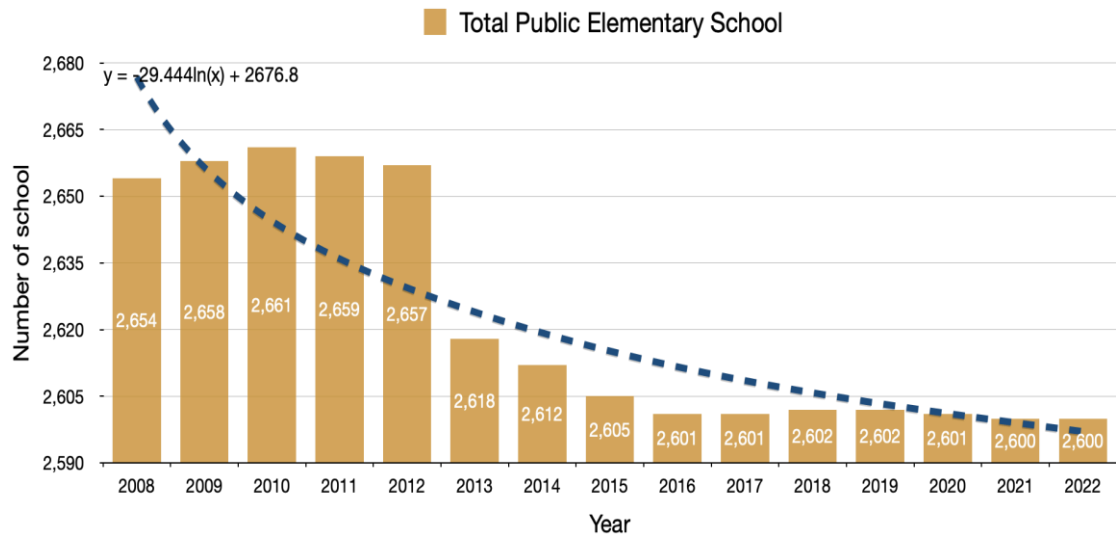
Figure 1-52 Total quantity of public elementary school in Taiwan

Compared to the total number of the public elementary school and private elementary school, the trend line shows that the private elementary due to the school management and operation system is holding in the private origination, which is there are many school operation goals or management strategy are not affecting by the government policy. As long as the school has its own characteristic in many ways, for instance, the education program can attract he student or parents, a good and professional trained staff and teachers, a well marketing strategy to keep the private school operating, the private elementary school can still operate well without worry about the abandoned situation too much (Fig.1-53).
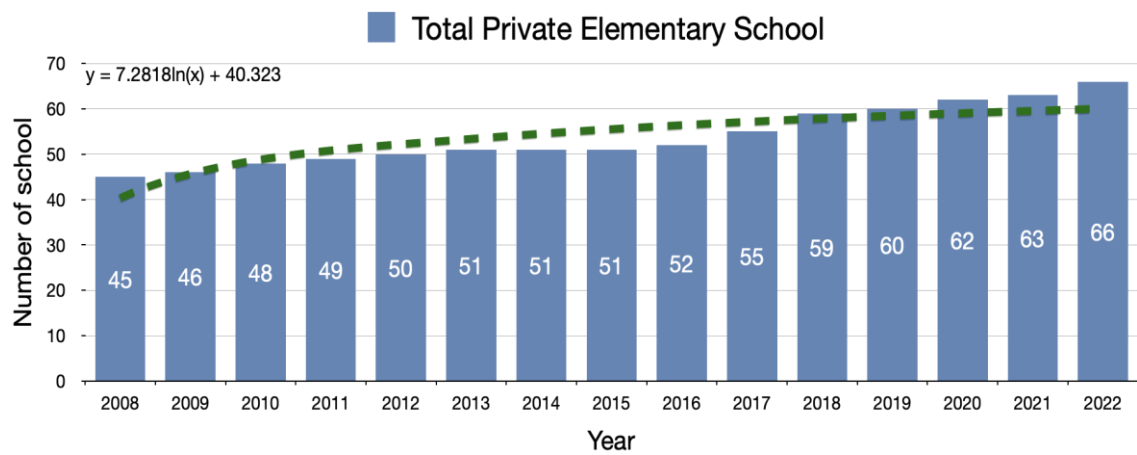
Figure 1-53 Total quantity of private elementary school in Taiwan

1.5.4 Prediction Crisis of School Building between Junior High to University

      In the past decade, Taiwan's so-called education reform has seen many blind spots, especially when many principals do not understand the characteristics of local culture and ignore the differences in human intelligence Populist slogans. With the help of administrative resources, a series of contradictory reform measures that have not been tested, evaluated, and contradicted are forced. Over the years, not only are teachers exhausted, but students are also at a loss, and the burden on parents has risen sharply. In 2014, the 12 years of compulsory education begin. Continue the junior high school education, the public school still occupy the most junior high school educational environment. And the private junior high school remain the same number until 2018 begin to increase slowly in every year (Fig.1-54). At this point, the graph of high school in Figure 3.31 shows the number of the private school are closing to catch up to the public school. Due to the declining birthrate issue, the first impact object is the elementary school. As long as the society is reaching to the high aging society, the next effect school by the social situation will be the public junior high school building. Also, the public high school building may face the consolidation situation which is predicable from the data collection (Fig.1-55).
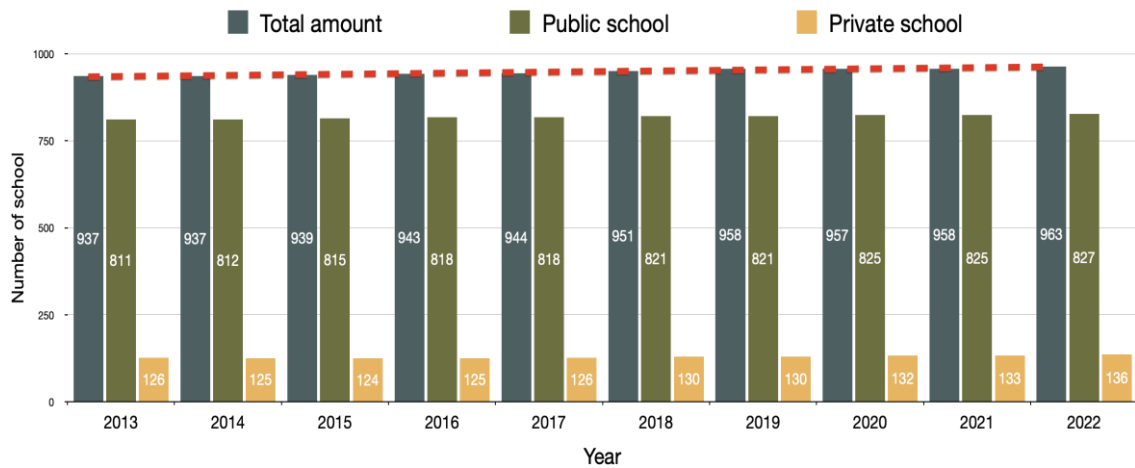
Figure 1-54 Total quantity of junior high school in Taiwan
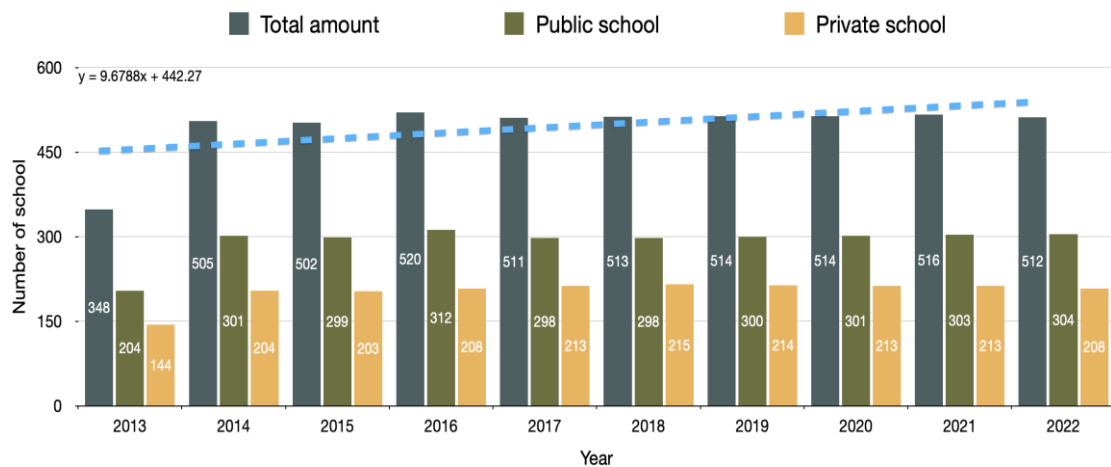
Figure 1-55 Total quantity of high school in Taiwan

59

One of the greatest achievements of Taiwan's education reform is to create a group of "new classes" that rely on education reform to gain power, they dominate education policy, influence personnel changes, and control resource allocation. Even educational policies that are not justified in theory are packaged as educational reforms and directly incorporated into schools and even curriculum materials, while principals, teachers, and students often have no opportunity to express their opinions. Private school is always having the advantage and disadvantage in the educational system. From the data above shows that neither public nor private school building may face the less student's entry, it turns out there are going to have more unused space in every school building in the future (Fig.1-56).
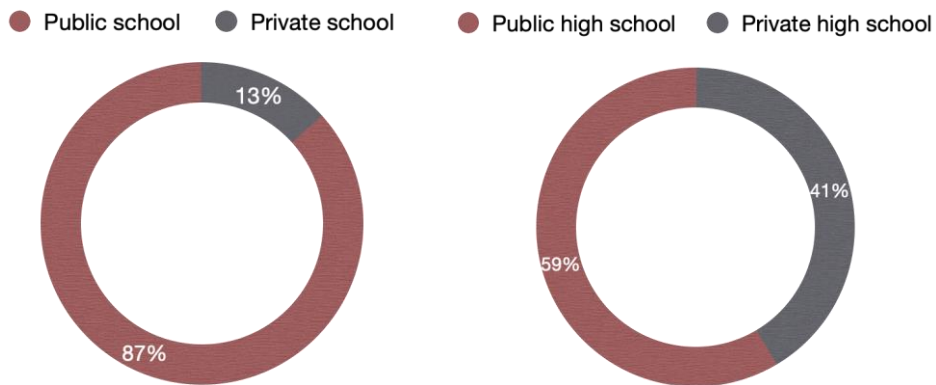
Figure 1-56 Percentage of junior high (left) and high school (right) in Taiwan

Both school building as a public facility can cooperate in the future. Even though the private school building belongs to certain private owner, but there still has the flexibility strategy to propose a plan to use the school building in a creative idea. In this case, this predicable crisis of unused space or abandoned condition can be prevented before a school building is sinking down to close it. Even though the government now has fully support the reused space project in the elementary school building, the strategy of avoiding the school is closed should be extend to the junior high and high school building. To seek the alternative options to use the unused school space efficiently. Moreover, let the school building become a new role to reach the need of the present society, which is a good strategy to convert the existing situation of the school building. On the other hand, the transformation of the school building can bring a new phenomenon to the overall society and people's daily lives.

The Potential Crisis of University Existing. Taiwan starts to notice the society will be a high aging society that the birth rate is declining every year. And most schools survive to affect by the student enrollment, even for the university. Chong Hua Bilingual School was former the Kao Fong College of Digital Contents, which are both private schools. After the college was closed, I-Kuan Tao bought the whole school building, start to rearrange the campus to become a consistent system from primary school to high school. Students live in the dormitory; their education program is willing to connect to the neighborhood community. Because previous students were adults, the design requirement was not specific to the age between 6-18 years (Ralph & Levinson, 2019). Therefore, many space layouts have to be redesigned to accommodate the appropriate human scale such as the desk and the chair, they also need to reinvestigate

the fire safety for the emergency circulation (Fig.1-57).

Figure 1-57 The new design functional require reusing the space in a university environment

In the 1990s, the annual birth population in Taiwan exceeded 300,000, and then declined, falling below the 200,000 marks for the first time in 2008; But at the same time, Taiwan was undergoing educational reform, and the policy of establishing universities made the number of colleges and universities as high as 160 universities in Taiwan (Fig.1-58). As end of July 2022, 12 colleges and universities in Taiwan have stopped recruiting or suspending. Also, many experts predict that more than 40 colleges and universities will withdraw in the next 8 years (2030).
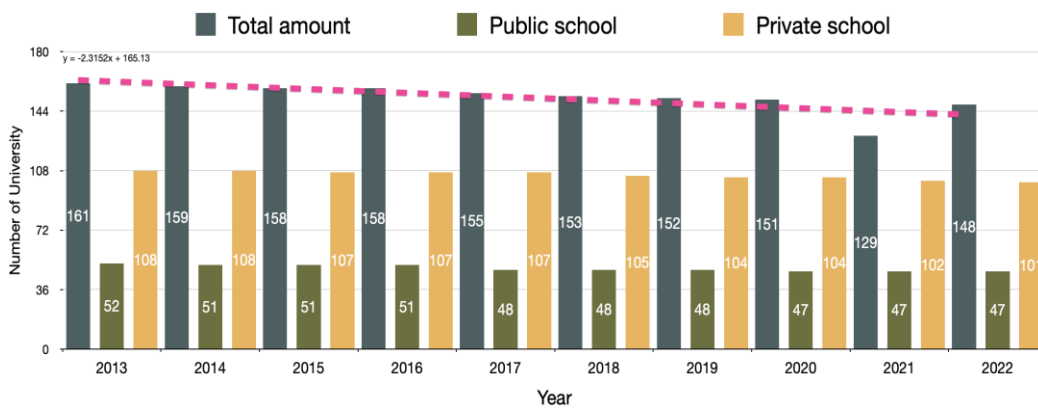
Figure 1-58 University existing condition in Taiwan

According to the latest data released by the Ministry of Education on the "Forecast Report on the Number of Students by Education Stage in the 2022-2037 School Year", it is predicted that from the school year of 2022, the number of first-year students will surpass the source of high school students that there will be a golden death cross. Research has found the data is analyzed that according to the current situation, at least 40 universities will withdraw in the next 8 years, or worse, especially private university.

Taiwan's higher education is facing a death cross, and the number of new students enrolled in universities has plummeted, which means that universities will face a business crisis of insufficient enrollment. The shortage of children has directly affected colleges and universities, especially private schools, resulting in insufficient enrollment and closure of many schools. In Figure 1-59 shows that the private university is occupied 68% in overall university and only 33% public university in Taiwan. In recent years, colleges and universities have faced recruitment pressure, many universities have been unable to

make ends meet due to the small number of children, not only private schools, but also many public schools, in terms of hardware construction and repair, cannot prepare a budget. In fact, under the impact of the small number of children, there is a surplus of educational resources. Many schools have transformed after the abandoned schools. They are forced to switch the operation of the school itself and trying to activate and reuse the space after the closure to achieve zero lost space and full activation of the school building space.
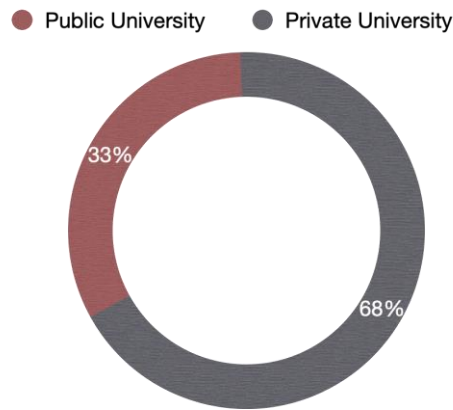
Figure 1-59 Percentage of university in Taiwan

1.5.5 Abandoned School Buildings in All Education Level

In this section, the research finding about the status of new school, abandoned school, and consolidation school buildings from 2013 to 2022. In the past 10 years, school buildings have accelerated change in all education level. When the society has start to face the declining population of school-age student in 2000 and 2010, this phenomenon begins to reflect the result of the school architecture whether preserve the school building or abandoned it. According to the data collection shows the trendline in each educational level (elementary school, junior high school, high school, and university) present an upward trend, especially the elementary school level, the trend line is higher than others that is obviously showing in Figure1-60.
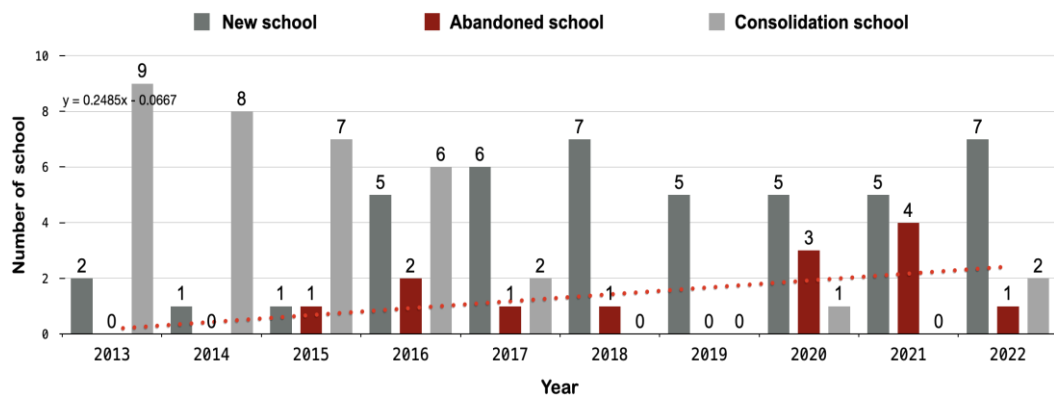
Figure 1-60 Abandoned elementary school in Taiwan

Likewise, elementary school and junior high school buildings having another option which is the consolidation choice. Many schools in these two educational levels can connect to each other and become

a coalition. Like a partnership or affiliation to help each other which is often seen in the public school (Fig.1-61).
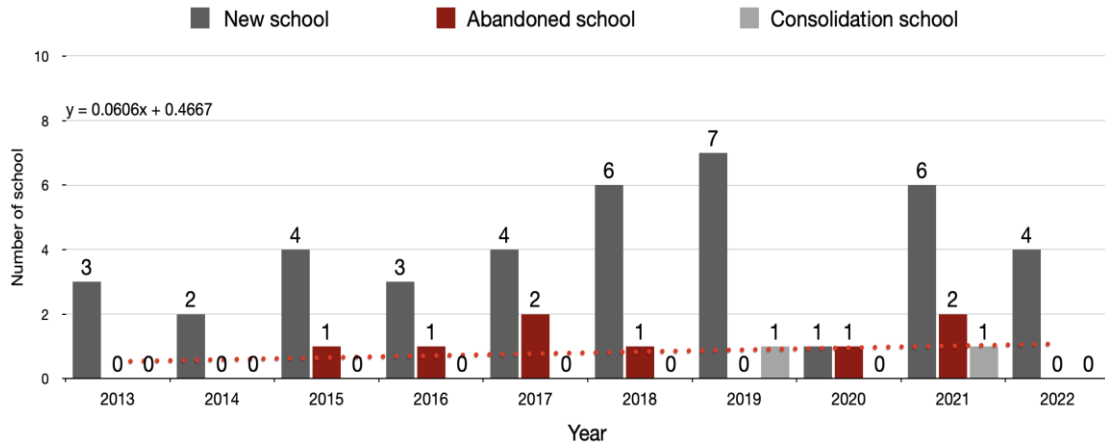
Figure 1-61 Abandoned junior high school in Taiwan

Although, the data shows there still have a new school is established in almost every year, but the most of the new build schools are in elementary school and junior high school level. These phenomena because the private school is these two educational levels are being required in particular group of educational expert, stakeholder, and parents. However, there are few new schools is established in high school level (Fig. 1-62), even there is no new school building in the university educational level.

In previous research findings, the prediction crisis in the university educational level is begun to show the difficult of the school survive in the past 10 years. In the university educational level, the abandoned decision still can be exchange to another substitute option. Instead of abandoned all school facility (all campus), the university can seek the support to consolidation another university, which is meaning to join the partnership as a union. The advantage of this can protect the present student's education right, professor, and staff in this ally relationship.
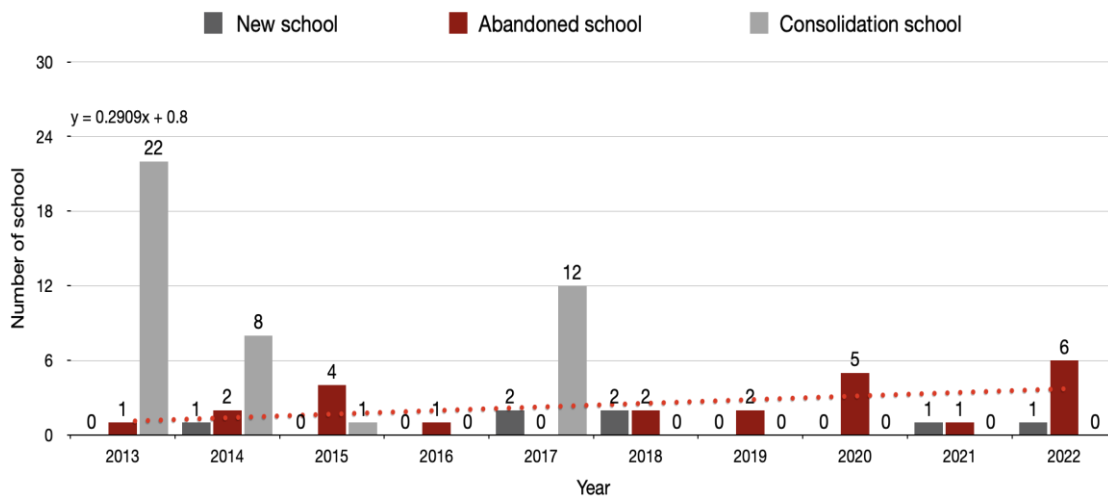
Figure 1-62 Abandoned high school in Taiwan

Not only the school committee can share the administration resource but also the educational knowledge can improve more wilder professional expertise (Fig.1-63). University's condition is getting a bit difficult to maintain in recent year, not only because the students is getting less but also the educational resource is hardly to have the support from the school organization, especially the private university. Public university still is the major choice for the fresh man to choose. Thus, many private universities are seeking another way to maintain the education system through creating the cooperation educational program with the industrial company. To provide more practical experience for students to know in advance.
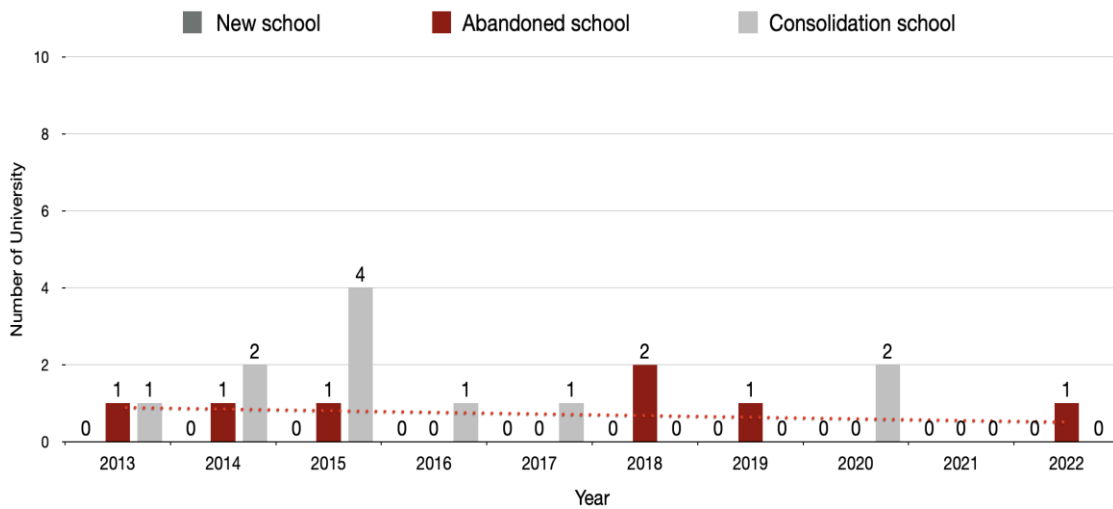
Figure 1-63 Abandoned university in Taiwan

1.6 School Building Condition in Japan

1.6.1 Society's Impact on School Development and Progression

A new era of learning from the history before Japan's educational history has been changed by many social conditions. What they are proposing now is according to the educational environment related to the society 5.0 era, in which cutting-edge technologies such as artificial intelligence (AI), big data, the Internet of Things (IoT), and robotics have become more sophisticated and incorporated into all industries and social life. In an era where it is difficult to predict, the impact of the spread of COVID-19 is spreading in many ways, and the impact will be wide-ranging and long-lasting. Japan's 18-year-old population, which is about 1.2 million as of 2020 (peaking at over 2 million around 1990), is estimated to decrease to about 1 million by 2030, and to about 900,000 by 2040, roughly three-fourths of the 2020 population1. Under these circumstances, the number of schools and students is also on the decline situation. Due to the declining birthrate, there are some areas and schools where it is becoming difficult to maintain educational functions. In this period of time, rapid change in the education environment, school education in Japan is required to nurture the qualities and abilities of each student; so that they can recognize their own strengths and potential, the goal is also to respect all others as valuable beings, cooperate with diverse people, overcome various social changes, open up a rich life, and become a creator of a sustainable society. moreover, it is important to steadily implement the new curriculum guidelines. In other words, the educational

environment is also necessary to realize sustainable and attractive school education (MEXT, 2022).

Because the covid-19 has changed a lot of learning behavior, this situation is also giving diverse forms of learning according to different subjects and activities. A new project idea is called "GIGA School Concept," which integrally develops a terminal environment for each student at the compulsory education stage and a high-speed or capacity communication network environment at all education levels. Also, to see thoughts by imputing students' thoughts into a terminal, sharing them on the cloud, and aggregating them on a large presentation device not only from the classroom but also from various places or subjects.

Likewise, to create and collaborate by composing and performing in groups, students' general meetings and other events are distrusted online or offline, and they can watch and vote using terminals in various places, not just in the classroom, it is just like a working style to be reform at schools. In order to create an environment in which teachers can fully devote themselves to the tasks that only they can do, and also carry out effective educational activities for students. Also, it is necessary to enhance guidance and support to improve the efficiency of school affairs by improving the communication network environment within schools and introducing an integrated school affairs support system. The government is establishing a workstyle reform at school, such as the planned establishment of 35 students in one class in an elementary school. However, the mission is to enhance individual optimal learning and collaborative learning, the more integrated the more social connection can be created through the process.

By realizing the "GIGA School Concept," and optimally combining past practices, it is necessary to change the school education performance in the near future. To solve various problems and improve the quality of education. In addition, based on the importance of interaction and its issues that have become apparent in the practice of distance and online education. The advantage is also having a chance to meet and cooperate with students and local communities, which is a hybridization of user behavior to learn social engagement in the present time. A small number of students is a trend for one of the classes and also to develop guidance to understand the user behavior in between each of student is a new challenge to learn and practice in the teaching environment now. Since the enrollment number of elementary is also declining, there are always children that need a place like a school, even though the performance of the school may not be as usual.

Collaboration with each other and also with local communities or related organizations is another new mission to create during the learning situation in the school environment. Schools are not only a place just about learning for the children or students, it is also a place for them to play a variety of roles, for instance, the core of the formation of local communities. Thus, school is necessary to promote cooperation behavior for the student to experience social engagement as soon as possible, no matter if the group is a community center, an organization, or a company. In addition, it also creates a connection to the local residents, and communities with a chance to have a dialogue with the local government, companies, social education facilities, universities, welfare facilities, and related organizations such as NPOs are assumed. On the other hand, the physical requirement of school buildings on the campus should be aware of a safe,

secure, and high-quality building environment according to the existing conditions and local environment, to promote the usage of social gathering spaces, community use, etc.

1.6.2 Current Status and Issues of School Buildings Safety

The current status and issues of school facilities safety are about the disaster prevention or mitigation. Due to the age of a school building, at least it can be recalled the minimum 50 years of the established time. Either the school building material is reinforced concrete or wooden architecture, the school building cannot be estimated as a safety facility and learning environment. Hence, the Basic Plan for National Resilience in Japan, regarding school facilities, it is stipulated that earthquake resistance measures including non-structural members such as ceilings, aging measures, and disaster prevention functions at evacuation centers will be promoted. Based on this, the Japanese government have steadily promoted earthquake resistance measures for school facilities in the "Three-Year Emergency Measures for Disaster Prevention, Mitigation, and National Resilience" on December 14, 2018. Furthermore, in December 2020, the Cabinet approved the 5-year acceleration measures for disaster prevention, mitigation, and national resilience. It will be promoted intensively in the five years from 2021 to 2025, the government will put all efforts to accelerate and deepen measures for national resilience purpose such as strengthening functions in every school facility.

People are well known that the earthquake disaster is a huge deal in Japan and Taiwan too. In the review of the school facility safety task what the Japanese government is trying to prevent the disaster and promote the strategy about the actual situation in earthquake resistance of school building structures which is also including the non-structural members. As of April 1, 2021, 99.6% of public elementary and junior high school structures have been made earthquake-resistant, and 99.5% of them have taken measures to prevent falling ceilings in indoor school spaces. In order to protect the lives of children and realize a safe and secure educational environment that can serve as a local evacuation center, it is necessary to promote anti-aging measures, including earthquake resistance measures for non-structural members other than suspended ceilings, and to strengthen disaster prevention functions. However, the reality of aging facilities becomes an inspection task to reevaluated if the school building is qualified to continue to use. Many public elementary and junior high school buildings were built in the late 1960s to 1970s, and about 80% of them are 25 years old. It is necessary to reduce and standardize maintenance and renewal costs while extending the service life, and to proceed with facility development strategically. This is also becoming the urgent mission before reuse the school space.

Under these circumstances, it has been decided that each local government will formulate a life extension plan for each individual school facility in 2020. But in 2021 As of April 1, 8% of the installers have not formulated individual school facility plans, and it is necessary to formulate them as soon as possible before the school space is reused in the future. In addition, the "Ministry of Education, Culture, Sports, Science and Technology Infrastructure Longevity Plan (Action Plan)," which was formulated in March 2015 to clarify the medium to long-term direction regarding the maintenance and management of school facilities under its jurisdiction and management. Since it was revised in March 2012, it is necessary

to enhance and review the contents, such as reflecting the status of deliberations by each local government in a timely manner even after the formulation of individual facility plans.

To build a building is easy but to maintain a building is another physical issue to do. Neither the building is abandoned nor not uniquely at the present time, the building should not be estimated by these reasons. Maintenance and management of facilities are the critical issues during utilize the architecture, especially the public facilities as the school in people's living environment. As school facilities continue to age, there were approximately 32,000 safety problems in public elementary and junior high schools nationwide, mainly due to the aging of buildings. In the fiscal survey in 2017, more than double the number in the fiscal survey in 2012, which has increased faster than what people's think. On the other hand, local governments are responsible for appropriate maintenance and management costs. Not only there is a large discrepancy between the mechanically estimated amount of local financial measures per municipality and the actual average amount of maintenance and repair costs in the municipality but also the policy consideration about the management and the responsibility.

According to the findings, 94.9% of public elementary and junior high schools are designated as evacuation centers in 2019 and 61.1% of respondents own emergency power generators. In May 2021, the "Guidelines for Securing and Operating Welfare Evacuation Shelters" were revised with the revision of the Regulations for Enforcement of the Disaster Countermeasures Basic Act. In the "Guidelines for Securing and Operating Welfare Evacuation Shelters", the Japanese government has promoted the designation of designated welfare evacuation shelters, adjust the recipients in advance, and improve the human and physical system to bring a better living condition to reduce the impact form the disaster. It is indicated that the improvement will promote direct evacuation in a disaster and strengthen support for people requiring special care. Thus, designation status of evacuation centers and use the school facility as the disaster prevention functions bring a healthier situation outcome to offer a safety space and enhance the school building as reuse the resource. Furthermore, the guidelines also envision special needs schools as designated welfare evacuation centers in the future use too.

Based on the School Health and Safety Act, schools conduct safety inspections of school facilities and equipment, and if any matter that hinders the safety of students is found, appropriate measures are taken to improve the school environment. In 2018, 98.6% of schools have implemented safety inspections of school facilities and equipment, and 47.1% of schools that have implemented safety inspections had problems. In terms of safety management efforts, 97.3% of schools take measures to prevent suspicious persons from entering the school premises and school buildings. Also, 58.1% of schools have security cameras installed. There is cooperation with security companies and 72.8% of schools have a contact system. The entire purpose of the situation is ensuring the situation of safety inspection and safety management in every school building and equipment on campus. Plus, advance safety management is one of the important risk management measures to prevent children or users from being involved in accidents.

The number of elementary and junior high schools, the number of students is on a downward trend.

Over the past 10 years, the number of schools has decreased by 9.8%, and the number of students has also decreased by 9.8%. There are 244 municipalities (14.0%), one municipality, one elementary school, one junior high school, etc., which may affect the quality of the educational conditions. In some regions, there are areas where the rapid increase in the number of children and students is a problem due to housing development. In addition, in 2021, 37% of the established individual school facility plans include consideration of consolidation and abolishment. It is necessary to examine the policy of the strategy and reflect it in the school organization in a timely manner. There were 361 cases of school consolidation in 2019, and 998 cases of school consolidation has planned after 2020. In addition, 19% of the school establishers stated in the individual facility plans that they planned to combine school facilities in 2021. Therefore, the proper scale and allocation of the school in the actual situation should rethink the meaning of the school role in a region. Consolidation or abandoned may not be the only way for a school to become. It is necessary to consider it and reflect it in the plan in a timely manner.

Consideration of flow lines and safety is an issue when creating spaces for use by local residents, etc. As school facilities that are open to the community, including compounding and consolidation. Utilization of private sector vitality, actual situation of Public Private Partnership (PPP) or Private Finance Initiative (PFI) is a new option to enhance the school building instead of the school building is vanish it. In addition to the deterioration of facilities, the utilization of private funds, etc. is progressing through methods such as PFI in order to realize efficient and good provision of public services while responding to the shortage of staff of local governments. By the end of 2020, a total of 875 PFI projects had been implemented, including 292 in the field of educational facilities, which 201 were related to school facilities. As far as the result of the finding, the actual state of process and utilization when redeveloping school facilities is undoubtedly to improve the social benefit both in physical and mentally to the public. When redeveloping school facilities, the participation of those involved in the school, such as teachers, students, parents, and local residents, who use the school space is required to join the redeveloping process. Among the public elementary and junior high school, the new construction projects in the over past five years, 50.3% of the projects adopted the proposal method as the designer selection method, 43.4% of the projects adopted the price competition method, and the projects adopted the comprehensive evaluation bidding method is 3.8%. Furthermore, even after the facilities have been constructed, the concept of planning and design and the way of thinking about their use are not necessarily shared among faculty and staff, and there are some spaces that are not fully utilized. Not only the school building's transformation process but also the actual needs of space become another new spatial design level in the school architecture design.

1.6.3 Abandoned School and School Regeneration Condition

Due to the declining birthrate and decrease in the number of students enrollment, there are around 450 schools have been closed every year. Based on the result of finding date on the utilization of closed school buildings in 2021, it is about 80% of the existing closed school buildings are used for various purposes. Abandoned schools are an asset for local government and community. By actively utilizing the

school spaces effectively according to the actual situation and inquires of the community which can expected to bring various effects for the local environment. What can be expected of the benefits such as reduction of maintenance and management costs of the school buildings as a public architecture. Also, the industrial promotion of a new communication topic such as a school building maintenance become a revitalization place of the local region. All the advantages can recreate the genius lotic in the local built environment. Since 2010, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) has launched a project to use the closure school return to a new place to connect to the future for everyone. Therefore, there are many cases has been transforming the space to a new use of closed school buildings. Thus, abandoned school is not the end, but the beginning in this period.

In recent years, the vast grounds and classroom partitions of abandoned school buildings have been utilized for social education facilities, welfare facilities, experience exchange facilities, etc., and even companies have set up offices in anticipation of employment promotion. This time, Japanese government have created a collection of case studies that collects examples of the use of closed schools across the country that are being used for a wide range of purposes. This collection of case studies introduces the circumstances leading up to the use of closed schools and the unique advantages of closed school facilities. During the review phase, a closed school can be used for any kind of facility depending on the proposal idea. In addition, for companies that intend to utilize closed schools, the advantages related to the location and building characteristics of the school such as the ability to utilize a large amount of space, easy-to-use space partitioned by classrooms, and a quiet environment.

Secondly, the merits of utilizing existing facilities such as early business start and cost reduction by utilizing existing facilities. Last, topicality, media attention, and community-based activities are possible, there are various merits such as merits unique to the former school too. According to all collections of case studies will be some assistance in considering the use of closed schools for who are interested to redesign the school building in the future. As the study of the unused space in the school building, it shows the unused space and temporary unused space in the public elementary and junior high schools are 96,328 spaces in the current situation. Which means as a regular classroom, the utilization is getting less than before it was. Approximately 83.5% (80,414 rooms) are used as private classrooms and 16.5% (15,914 rooms) are used as temporary extra classrooms (Fig.1-64).
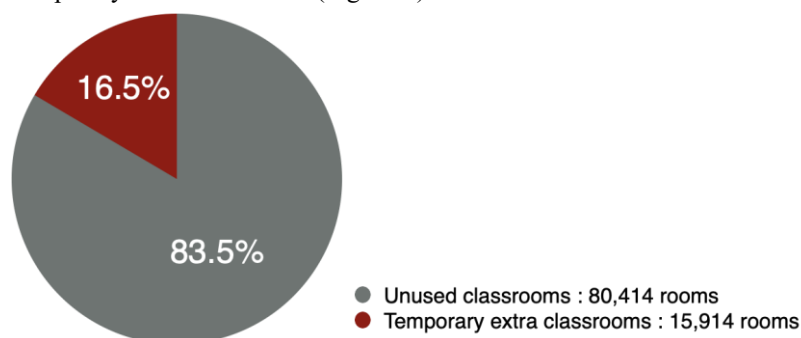
Figure 1-64 Comparisons of unused and temporary classrooms in elementary and junior high school

Compared to the utilization status of unused classrooms, there are approximately 98.5% (79,216 rooms) are in use and 1.5% (1,198 rooms) are remain the same status that is unused the space. As the data shows, in number of 79,216 rooms, there are still used by the school facilities is 75,817 which is about 95.7% in use by the original school. Other results show the utilization status of unused classrooms by other school committee and non-school committee are 0.2% (195 rooms) and 4.0% (3,204 rooms), these outcomes shows that the user other than the school itself are required to use the school space as well (Fig.1-65).
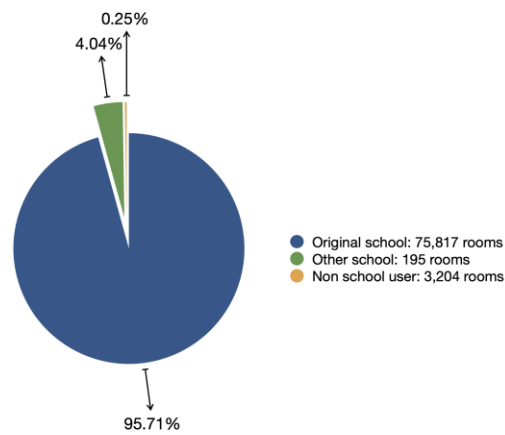
Figure 1-65 Comparisons of unused and temporary classrooms

At this point, the study can also have more ideas how these spaces have been utilized by different users or purposes. Since there are 75,817 spaces used by the original school facilities. It comes the results to show the function of the space. There are approximately 90.0% (68,199 rooms) uses for children as diversification of basic leaning, teaching methods, special lesson and communal rooms. Many different use purposes also use for foreign children to learn the Japanese language or other language learning. The space is also using as an exchange message, counseling or preparation for kids, teachers, and other participants to get together. Other rooms are about 10.0% (7,618 rooms) is used as a space for opening the school to the community during the daily life. The detail status shows in the figure 1-66.

When the status of utilization school space after the regular school time, it shows there are approximately 67.2% to use the school space which is about 2,152 rooms out of 3.204 of total. Of course, the use conditions are according to the actual situations and requirement of the local region.it is also showing that even after the normal school opening time, if the school can open to the public beside the regular school time, the school space can also be used efficiently. The finding shows the space has been used by kid's club are the most common use. Others use of rooms and after school use are the second and third usually use for the unused space which are 243 rooms and 242 rooms. Social educational facility such as cultural and sports use can be also often using purpose. It is also known that most of the school spaces is used as repository for local government work and cultural properties (Fig.1-67).
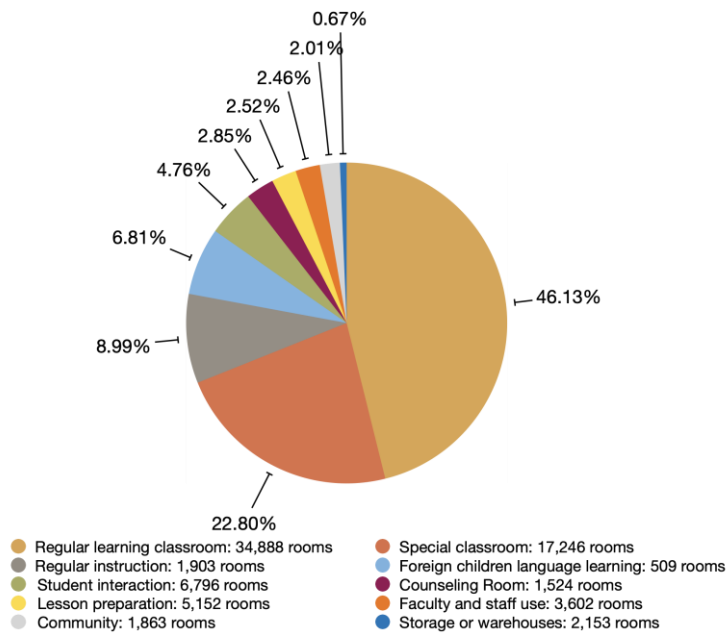
Figure 1-66 Purposes of utilization space
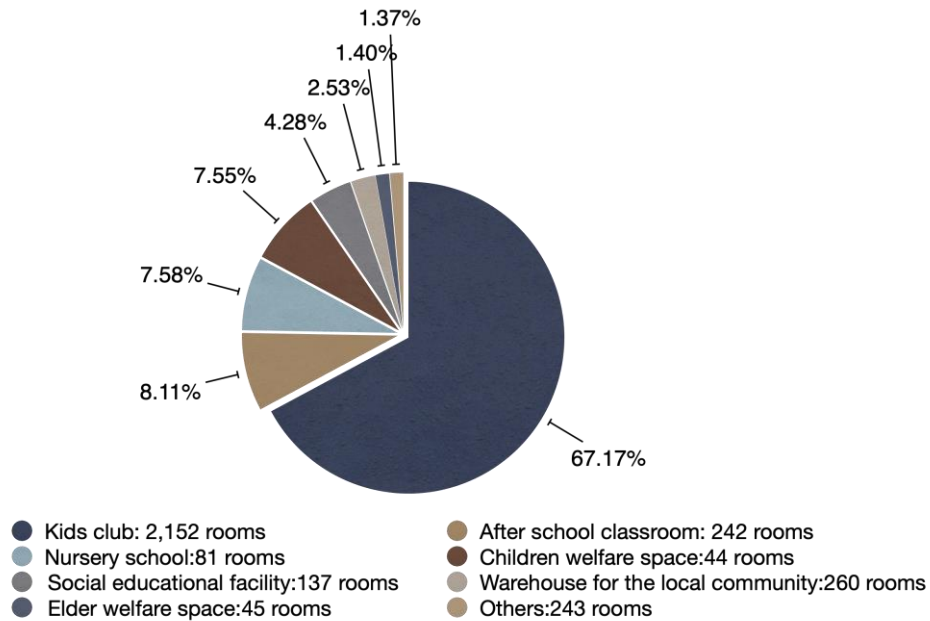
Figure 1-67 Purposes of utilization space after the regular school time

Another research finding material shows the status of reuse school spaces which is waiting to be consider changing the existing abandoned situation. From 2002's number of schools is 23 schools till 2020 were 215 schools. As the result, the trendline is continue to upward, more and more schools are trying to exchange the original purpose of the school space. But there is a challenge which is what the use purpose

of the school space will become. It is not about the school can be preserve or not, it is about what the school space can be present for the existing social environment. Thus, a new or creative architectural programming become the task for the school committee, designer, and stakeholders. This process needs to take a certain time to communicate to everyone who want to join the school space revitalization, also think carefully about the utilization of the school space (Fig.1-68).
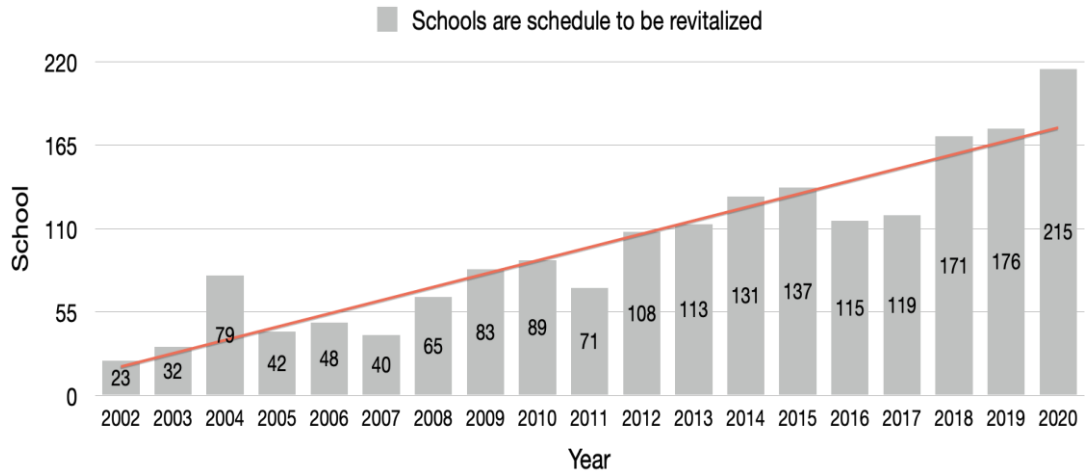
Figure 1-68 School status of scheduling to be revitalized

More than 10 years, Japan's school buildings have faced a huge challenge to think how to preserve the entire school buildings, which is including the complete campus environment. It follows that the overall status of the abandoned schools in Japan is also increasing every year that the trendline shows upward to the near future (Fig.1-69). Also, the average number of the abandoned school approximately around 400-450 schools per year. Because of the insight to predict the situation after the school has been abandoned, the government has promoted the project to reuse the school space and transformed the school to another use in 2010. This action brings reduce those school that having the trouble to continue and have a second chance to reuse the school again in the local community.
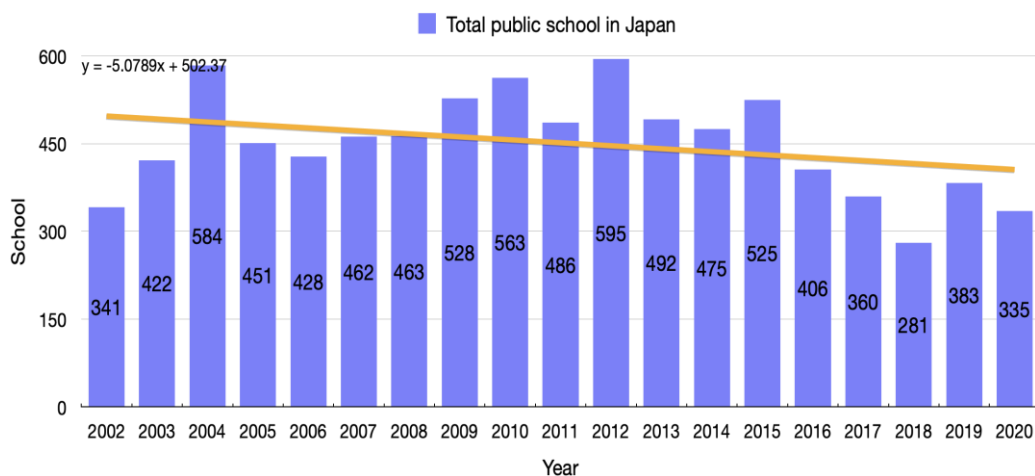
Figure 1-69 Total abandoned schools' condition in Japan

As the figure 1-70 shows the abandoned school in Japan is not only happening in the elementary school but also the junior high and high schools have the same issue that is facing the school space become a lost space. All the education levels are having troubles to decide to keep the school building or demolish the school building. Due to the Japanese culture and the social value 's opinion, the Japanese government has seen the issues and potential to use the school space as other advantage to assist some areas such as the rural area to progress their local industry development. There will be more detail description about the revitalization strategy in next section.
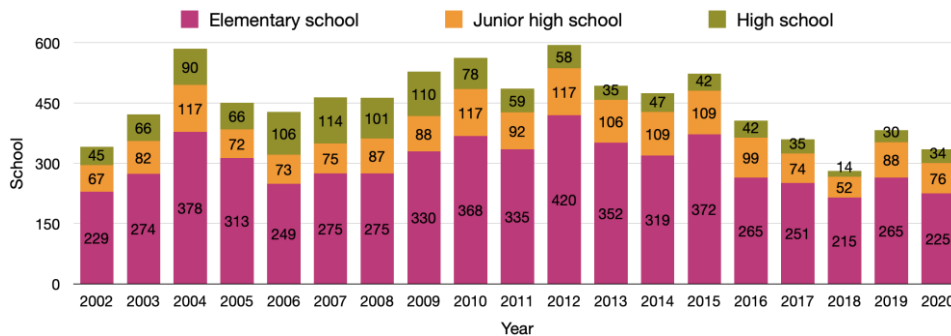
Figure 1-70 Abandoned schools in three education levels

According to the date, it shows until 2020, there are 8,580 school was abandoned for the total. In 8,580 abandoned schools, the school buildings are still remained on the site have 7,398 schools. On the other hand, there are 1,182 schools was demolished which are not all abandoned schools have the luck to preserve the original school building. Among 5,481 schools are revitalized and still use the school space now. however, most of the school spaces are used based on various needs from the local society environment, local government will open the news to the public and communicate the transformation process. Most of the school spaces are used as social facilities in different programs that is about 39.06%. Also, company and start-up support business are getting popular in a new industry business which has 10.09% of the total spatial usage purposes. Last of all, there are 1,917 schools are not he revitalizes at this period, including 278 schools has the new program and 1,424 don't know the program yet (Fig.1-71).
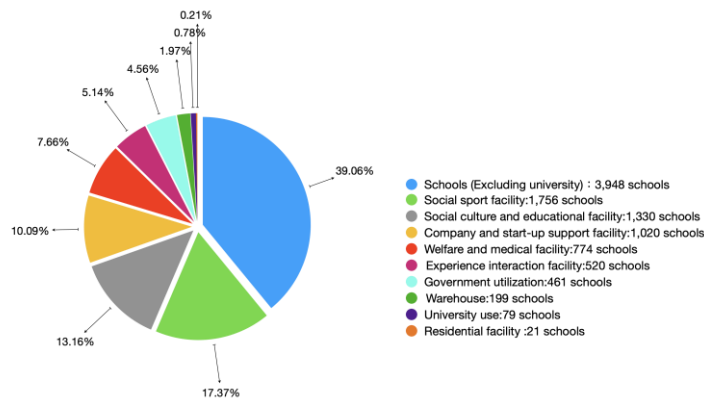
Figure 1-71 Condition of reuse school space in Japan

1.7 Research Flow Chart
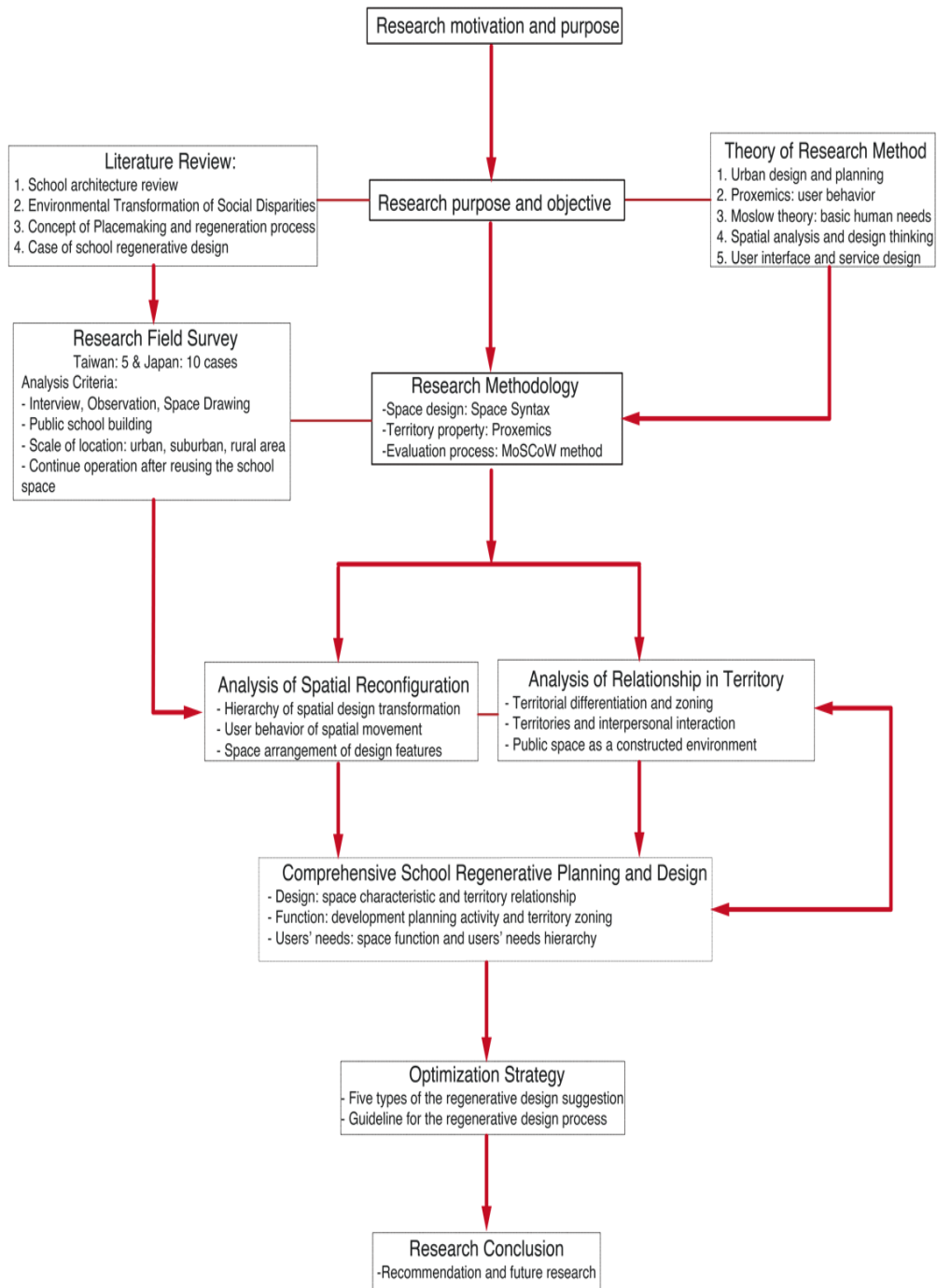
Figure 1-72 Research flow chart

CHAPTER 2

Reviews of Relevant Researches

2.1 Urban Expansion and Landscape Variation of Built Environment

With the rapid development of globalization, industrialization, urbanization, and informatization, numerous economic activities are aggregated in cities, resulting in uneven resources distribution between urban and rural areas. Additionally, the falling fertility rate has caused many abandoned education-related architectures in both areas. When an architectural space is non-operational, it delivers neither the fundamental spatial value nor contributes any interaction to its neighbors. Sustainable environmental education has been a major subject in the architectural education program. A complete architectural design project is learning from the environment and combining the community's needs. This process will also focus on the concept of sustainable and environmental control that people are well known by green architecture and its technology system. Before design a building, urban planning, and landscape design are always the priority to study, to recognize the positive space and antispace of the site (Spelmon, 1993). Thus, to understand the urban-rural environmental growth with different social impact in people's daily living space (Modesto, Kamenečki, & Tomić Reljić, 2021). Moreover, to develop the space consciousness and relationship between the inhabitant and environmentalism.

2.1.1 The Position of School Buildings in a Region

The disparities between urban and rural areas indirectly affect many transformations in the landscape appearance of urban-rural areas, giving residents opportunities to reevaluate their living space or neighboring environment (Ding, Zhao, Yan, & Wang, 2022). A city's landscape architecture variation encourages each individual to notice the dissimilarity; at the same time, the difference can improve everyone's living quality both in physical and mental health (Altamirano, et al., 2020). The definition of human living space includes not only their own accommodations but also every element of the street, characteristic of the building, and interaction between people and activity in a district. Also, humankind has established an environment to live, interact, and exchange to adopt the social movement. Thus, when designing the space or environment, people should take the rich landscape elements, the diverse spatial scales, and different ways of interpersonal interactions into account. With a thorough understanding of both geographical and residential needs, a more efficient plan can thus be established to raise the overall usage and value of a land (Camrass, 2022).

In this research, school plays a role to link the local community connection, a sense of place can be regenerated from the social formation into another image of the city (Casey, Feld, & Basso, 1996). A Clarence Perry concept was shown in 1910, a school was servicing a quarter of the radius scope for its neighborhood. School architecture in this twenty-one century has been changing a lot by this new modern culture movement (Burke & Grosvenor, 2008) . The history of the school has existed for centuries, in the beginning, the school has a limitation for a group of people are known by the elite that they could go to the school. Of course, the religious institution was the center of culture for the society that also made the school became the most important faith center to sustenance.

In the past, the school also has been conceived to be like a place of common living for a religious purpose, a place of production, or a Domus. Both mentally and physically support the entire social environment. But, the school in this present time, what is the school's role in people's living environment

(Fig.2-1). According the image of the city, there are five elements to be thinking when people observe the city (Lynch, 1960). Thus, the school facility is no longer the student's privilege, it is also offered for the community to learn, activity for the elder, variety of use for the children. School architecture has been purposing (Sánchez, Gallardo, & Ceña, 2014) to another level of usage, after the management strategy and safety issue concern, its building space can be used for the event to a local community as well. There are many private foundations use as their office, communication center, welfare facilities, etc., school is not just the place to learn (Gu, Li, & Han, 2015).
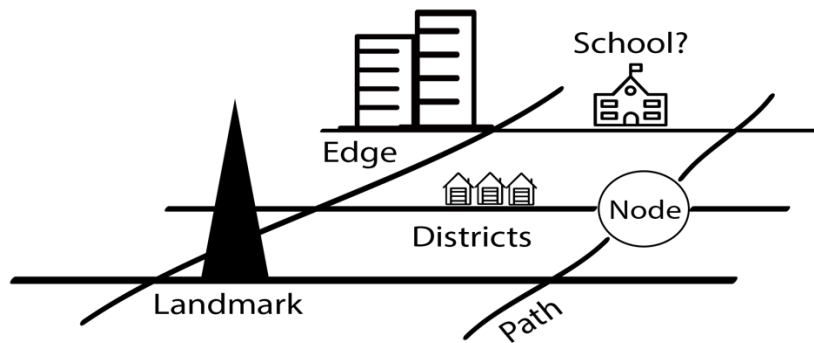
Figure 2-1 School's role in a city

While the issue of a school closing or renovating into some other new function, many countries are challenging the transformation meaning of the school architecture. As a famous architecture, people are willing to know the characteristic of the architecture, what are the characteristics to represent the building in a city. For instance, when people ask what the reprehensive architecture in Taipei is, people are often saying Taipei 101. Taipei 101 as one of the images to present Taipei city. Instead of a famous architecture, as a normal architecture, the characteristic of a building can be in many different aspects such as the architectural style, the material of the building, and the detail design as door, window, lighting, landscape, etc. Besides this, the activity was hosted in the space whether interior or exterior is also the presentive image of the architecture. In this research, to regenerate the school building and make the school building become the image of the city is a significant design when people are trying to reuse the school space in an area. Moreover, school building is a public facility which is also an obviously visualize object to see in an area. Eventually, an abandoned school building without any reuse's possibility, the school building at this moment can be easy to be seen as a bad influence object in a city. Therefore, the idea of regenerating the abandoned school building becomes a primary work either in the urban planning or landscape design in an area.

In view of some reuse school building cases in the United States of America, the Illinois Institute for Rural Affairs studied the conversion and adaptive use of closed school buildings in rural Illinois (Spader, 2007). The research outcome the value of the school building, examples of appropriate uses, procedures use by developers in purchasing the buildings, and brief descriptions of the conversion process. The rehabilitation of abandoned buildings can promote unique opportunities in managing growth in a community. The Illinois Institutes for Rural Affairs, their research report showed several abandoned schools had transformed to new use successfully, to rehabbing the school building, either a

public agency or private developer involved to operate it. Renovated abandoned school buildings can serve as many possibilities use, description as below (Sánchez, Gallardo, & Ceña, 2014).

The first case, Pearce Community Center, Chillicothe, a former of the old Pearce Grade School. Pearce Community Center serves Chillicothe in a greater variety of ways than any organization or institution in this town's history. The school building is also the located in the heart of the community, this mean so much for this school architecture which preserved and converted the building into community center to serve for the community. Secondly, the old school center was the former of Farmington High School that unfortunately burned by a fire in 2014. In 2005, two local residences purchased the building and conversed to a recreation purpose. It offered many activities such as theatre, pin pong table even a small apartment. The special regenerate program was a federally funded preschool program that accelerated to help the empty space into a significant event to continue the school building's value and feedback to the community. With 70,000 square feet, the old school center offered a major connection to a large group to hold all different events, according to the owners, is to "see people have fun and have fun using the old school center".

Last, the Logan grade school in Hanna City, Illinois was closed when the school was consolidated to another district. The Hanna City Village Board bought the Logan grade school to plan to reuse the space. After the school was closed, two local residents purchased the building and tried to reopen it with a new program, but it failed until the building was planned to start with an antique mall purchase by a Small Business Administration. The conversion of the school building went through a fast process due to the good condition itself. Four and a half months later after purchase, South Eden Village opened to the public as an antique mall, handmade artworks, crafts, old furniture, etc. The renewal program also provided freelance to rent the space and required to volunteer to take care of the building. In this way, it also releases the stress of the labor cost.

2.1.2 Culture Dynamic of School Building Environment

In making the idea of dynamic culture, Professor Tom Porter explains that the "Dynamic is the sign of life. Dynamic implies movement, and movement involves energy and time" (Porter, 2004). The social experience of architectural environment refers to a new design viewpoint. From the perspective of a new cultural experience of life, the historical process of region development has influenced the school architecture to play a central role in the neighborhood. Since the unpredicted transformation of societal culture, each period of the school architecture configuration in the environmental space will dedicate the image of a district. Also, the regional development's policy is always focusing on support economic development, protect the land, and improve human living standards that establish a coordination and organization functions between the school architecture and the neighborhood. The characteristic of the culture dynamic is also reflecting the designer's vision and planning strategy that create appropriate redesign programs for architecture environment. Furthermore, the decision maker usually plays a critical role in ensuring the renovation process is well organized to provide supervision and guidance to the participant, private enterprises, and the residence (Li, Tang, & Cui, 2022). The overall architecture environment can be different than before.

At the end of the 18th century, the school architecture's system has changed throughout the entire educational institutions. A group of people (for instance, the academic educator, politicians, and locally active inhabitants) gathered to discusses the connection between people and education. Thus, the perception of school architecture reformed significantly in Europe and continue the local historical culture value to enhance in the society. In the 19th century, a local school gradually developed into a territorially linked school systems, which required a mass site plan with specific school building for the purpose of learning. The evidence from historical resources described when a school architecture is the major dominant of the region landscape, the school is also involved in the representation of the place. Furthermore, school architecture displays the strong position of buildings and neighborhoods (Helfenberger & Schreiber, 2019).

A sustainable regional environment was a society-wide long-term concern; moreover, it remained the quality of citizens' life (Liu, 2022). To start the redesign progress from a place, to understanding the minimum environmental destruction effect by participating the place with human living progression is an important investigation (Fig.2-2). Specifically, the fundamental thinking is to realize the natural progress, then to understand how to take the benefit without destroying the nature resource. On the other hand, the technology usage should focus on two subjects: low-impact environment and high efficiently solutions. A comprehensive school architecture redesign project should learn from the surrounding environment and share the land value with the public (Mang & Reed, 2020)
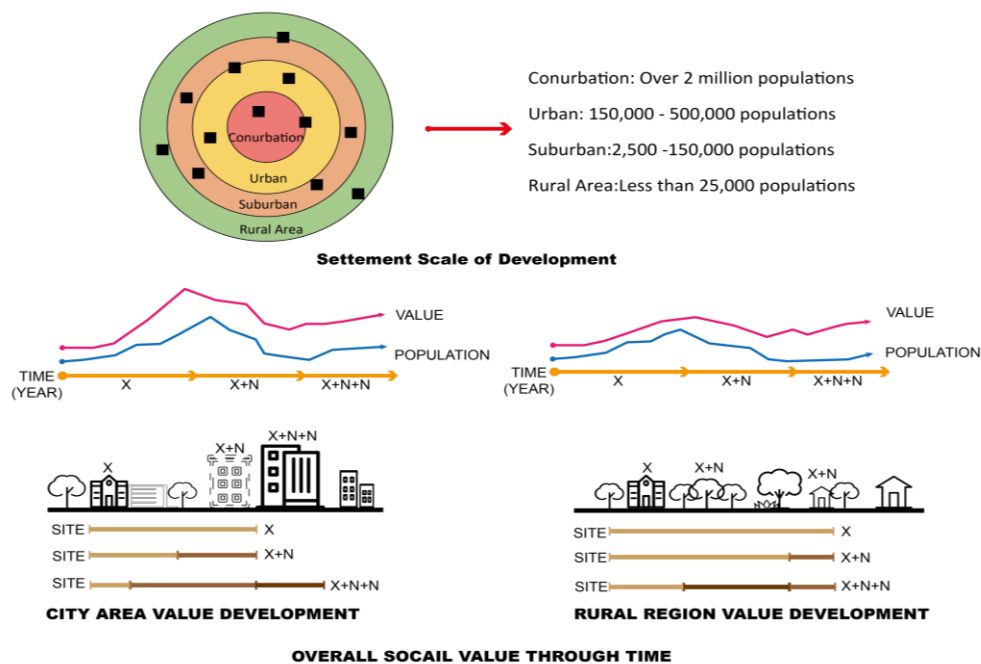
Figure 2-2 The social value of school transformation

Moreover, the reason for renovating the school architecture is to bring in positive effects to the region. Different scales of school architecture have been redesigned to different purposes such as the case of Daimyo Elementary School in Fukuoka Prefecture, Japan. Daimyo elementary school was closed in 2014 due to the loss of the student population. Also, the school is located in the center of the shopping

and business district in Tenjin city (Tsai & Dewancker, Investigation on the Regeneration Architecture Program of Abandoned Schools : An Overview into the Design of School Architecture Characteristic, 2021). Due to the Fukuoka city is one of the main regions for the new starter, the startup center is also located in this building to support another new starter for their business. Every classroom in this school building can be rent by anyone for office, workshop, or studio use. It also has a shared office on the second floor that includes all utility bills and internet to use as well. In this school building, the characteristic of the school architecture remains the design as it is. The building even has a bar open at night to make this school alive. Due to the land scarcity and the urban development policy in Tenjin city, Daimyo elementary school has been preserved and converted into multifunction program for its citizens. The redesigned space offers several utilization functions such as co-working space, restaurant, and rental office, which increase the overall profit of the building and land value (Fig. 2-3).

(a)   (b)   (c)

Figure 2-3 The daimyo elementary school

Japan is becoming an aging society for a very long time and many school buildings have been closed or abandoned either in a rural area or a city. Follow three cases are the abandoned school transformed into various programs such as an exhibition, living or café. The new program brought a new use way of the space, not only one function foe one school building. However, the regeneration of the school building becomes a fresh image for the whole community. The Kyoseinosato Kurikawa INN Museum former was Kurogawa elementary that was closed in 1995 and reopen in 2002. The art exhibition shows not only local artists but also other countries' artists. Artists use the classroom to put the sculpture (Fig.2-4), at the same time, a classroom is also a lecture place. The whole school building becomes a museum that vivid the surrounding and exchanging art information. The museum program works very well here. Another example, Iikane Palette transformed the former Iikane Jingo elementary school into a multi-function program. The school building offers a guest program, invites people to stay in this renovated building. The whole building also in a good condition, the design group conserved many characters of the original like the structure, they redo the floor material to meet the need for the new function. This regeneration program combines many mixes used and it still operates well, the guest house program is an attractive proposal that does also help keep the space running now.

(a)   (b)   (c)

Figure 2-4 The Iikane Palette environment

Last case is Hota Elementary School in Chiba Prefecture, Japan. Hota Elementary School is changed to a tourist center which include a hotel, local agriculture store, and hot spring service in a rural area (Fig.2-5). In this redesigned school, the school building has been extending the extra space from building façade, this is one of the transformation design decisions that is different from other regeneration school cases. While the school is waiting to be transformed into a new program, the school committee also invited the local university student and residences to participate the decision making which comes out an extremely successful result and bring good benefit too.

(a)   (b)   (c)

Figure 2-5 Hota elementary school's environment

Schools remain spaces which are reutilized efficiently in different scales of settlement; additionally, the architectures have enhanced both ecological and social considerations. In spite of being abandoned either due to population migration or economic development policy, both schools' have represented different values in their surroundings. After a systematic redesign plan and a framework of interrelationship with the inhabitants and public living, the school architecture has the potential to represent a friendly built environment.

2.1.3 Social Value Impact of Abandoned School Environmental Space

Taiwan's birth rate has decreased over the year, affecting many schools' entry percentages, which became a problem for managing a school's operations. Many schools have tried to find a method to avoid school closure due to declining enrollment. The population structure is not just a number, but rather an issue related to an entire social and economic environment. At the same time, the aging population is slowly affecting the region's development in Taiwan. In the past, urban-first development strategies have exacerbated a downturn in rural areas during the socio-economic transition. Hence, many companies are willing to invest the business and move their industry facilities to the rural area. This consequence expands the basic infrastructure in the develop region; similarly, more emphasis has been put on the living conditions by the residents. The increasing industrial movement and population have stimulated the economy and land value in the rural areas. However, under this society's survival competition, the public has moved to the inhabitation that possesses more social welfare resources.

Thus, this conversion causes the second population emigration, and area development stagnation happens again in the rural district. According to such rapid switch in social and economic structure, it is quite challenging in building a comprehensive development plan in the rural areas of Taiwan. Taiwan starts to notice the society will be a high aging society that the birth rate is declining every year. And most schools survive to affect by the student enrollment, even for the university. Chong Hua Bilingual School was former the Kao Fong College of Digital Contents, which are both private schools. After the college was closed, I-Kuan Tao bought the whole school building, start to rearrange the campus to

become a consistent system from primary school to high school (Fig.2-6). Students live in the dormitory; their education program is willing to connect to the neighborhood community. Because previous students were adults, the design requirement was not specific to the age between 6-18 years. Therefore, many space layouts have to be redesigned to accommodate the appropriate human scale such as the desk and the chair, they also need to reinvestigate the fire safety for the emergency circulation.

Figure 2-6 The social value of school transformation

In reality, many crises result in overbuilding of buildings or preventing local attractions from staying in the same area; infrastructures such as schools, factories, and houses do not share the similar level of mobility with human beings. In another words, when people switch living places, many institutions are abandoned, which becomes a serious issue in a rural area. In particular, the school facilities in the region face the most severe problems from this population movement. Whether the school has been re-generated or not, school facility still represents a product of an era in the district. Neither elder generations nor younger generations could deny that their time at schools was a memory that existed in their growing period. Despite the emotional aspects of preserving the abandoned school, the characteristic of space design for a school's renovation is a crucial impact on redeveloping a community (Bard, Force, Gardener, & Wieland, 2005).

Essentially, the purpose of preserving an abandoned school is to make the genius loci of the school and its neighboring to be seen again. The prevailing character or atmosphere of a place is the statement to study during this research. The public believes that school facility is an intermedium to reconnect the public and place after its regeneration. Also, this intermedium can assist in collecting the social culture value and identity of the neighborhood, which is an important message for every inhabitant in the near future. In the same way, a professional designer should utilize the knowledge of architectural technic, either emotionally or rationally, to assist the neighborhood in improving the quality of their environment. To summarize, the significance of this research is through a series of architectural design strategies to discover the equilibrium in spatial order, territorial relationship, and programming arrangement; moreover, this study revises the configuration approach in order to improve the design to extend the building lifecycle and represent the scenario of a real community (Chen, 2016).

2.1.4 Combination of School Reuse Space and Social Welfare Value

Before the phenomenon of domestic teenage feminization, schools at all levels may build a large number of school buildings or expand various facilities when they are established due to sufficient funds

or considerations on the number of students enrolled. In recent years, the construction of schools at all levels has reached its peak in the society. When the birth rate dropped sharply and the number of children decreased, educational resources had to be reduced accordingly this circumstance. Among them, some schools that were expanded a lot at the beginning may become lost space or have a low utilization rate in each school space. These phenomena may even end up with insufficient enrollment, and then the school will have to face the fate of consolidation, closure, and abandoned.

There are many reasons for the lost space in schools such as school buildings, gardens or other spaces (Akturk, 2016). Mainly including reduced number of users, improper planning and design, improper management and use condition, restrictions on building laws, insufficient maintenance funds, and disrepair. The nature of the unused space in the school caused by the decrease in the number of users due to the number of young children should be classified as "redundant", which is the nature utilize of "unnecessary". The space that was left out because of the less children situation and is no longer needed by the school. On the other hand, it affects the operation of education before but now the feasibility of transforming the unused space into community resources is obvious exist in the present social environment (NDC, 2023). As this research find out the central government has successively put forward the plans such as the "Overall Plan for the Revitalization of Campus Space" and the "Plan for Revitalization after Campus Consolidation". Although these schemes are to properly use the unused space of the school and maximize the usage of space resources. However, the main axis of its approach is still focused on the business model of cooperating or renting (borrowing) space from the school without affecting the normal teaching of the school after the revitalization.

As previous investigation, there are a total of 230 abandoned school buildings across the country, which 211 have been revitalized and 19 are waiting to be revitalized (TESAS, 2019). The proportion of revitalized uses includes 4.7% for sightseeing and leisure, 14.69% for social welfare, cultural and educational institutions, 56.4% for use by institutions or groups/self-maintenance by schools, and 24.17% for site return or demolition. Among them, less than one-fifth of them are used in tourism, leisure, social welfare, cultural and educational institutions, which shows that the revitalization of the abandoned school buildings has not involved too many communities and non-governmental organizations. Furthermore, the strategic goal of revitalizing unused spaces is still lacking in response to the social structure of "feminization of senior citizens". The way to improve should be combined with the resources of local agencies, communities, and social welfare groups. They should consider the population structure of the area, cooperate with the current long-term care plan (commonly known as the long-term care plan) or increase childcare services, etc. Allow the reuse school to participate in and jointly plan multiple programs and activation uses. On the basis of the aforementioned improvement directions combined with the resources of local agencies, communities, and civil society welfare organizations, based on their consideration of the population structure of the area, and on the basis of current policies and social and environmental needs, the revitalization of abandoned schools should be based on several aspects (M.O.E, Study In Taiwan, 2021). This research is recommended to proceed in few suggestions as below.

1. It is not easy to obtain land in Taiwan. To meet the needs of the aging society and the

encouragement of childbearing in the social population structure, the use of school unused space should establish a legal link with relevant social welfare laws and regulations, so that school unused space can become an aging local community resource.

2. The current mechanism for utilizing idle space in schools should break away from the model in which a single educational unit is responsible. Change to a multi-management model so that other units such as social welfare units can participate in the management and operation. At the same time, it can also free up more school idle space such as venues, software, and hardware equipment, or add teachers for local use.

3. The school space that is a public asset should be transformed into a place of diversity, service, sharing and co-creation by setting up public and shared architectural spaces. For instance, kindergartens, combining community-related activities, or adding local industrial education facilities. Consequently, to provide a regenerative campus space where everyone can participate.

2.1.5 Built Environment Design and Social Engagement Strategy

Social media has been part of a human's daily life that usually becomes one of the communication tools in this social environment (Bergerot, 2022). While it is true that social marketing and content marketing are inextricably linked, community marketing is also spread content with a fresher, more professional way to package content, to maximize the benefits of content marketing. It does not necessarily follow that urban creativity and placemaking can solve the social issue or political aspects. However, social media has changed the traditional architectural design process; people will know, hear, and learn from online technology. Nowadays, a design project cannot just focus on the spatial relationship; to execution, the architectural design project is important to connect people's minds. A strengthened link between architectural design and all kinds of social media in the digital era is expected to reinforce the idea of urban creativity as placemaking strategy (Tsai & Dewancker, Architectureal Design Process Combained with Social Media Technology:A Case Study on Urban Creativity and Placemaking Strategy in Taiwan, 2020).

Currently, the participatory placemaking strategy put into practice, this research mainly focused on applying Facebook, YouTube, and website with the design process. The social media technology is designed to develop the architectural project process that has been seen and communicated to the public; through this platform, people can brainstorm the idea easily and adjust comments quickly. Furthermore, it will indirectly tie up the connection between the place and people, effective communication, teamwork, self-learning, and environmental design to implement the social practice. In recent discussions of the architectural design process, a controversial aspect has been digital media is a new design technology in architectural design. On the one hand, some argue that digital media is part of the architectural education system. On the other hand, others argue that digital media shouldn't be involved in the architectural design process. However, neither of these arguments considers the alternative view that digital media currently plan an important role in architectural education training. Architecture is related to human science, art, and social science subjects. It is about environmental issues, social culture, and human

behaviour; additionally, architecture design is a situation where people are peaceful and agree with each other, or when things seem right or suitable. In this research perspective, architecture design is the in-between harmony place and people (Fig.2-7).
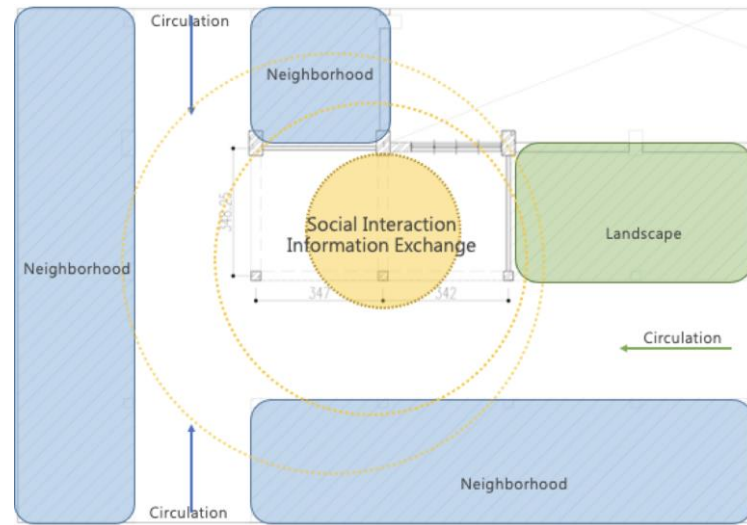
Figure 2-7 A place for social interaction information to exchange the daily information

Additionally, studies of the architectural design process have indicated that the internet is slowly dominated by design thinking and method, even though it has taught or invited the skilful expert from the professional filed. However, it is not clear that this conclusion applies to the idea of digital media as part of the design strategy still becomes an abstract thought during the overall architectural design process. People see digital media as a new design tool that proposes their design in machine reusable or digital architecture form on architectural design. Examples of projects often to discuss by Frank Owen Gehry, Walt Disney Concert Hall, also Dame Zaha Mohammad Hadid. Generally speaking, digital is any data represented with a series of digits, and media refers to a method of broadcasting or communicating information together. Digital media refers to any information that is broadcasted to the public, is transmitted from the internet for viewing, which everyone hears very common is social media. To put it another way, the architectural design process combined with social media technology will bring the design process and its outcome to a new scheme level.

Social networks have traced the concept back to 1967, called "Small World Phenomenon" by Stanley Milgram. Professor Milgram was a psychologist from Harvard University; the research was examining the average path length for social networks of people in the United States. He suggested that human society is a small-world-type network characterized by short path-lengths. The experiments are frequently associated with the theory "Six Degrees of Separation." As everyone knows, a social networking site is also known as social websites, an online platform that provides users 'information such as a public profile, user images, or events. It establishes different rules for connections. A user can confirm or deny the new person's request to interact or not; during the connection phase, people can make their own decision by allowing or inviting this further new user from the suggestion list to make more connections. People create their person's network background to introduce themselves like LinkedIn, a person's professional date and his major, the skills, or the interest. It is more like a digital

business card that has a more detailed description. In the last decade, social networking sites have begun a serious revolution until the name social media comes out, from writing an email to instant message and Skype, personal blog to Facebook. The internet technology first brings interaction to the public or semi-public profile page. Social media's emergence has the connection and profiles, combines with the digital tools to share information, even emotions online easily and quickly. While social media straddles the line between personal and business, it is beneficial for a specific culture, purpose, or user bases. For instance, fan page or industrial groups, within click the Like button (thumbs-up), share, or follow on the news feed, open a new page of communication in this society's markets.

Participant architectural design with social media shows social media as a design tool in the architectural design process have some advantages. Site appraisal as known as site analysis often, the site appraisal is the first tangible piece of information produces at the design process. Since online resource has been very convenient, people who will visit and understand the environment condition are easy to know but hard to realize the essential meaning. A placemaking project which the writer has the own experience of creating a CO-UP studio to start the placemaking process in Taiwan (Fig.2-8). Thus, we change the design education behavior as a placemaker. Even though the designer collect data from site visiting, if they don't start to communicate with the locals, there is still only a little information to support them from what they have been experienced. Interviewing is one of the participant methods for placemaker who involve themselves, asking questions about the environmental contents and, hopefully, receiving answers from the locals. Because designers have been surveying the site by themselves. Therefore, the interview structure will suggest use a semi-structured interview type. This type of interview is widely used for students, they had predetermined questions, but the order can be changed by the interviewer's perception of what seems most appropriate. In this situation, designers might take more time to back and forth to know the local's society's useful answers.
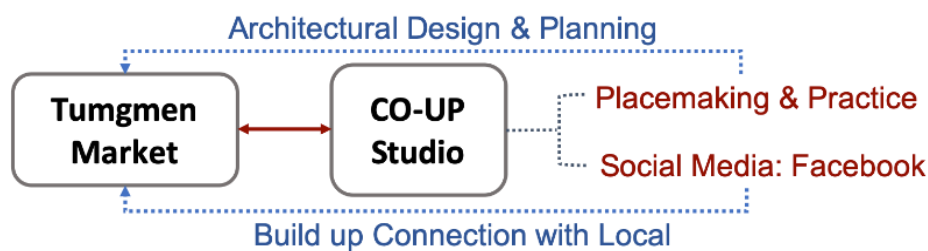
Figure 2-8 Placemaking design process in a specific architecture design project

Additionally, participant design is often used to service a community's project, which in several cases, who lives in the stalls or operating a business in the local area. Designers need to know virtually every person involved in this social community because the main purpose of participant design requires students to observe and attempt to become one of the communities. A physical presence and chatting and involves local's daily life are part of the social culture. Students learn their social routines and habits, even their business management or non-verbal communication, to go through the process. To record the outcome, students designed a daily work timesheet and used social media to record what they have discovered from the environment every day. Back in the 1960s, Bernard Hunt architect noted that "We

have theories, specialisms, regulations, exhortations, demonstration projects. We have planners. We have highway engineers. We have mixed-use, mixed tenure, architecture, community architecture, urban design, neighborhood strategy. But what seems to have happened is that we have simply lost the art of placemaking; or, put another way, we have lost the simple art of placemaking. We are good at putting up buildings, but we are bad at making places." Placemaking is one of the design approaches that often uses in a public area with basic society collaboration. The traditional architectural design may have a site to visit, an invisible client in a design project but never have the opportunity to deal with the real problems and build it. Therefore, in this research participation students are going to deal with environmental issues such as structure safety, electricity and water system; also, social humanities issues. Nowadays, architecture students can render very nice graphics with beautiful light and texture of the space, but they never understand the purpose, even the design concept looks perfect to be not realistic. The design has no connection to the local environment; thus, understanding the circumstance in a real-world for these young generations, this project advocates placemaking is a good strategy to educate the architecture students (Fig.2-9). This practice design of placemaking process is also a new experience for all students to participate the architectural design than the traditional architecture design studio. A real space design project will be transformed after everyone's effort in this placemaking project.

Figure 2-9 Placemaking process of CO-UP studio in Taiwan

Most people assume that social media is helpless in the architectural design process. But I say social media like Facebook stimulate participant's' attention and their behavior. It is a big challenge from traditional architecture studio to go through the design process combined with social media strategy. Create social media attract participant's' minds that improve people's connection, but social media also affects the design communication when the project needs to be finished. To test the hypothesis of placemaking with social media strategy that the architectural design process combined with social media technology could help the design process become efficient, this research preset social media from Facebook, which utilizes the Fan page and Group function (Fig.2-10). Our progress suggests social media should involve in the early design phase. Managers or staff who trained to represent an organization to connect to the local community; meantime, they uploaded and shared on the social media that was opened to the public to view.

During the architectural design process, the internet or social media has become common today to search resources online instead of finding solutions from books; students' study method has also been developed into many options. Dialogue between projects' idea and people turn into instantly and very

convenient. Moreover, in the documentary, the design process begins transparency and complete. Following the description, the user will indicate whether students, educators, or people in general.

Figure 2-10 Placemaking project's process share on the social media fan page

Conventional wisdom has it that social media is a platform that allows people to create content and interact with each other. However, now social media becomes the tool to communicate during the design process. In the social network world, a social community is not just a particular channel. "Community" can refer to a group of people or a place where a group of people gathers online; in this case, all participants will join both the department and project's Facebook fan page and group. Furthermore, users also send the invitation to their friend, even friends' friends to join too; the reason is spreading to each community as possible to catch people's attention. The concept of interactive and user-driven behavior has been provided on social media easily, writes a pose, or leaves a comment to be a new way to connect. Users post a description of the task; others leave comments to share experience, express emotion and update content. Communication the idea on social media is fast and direct because this interaction can take many forms. First, sharing links to interesting content produced by third parties, multiple information can simulate a user's creation. Second, users can understand each task at any time, no matter public updates to a profile, including information on current activities, sharing photos, videos, and posts. Finally, users can review and organize the project process if users are well-planned for the posting schedule and content.

The finding that social media create an attractive purpose for students during their design phase, such as visual expression, the project to be seen in public and online, encourages their learning interest to achieve an accomplishment. This course results or data information can also be published on social media. The place can become a space for the interactive exchange of market information. Hoping to use the placemaking project to transform and reuse, attract more people to the new school program to reconnect the place. Moreover, inject more young vitality in this over a hundred years of architectural building. But some circumstances will accidentally occur that this principle need to have the skill to know how to adjust their attitude and actions during the design and placemaking progress. In many cases, there are still many elder generations who live around the community; due to the history of the school memory, many stories of the memory collection bring the advantage to the school space. However, it may also cause some problems; people will speak out how the political issues, and it adds their emotion to us. For instance, an academic group might involve in an odd situation between the city government and the community.

Using social media technology as a design tool during the school regeneration process and after,

it tells us a great deal about promoting what we do. It will also increase other societal problems like negative criticism, emotional language, and forge impression from anywhere? With social network technology everywhere, followers grow, social media has positive and negative effects on our society and value. Undeniably, social media shows the power of traditional media's limitation by spreading and sharing an idea, looks interact with others but barely connect to their mind. Young people on the internet always want to render the "perfect" image, even depressed, and pretend to be happy. This behavior sluggishly creates pressure on themselves without notice; social media has caused young people psychological health crisis; this is a global problem. In summary, this research study shows that educators demonstrate an appropriate perception among the physical sense and mental cognitive is important during the architectural design process, but how deeply involved in the design process or what platforms a social media is involved as a design tool remains unresolved.

2.2 Placemaking Design Progress of School Building Enhancement

2.2.1 Behavioral Sciences and Environmental Space Intention

In this research study, while the person-environment theory can be called as organism-environment theory maybe is a batter explanation to describe the relationship between behavioral sciences (Abdullaeva, 2020) and spatial design. Because this theory needs to describe and explain the stereoscopic environment configuration in different organisms that can afford its inhabitants. However, this research focuses on the spatial allocation relationship at the quality level, basically taking users in a specific place as the main starting point (Cleveland & Fisher, 2014). Therefore, the concern is the human environment and the relationship between people in the environment. Based on the understanding of people, he is a biological individual, a psychological emotion, and inextricably linked to society and culture. The purpose of the discussion is to enhance the understanding of the so-called architectural forms and the spatial environment of the facilities in the architectural tradition at the level of action and emotion. Procedural in design is a practical nature that deals with the scope of environmental design. But design cannot be science, it can be described from a program or process and solved into research using scientific methods. In other words, the learning process of this study focuses on describing and explaining the relationship between human activities and patterns of the built environment (E., Jr., & E., 2012).

The psychological study of behavior related to the daily physical environment can include many theories, such as perception theory, cognition, social and anthropological psychology, social relations studies, and cultural studies. The physical environment is part of the design process, and the characteristics of the physical environment are particularly important to human ecology. The basic goal of behavioral science is to develop empirical theories to describe and explain phenomena and to enhance the user's perceptual behavior in the built environment (Meng & Haggard, 2016). In the current architectural design process, designers and users often have different cognition of space use, designers usually use their own design intuition ability to make judgments in advance in an attempt to guide future users to use the designed space. But the future user's perception of space cognition, without training must accept the space designed by the designer, and there is often a large gap between the spatial cognition

between the two. So, suppose that the future activities and value patterns of users in a building space are predicted through the theoretical basis of human behavior, that is, as a space designer, if the designer can train in behavioral science knowledge, he can predict the behavior relationship between future users and the spatial environment advocate action prediction and prepare space design ideas. In the future, in the process of designing and implementing the overall space environment, the problem that the space design does not meet the needs of users will be avoided.

Behavior design is not only to learn from process experience, but also to think about what can be used as a learning improvement direction for design in experience. In the past, the evolution of architectural history held that architecture must serve three basic purposes in lateen words: utilitas (utilities), venustas (beauty) and firmitas (strength). Similarly, other scholars have argued that architecture, like all working art, must have a way to guide its operation and produce perfect results. Therefore, it is also said that a building must have three characteristics: commodity, firmness and delight. The change of architectural style has also had a significant impact on the overall history of architecture, so the variety of technology has also become one of the important characteristics of architecture in 20th century. However, there are many changes in architectural styles, which also come from many interrelated factors of the contemporary environment, such as: changes in lifestyle, social stratification, changes in values, and economic and cultural changes, and the development of diverse technologies from available resources. Modern designers often set the functional goal of design on the commercialization of buildings and taking into account safety, but in fact, the diversity of forms will also affect the aesthetic experience of users' use of space. Aesthetic functions must be perceived from other functions contained in the physical environment, and users create presentation methods based on symbolic aesthetics to convey information about their own or others' expectations before conveying influence on those around them. Assuming that the process of space reuse is for designers to once again create an environment that meets the requests of users, then the artificial environment, if properly reorganized, will meet the basic needs of human beings: survival, safety, cooperation, respect, learning, aesthetics, etc. Consequently, one of the statements of this study is also to strengthen the sensitivity of designers to the needs of users in the specific place.

For most environments, designers can identify problem points in one place and find or create the best design results in a particular connotation. Generally speaking, these results will be a number of complex space desires. Also, a variety of different users and groups, but also a variety of different needs and lists to be met. Environmental design problems often arise from the disparity between the current environment and the configuration that better meets the needs of an individual or group of people. Therefore, designers are not only concerned with solving problems and obstacles in human development, but also enhance the user's diverse experience and create an important design task for environmental space. All environmental design issues are unique and do not have a specific formula to deal with. Thus, it is unreasonable to make everyone feel satisfied with each building, spatial function, or open space design, or to expect any one solution to meet all needs equally. Hence, through the process of environmental design, and people adapt appropriately to the environmental behavior and spatial

cognition created by this process, it is one of the ways to achieve respect for the sustainable environment. In other words, it is hoped that the environment of public life, there is a public building space that can combine more diversified social life patterns and rich physical environment, so that the architectural space is more flexible and open to diversified use to adapt to the current living environment (Hall, et al., 1968).

Architecture, landscape design, urban design. In fact, they are all modes of supporting user behavior and movement. Users do not necessarily have to feel the best, but many inadvertent usage behaviors will be affected by environmental elements and space configurations in a shallow consciousness. For privacy, personal space, sense of domain and design, there will be different spatial experience and psychological feelings. The analysis approach towards behavioral science and the architectural theories from this research are based on the theories from Edward T. Hall (Brown, 2001). Edward came up with a theory called proxemics, which is a theory that studies the necessary space between users and their behaviors (Fig.2-11). Furthermore, the relationship between culture and social environment, includes three different levels of behavior spatial definition: privacy, personal space, territoriality. The beginning of this study discusses the hierarchy of space design in public school spaces by using the space syntax methods and proxemics theory. However, as the social environment structure is different from the past, the analysis criteria of spatial behavior is modified in accordance with the current redesign situation such the region crisis, participant communication, and lack of local resources. Therefore, it is important to understand the built environment's distance between each different human behavior in various situation. Not only to respect the social distance between one person to another person but also to respect the connection in between when it is a public environmental space.
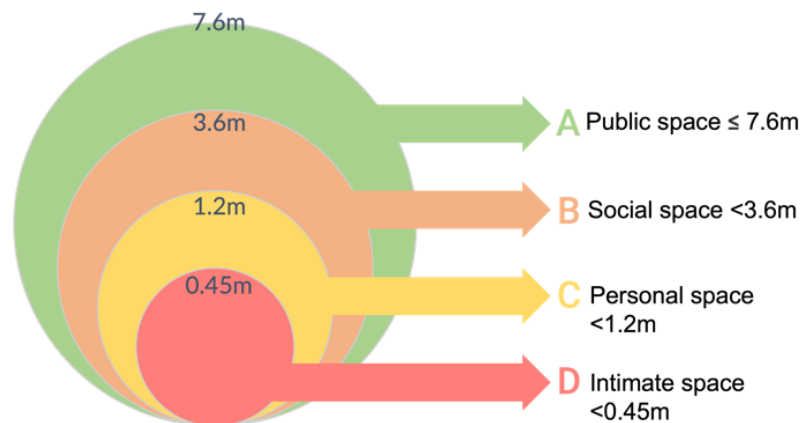
Figure 2-11 Proxemics theory by Edward T. Hall

According to the concept and method, each research material demonstrates the different quality of space reuse efficiency and provide a distinctive approach of architectural design mechanism. Additionally, when the architecture programming has been established, the influence of the facility's function determines the user behavior. These various arguments will have significant applications in user legitimizing identity as well as in project identity in the region. Beyond reconfiguring the school space, the relationship is encompassing the identity of region and building together, which is an important effect

with regards to reestablishing the built environment in this study. Designers are always making judgments and design decisions for uncertain things, and the opportunity for space recycling happens to allow designers to reduce uncertainty through the process of regenerative design, combined with the concept of spatial behavior, but it cannot eliminate uncertainty (Fig.2-12) (Huitt, 2007)8)
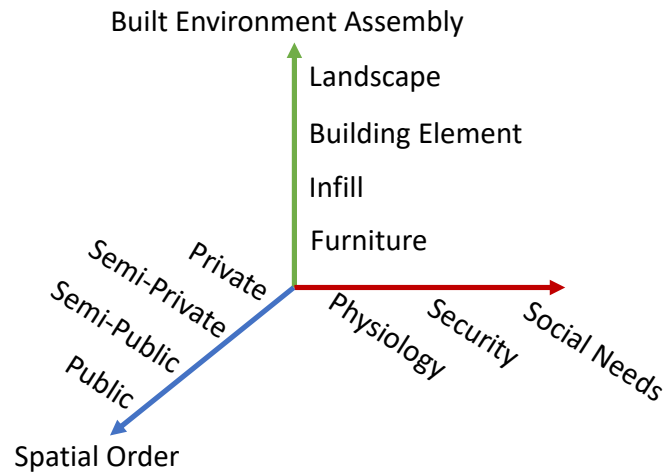
Figure 2-12 The Social Value of School Transformation.

In this study, the research process focuses on the purpose of human service users in the environment, rather than the method of building materials and spatial geometric composition. The purpose of this process is to reduce the uncertainty of the issues arising from the current environment that the designer is involved in, and how to use the elements and spaces in the environment in the design process, and how to serve the user. Through the regenerative design method and the reconstruction of architectural functions, the purpose is to point out how environmental elements and spatial configuration affect users' perception of the environment, which is called spatial imagery. In addition, the activities that occur in a place will affect the user's image of the environmental space. In other words, spatial cognition is influenced by spatial behavior patterns, as Moslow points out the most basic human needs: the need for security and belonging, which also refers to the user's mental safety function in the space in the built environment (Fig.2.13) (Huitt, 2007).
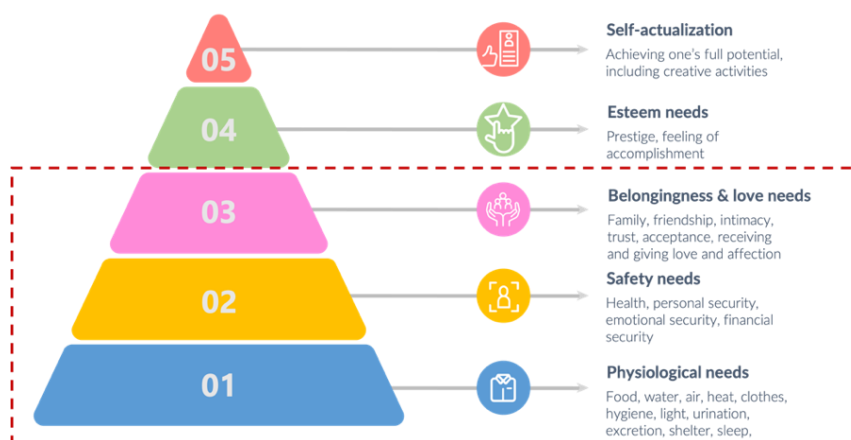
Figure 2-13 The basic human needs by Moslow theory.

2.2.2 Role of Supportable School Environment Development

A sustainable school environment becomes an important task in the society environment. With regard to accomplish the task, this research has structured the subjects to explain the purpose of reusing the abandoned school space in the local neighborhood. There are seven subjects to describe the role of sustainable school.

(1) Encourage the social interaction between students, neighbors, and participants.

(2) Diverse learning among the cultivate group in the community.

(3) Educational resources effectively integrate and utilization.

(4) Construct a high-quality learning environment.

(5) Balance the education functions of urban and rural area.

(6) Ensuring the rights and interests of students in school.

(7) Inheriting the culture characteristic of the region.

When a school faces the problem of abandoned and transforming, the local competent authority should plan a scheme for merging or closing the school. A campus space utilization and financial support plan should be proposed to make multiple use of the unused space after the school is closed. Also, there should have a team to regularly review the status of the school regeneration, to keep track the reuse situation and review the effectiveness of consolidation. Therefore, when merging or closing a school, a number of principles should be comprehended. On the premise that students obtain the best teaching environment and learning effect, provide students with a wider range of cultural stimulation, enhance peer interaction, and promote learning effects. Provide special care for students in areas with unfavorable geographical conditions, protect students' right in education (Benito, 2003). Improve the phenomenon of teacher turnover and the high proportion of proxy teachers in rural areas.

Also, enhance the division of labor among teachers, which is improving the teaching standards. Whether to consolidate or not, the decision maker must evaluate school resources, school convenience, and class size. People should consider factors such as cultural stimulation of students, community development, and financial efficiency. To ensure the rights and interests of the Native Taiwanese people and students in mountainous and rural areas that is another attention point. In addition to considering factors such as geographical transportation conditions, cultural heritage of tribal communities, and economic development.

However, it is not appropriate to abandoned and merge schools just because the numbers of the school enrollment, school consolidation should be considered more carefully while making the final decision. If the assessment is to merge or close the school, all relevant groups such as school committee and stakeholder should communicate and coordinate with the public. After the consolidation, the campus and equipment should be properly planned for reuse, but don't forget those students who suffer from school consolidation, it should be provided the basic service such as public transportation, student accommodation and other supporting measures. According to the literature reviews, during the school consolidation or abandoned evaluation, there are several social issues should become the consider criterial in the revitalization case (Table 2-1).

Table 2-1 Evaluation Criteria of School Consolidation and Abandoned

Category	Population	Standard of School	Geographic of School	Physical Equipment Requirement
School	Population of students in the region	Distance to public schools of the same level	transportation between neighboring schools to school	the merged school need to build additional classrooms and enrich equipment
Government	The growth of immigrants in the region	History of school	The role of schools in local economic development	Items designated by the local competent authority
Community	community population growth condition	Community or tribal cultural inheritance and economic development	Dependence of the community on the school	Safety needs for community use of school spaces

Schools that have under the school space renovation project can help the original school improve the situation of the existing abandoned school through the renovation plan, and it can also provide the newly improved campus space for teachers, staff, and students. In addition to a high-quality learning space, the new school space can also open to community residents, which is shared the school resources. In order to achieve the purpose of transform the abandoned school into a rebirth place, the following is a list of the principles and application methods for subsidies that the revived schools in Taiwan can currently receive. First, subsidy principles. The subsidy funds are limited to capital expenditures for improving space planning, moving lines, audio-visual equipment, and books in this project. Subsidy criteria: The approved funds are capped at NT$2.8 million per school (hereinafter the same), and the subsidy funds are capped at NT$2.5 million.

Secondly, application method: Public schools at all levels below senior high school should fully evaluate the current situation of the school building, confirm the service target and plan the service strategy, and develop an application plan based on this, and submit it to the educational institution with the required attachments according to the limit. The content of the plan should include work content, progress, service planning and operation management (including community introduction, open objects, opening hours, service content and management manpower planning, etc.) and expected benefits. Also, the appendix of the plan should include a schematic diagram or schematic photo of the space renovation, a campus configuration map, and photos of related equipment purchased. It is also advisable to describe in detail the construction method and the reason for the improvement of the planning space. Local governments should review the feasibility of school plans, including space planning, service planning, operation management, strategies for providing community use, urgency, and the necessity and rationality of purchasing (building) facilities and equipment.

Finally, review method. The agency will conduct written review according to the plans and funding needs of public schools at all levels below the senior high school level, and conduct on-site surveys, fund verification and allocation according to actual needs. Another application method that causes the whole process becomes a bit difficult is the application process of the subsidy funds. Usually,

the subsidy funds are support by every year that the school committee needs to provide all application documents to the government again and again. All waiting time, paper works, and physical condition of the school building are having trouble to keep up everything together at the same time, especially the manpower ability verse the money issue.

2.2.3 Balance between School Renovation Maintained and Regional Development

The building functions of public-school buildings belong to public service purposes. At present, there is no possibility of self-compensation or income in the regeneration cases of school's regeneration in Taiwan. If they are only carried out according to the self-raised budget of each local government, the maintenance of each school after going through the transformation process may not be able to handle or the willingness is not high enough to promise to continue the operation work (Kremenić, Andlar, & Varotto, 2021). This phenomenon will cause the school building to face the same problem of abandonment and infinite delay in improving the current situation again (Dias, 2015). Therefore, it may not be able to achieve the benefits of building a safe and healthy campus to offer multiple services for the community. At the same time, it won't also provide a convenient and safe environment for activities and learning to the community residents. Also, the phenomena as the public construction projects that the people may feel unlikely, which will lead to the public's dissatisfaction to those school buildings. Furthermore, local residence will loss the trust and perception to the government that is not a good impression to achieve the sustainable community and cities (Pedersen Zari & Hecht, 2020).

Risk assessment is always a subject that needs to be reviewed during an object's maintained and management. School architecture belongs to public assets that when the participants are trying either redesign the space or operate the place (Cai, et al., 2023). The rebirth number of abandoned schools is a huge data to collect, and the process of rebirth involves a lot of relevant professional skills, which is not competent for administrative agencies and schools at all levels. Therefore, in order to solve the problem of insufficient professional skills of relevant units, it is necessary to assign a professional organization to set up a special project working group to provide professional review manpower, conduct multiple professional publicity and personnel training. So as to facilitate the maintenance and operation of the regeneration space in the later stage, and to implement uncertain risk factors in the overall regeneration process are minimized. The business operators of local governments and schools often have too much business, resulting in frequent personnel changes and experience that cannot be passed on. Relevant laws and regulations need to be established clearly so that the undertaker can understand the relevant administrative procedures. At the same time, the administrative staff will also assist the school committee in solving related issues such as planning, design, and construction of new or expanded space. Avoid affecting the progress of the project due to changes in business contractors is a significant factor.

Operations management is another key point to continue using the school after the rebirth process. Implement plan implementation schedule management, quality control and follow-up operation management, etc., to maintain follow-up operations and provide community residents with related services. And entrusted to conduct study or observation activities to enhance the professional knowledge of executives and help the smooth implementation of the plan. The operation and management of the

local government should make a comprehensive and reasonable plan for the scale of the school, establish a management system, plan the progress of the project, and supervise the completion of the preparatory work of the affiliated school, to maintain the follow-up operation of each work item of this plan and provide relevant services for community residents. Establish a safety management mechanism and formulate annual planning measures for the new needs of school buildings. Considering the lack of engineering experience of some school personnel, the project may be handled by the local government as needed. To encourage schools to cooperate with this plan to open up the campus space to provide various community services for community residents, a two-way feedback mechanism for the community can be formulated (Cole, 2012).

Although the operations management system has part of the regulation been controlled by the government. School committee's operation management is the main mission and key to keep the school architecture endure in the community. For school operation management, it is necessary to evaluate demand estimates, submit plans, select technicians or architects for design and supervision, control project progress and construction quality, and implement safety management for teachers and students during construction. When carrying out project contracting, contracting, construction, acceptance and other operations, relevant organizational personnel involved in the regeneration of abandoned schools need to jointly supervise the construction of the project and pay attention to the quality of the construction. If public space planning is involved, the needs and opinions of different genders (such as school parents, community members, etc.) should be consulted to create a gender-friendly public space, thereby improving space utilization and user satisfaction. In response to social changes, the architectural plan for the regeneration of abandoned schools should move towards a safe and simple, healthy, and friendly, sustainable, and environmentally friendly direction (Tainter, 2012).

2.2.4 Placemaking Utilization of Design Thinking Process in Taiwan

To seek a new trend of the World Business Council for Sustainable Development (WBCSD), the education system and its performance are also transforming in various educational styles, especially starting from the fundamental school education system. Recently, this trend has also affected the education system in the university, which is known by the University Social Responsibility (USR). Therefore, in 2018, the Ministry of Education promoted the University Social Responsibility (USR) Program, which encourages universities to actively participate in regional development and make universities important partners in regional development. This will explore the practical significance of USR from different aspects, such as the background, goals, and implementation methods.

The concept of USR has been around the world for many years; the United States and Canada began to promote the responsibility of university team sustainability around 2010. Between 2012 and 2014, the European Union University Social Responsibility (EU-USR) was announced by the European Union University Social Responsibility (EU-USR). As universities are the cradle of talent development, if they can actively participate in social development and help local society solve problems through their knowledge, technology, and resources, it will help cultivate talents with a greater sense of social responsibility. USR aims to make universities more focused on local issues, provide professional

knowledge and technology, and contribute more to regional development.

Through USR, the University will work with local communities and industries to identify problems and design solutions that can contribute directly to society and regional development. In addition, through the interaction between the University and the local society, USR also makes college students more socially responsible and professional, applying what they have learned to solve local problems to cultivate more socially responsible talents. In addition, USR also hopes to promote attention to social justice and human rights protection through the University's power to improve society's overall quality. How USR is executed USR's implementation methods are pretty diverse, including courses on social responsibility, establishing social responsibility centers, and cooperation with local social groups. Among them, the most direct way to cooperate with local social groups is to explore local problems and provide solutions through cooperation between the university and local social groups so that the University's knowledge and technology can directly give back to the local community (M.O.E, USR, 2019).

In addition, the establishment of a social responsibility center is also an ordinary way for the University to more systematically promote social responsibility-related work, and establish a relevant indicator evaluation system, so as to better achieve the goals of USR From international trends to the policies of the Ministry of Education, they have begun to vigorously promote "University Social Responsibility" (USR), with "local connection" and "talent cultivation" as the core, starting from local needs, so that teachers and students can integrate relevant knowledge, technology, and resources in the process of insight, interpretation, and participation in real problems to assist local development and innovation. The greatest strength of USR is that it releases the academic energy of the University from the ivory tower. Universities often have technology and specializations but need to know where they can be applied; USR is like a bridge between the two. Universities help localities analyze dilemmas, look back at their departments, and propose corresponding solutions after integration.

In summary, the school year of 2022, 15 schools passed the public and private experimental education plan, it has increased of 6 schools compared with the school year in 2017. The number of students is 2,517 students, an increased number of 640 compared with 1,877 students in the 2010 school year, which is also including 1,460 students from middle schools, 780 from junior high schools, 277 from senior high schools, and 10,609 students. These number of students participating in the school year of 2022, the non-school experimental education was 10,609 for the total students, it had 6,595 were the most in elementary schools, 2,224 were in junior high schools, and 1,790 were in high schools (Table 2-2). This result shows that the overall educational environment has changed to another educational system, the traditional education system is changing because the trend of the direction to meet the new period of the social environment.

Table 2-2 Overview of the Experimental Education School

Year	Total Schools	Public schools entrusted by private individuals' management	School Style	Total Students	Type of non-school style	Public schools entrusted by private individuals' management s	School Style

School Passes by the Government				Total of Students			
2017	62	9	53	12614	5598	1877	5139
2018	74	10	64	15466	7282	1904	6244
2019	91	11	80	18110	8245	2190	7675
2020	104	13	91	20042	8744	2379	8919
2021	114	15	99	21703	9680	2487	9536
2022	124	15	109	23847	10609	2517	10721
Elementary School	86	8	78	15579	6595	1460	7524
Junior High School	26	5	21	5713	2224	780	2709
High School	12	2	10	2555	1790	277	488

Regard to the idea of different educational system, a sustainable environmental education oriented by participatory placemaking strategy can become a new action related to the concept of University Social Responsibility and built environment design between the educator, designers, stakeholder, entrepreneurs, and government. According to this concept, an experimental education project has accomplished an educational practice by using the placemaking concept in an architecture design studio program (Fig.2-14.
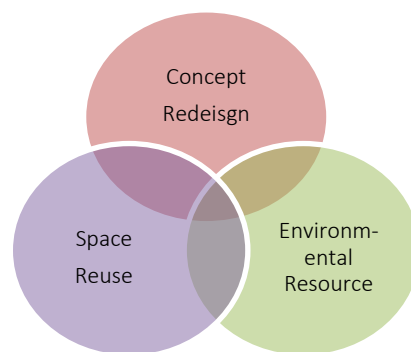
Figure 2-14 Sustainable environmental education concept

Sustainable environmental education has been a major subject in the architectural education program. A complete architectural design learning process will also focus on the concept of sustainable and environmental control that people are well known by green architecture and its technology system. Students are able to learn the knowledge from the university and use in their design project. Despite the university has taught or invite the greatest person from the professional practice, the idea of sustainable still becomes an abstract thought for students. They see sustainable as a slogan that proposes its design as their design gold of a sustainable environment. However, few students choose their design project to follow the crowd. On the contrary, many of these supposedly design their project in front of their computers are actually concerned walked into reality. For the truth is that there are many very good reasons for students to take the chance and participate in the real design project (Ekomadyo, Nurfadillah, Kartamihardja, & Cungwin, 2018). Perhaps students are willing to take a challenge to solve the real

design problems and utilize their skills.

In this research, the university plays a role to link architectural design education and regional cooperation (Esparcia, Escribano, & Serrano, 2015). While the targets to be achieved is to accomplish the client require and solve the architecture issue use the skills and resource from the university. In the 1990s, sustainability is one of the most important concepts to enter design thinking. Unfortunately, misunderstanding and misuse of the idea and objectives turn the word retain little meaning. The definition of sustainable is a society-wide long-term concern; moreover, it remains the quality of life not just the physical requirement, the majority is the mental need that we need to be noticed. The definition of the environment in this research will redefine as three-dimension space with human satisfaction. Technology brings tremendous convenience to this society, but it is indirectly to decrease the value of our landscape too. Consequently, educator continues develop the strategy and express the concept for next generation to become the urgent takes.

This design project is a traditional market called Dongmen market which is located at the center of the old town in Hsinchu that holds memories of different generations (Fig.2-15). The market has been standing in Hsinchu for 108 years and has the first escalator in Taiwan. The building has three floors above ground and one basement floor. There are more than 500 stalls in this building. Unfortunately, more than half of the stalls have closed due to changes in times and consumption habits, resulting in many low-income people or homeless stay in the market that cause certain social issues. Fortunately, in recent years, many young entrepreneurs have begun to settle in, and they have started to be lively at day and night, traditional to new business, from fresh, retail, restaurant, café, antiques and studios that bringing new phenomena to this old market (Fig.2-16).

Figure 2-15 Location of Dongmen in Hsinchu City

1911 • The biggest public market in Taiwan.

1970 • Fire destroy part of the building, and remodel the architecture untill present.

1990 • Globe industrial environment has been trandsformed to thea new ear, traditional maket had become threaten situation.

2018 • Goverment encourage younger generation walk into the market and set up a new policy for it. A new youth entrepreneurship site has been established.

Figure 2-16 History timeline of Dongmen market in Hsinchu City

In the traditional architecture studio, students usually seat in front of the computer or desk to think about the design. They may go to visit the site a couple times and have an invisible client in their project but never have the opportunity to deal with the real problems and build it. Therefore, in this research university students are going to deal with environmental issues such as structure, electricity, water system and also social humanities. Facing the environmental problem and learn from it, also propose how to solve the problems that they found. Design strategy and steps become different than before. This is a big challenge from the traditional architecture studio, students start to stay on the site and design survey and process, the methodology as below. Site appraisal as known as site analysis (Fig.2-17).
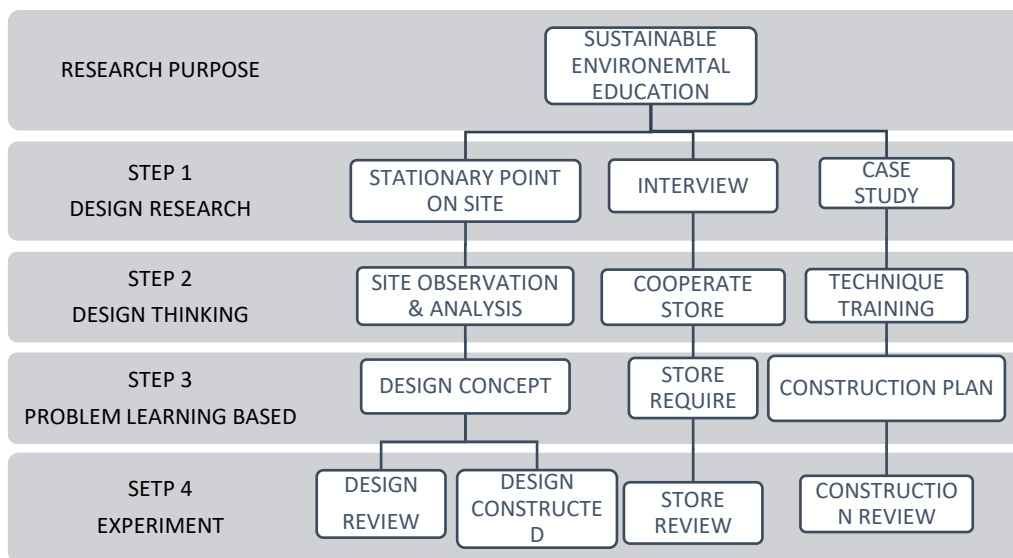
Figure 2-17 Placemaking strategy process of a design participatory project

the site appraisal is often the first tangible piece of information produces at the design process. Since online resource has been very convenient, students who will visit and understand the environment condition are easy to know but hard to realize the essential meaning. Thus, we change the education behavior, students are stationed to be there every day which they have a work schedule to arrange the site visiting. On the other hand, students become part of the market that will start to be like a friend with the community and the retail store (Fig.2-18).

Figure 2-18 Floor plan and existing environment conditions in Dongmen market

Participant observation is often used in a design project which consists of small groups. Students will need to be able to know virtually all the people involved. Because the main purpose of participant observation is that students seek to become a member of the observed group. Not only a physical presence and chatting but also involves local's social daily life. To go through the process, students are learning their social routines and habits, even their business management or non-verbal communication. In order to record the outcome, students designed a daily work timesheet that can be written down what they discover from the environment (Fig.2-19).

Figure 2-19 Daily work timesheet and space design by students

The facts about a site survey will include both hard and soft data. Hard data studies local or non-negotiable problems, such as environmental conditions, climate, building structure, topology, space. Soft data will study wider and more contextual issues, such as site history, cultural and human aspects, and its current significance. Despite students collect data from a site visit, if they don't start to talk with the locals, there is still only a little information to support them which from what they have been experienced. Interviewing is one of the methods for students who involve themselves, asking a question about the environmental contents and hopefully to receive answers from the local. Because students had been surveying the site by themselves, the structure of the interview will use a semi-structured interview type. This type of interview is widely used for students, they had predetermined questions, but the order can be changed by the interviewer's perception of what seems most appropriate. In this situation, students might take more time to back and forth to know the useful answers from the locals. Some circumstances will occur in an accidently way that students need to have the skill to know how to adjust it.

In Dongmen market, there is still some elder generation who live there, due to the history and policy of Domgmen market, the interview will bring the advantage, but it may also face a problem is the emotional aspect that influences the person. Students will also need to be trained to be objective in the design thinking process, as a designer, stay objective attitude during design (Quintana Vigiola, 2022). Placemaking is one of the design approaches that often uses to a public space. Back the 1960s, Bernard Hunt architect noted that "We have theories, specialisms, regulations, exhortations, demonstration projects. We have planners. We have highway engineers. We have mixed use, mixed tenure, architecture, community architecture, urban design, neighborhood strategy. But what seems to have happened is that we have simply lost the art of placemaking; or, put another way, we have lost the simple art of placemaking. We are good at putting up buildings, but we are bad at making places." Nowadays, architecture students can render very nice graphics with beautiful light and texture of the space, but they

never understand what the purpose of it, most of them are even don't have any connection with the local environment. To understand the circumstance and sustainable the environment for their generation, placemaking is a good strategy to educate the students. Also, the placemaker also called a CO-UP studio (Fig.2-20).
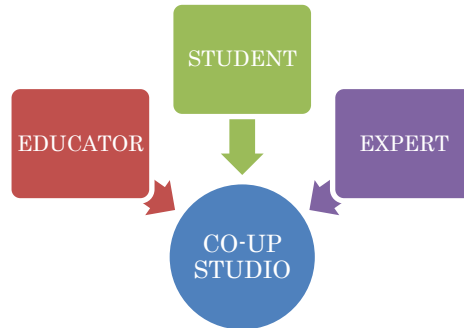
Figure 2-20 Member of CO-UP studio

To start the place-making strategy, this research starts to recruit a group of students that we call CO-UP studio, in this case, it will be 11 students divide by two small teams which propose and constructed two stalls (Table 2-3).

Table 2-3 Attraction of Placemaking Process
(x No interest, △ No Feedback, ◯ Interest, *Team Leader)

Student	Schematic Design Process	Construction Drawing Process	On Site Construction Process
Student 1 (5th year, Female)	◯	◯	◯
Student 2 (5th year, Male)	◯	△	◯
Student 3 (5th year, Male)	◯	△	△
Student 4 (5th year, Male)	◯	△	△
*Student 5 (5th year, Female)	◯	◯	◯
Student 6 (4th year, Female)	◯	◯	◯
*Student 7 (4th year, Female)	◯	△	◯
Student 8 (4th year, Male)	◯	◯	◯
Student 9 (4th year, Male)	◯	△	◯
Student 10 (4th year, Male)	x	△	x
Student 11 (4th year, Male)	◯	△	△

The area of these two stalls is 3x3m2 and 3x6m2 (Fig.2-21). The project's mission is creating the space that promote the owner's health, happiness, and well-being. Through the design concept, students provide the nature of place identity is challenged because the environment limitation, for instance, design elements turn into constructed, readjust mechanical system, and so on. CO-UP studio is simulated by the architecture firm, operating by students, they need to schedule not only the design but also the project's budget and construction time. The most difficult part is dealing with teammates' cooperation attitude and confronting the client at the same time. CO-UP studio is organized by three-part, student, educator, and expert. Educators play a guide role and finding resources to assist the student. Expert involves in a special

condition to support the extra resource or technique for the project.

Figure 2-21 One of stall's (Restaurant) design by CO-UP studio group

As the result, CO-UP studio connected the university and the local very closely, students are happy to see their design become a true project, even some of the design item is like furniture design or just panting the wall. The participatory placemaking strategy in the architecture education system brings more virtually and challenge to the students also university. We found that this design movement has been slow to affect the surrounding neighborhood. From the local perspective view, local people were not welcome students to stay because they always think that students are only doing their assignment, what they really need is who are willing to help them to change. Therefore, this organization CO-UP studio comes the first success. This placemaking project has investigated the university difficulties faced by the market environment, people, and students. To explore sustainable environmental education in society has been a very big risk and challenge task. As we know, real issue is not the same idea from the textbook, student and educator become the first group in the front line to deal with all happenings. From what we know, in particular, to improve the student's skill and knowledge of the sustainable environment, giving them a professional experience to do it by themselves is faster to understand the theory and well-trained technic (Fig.2-22).

Figure 2-22 A complete design project by the concept of placemaking

2.2.5 Sustainable Developing Environment of the School Building

The United Nations (as UN) addressed an announcement "The 2030 Agenda for Sustainable Development" in 2015, all United Nations Member will provide a shared blueprint for peace and prosperity for human being and our plant starts from now and into the future. In this statement, 17 Sustainable Development Goals (SDGs), which are an essential task for all countries in the world. In

these global missions, each country not only progressed but also developing in a global partnership as well. Each country understands "ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth-all while tackling climate change and working to preserve our oceans and frosts." Said by the United Nations. Due to the SDGs statement, this research is also looking for the proper solution during the architectural design process, especially to meet the no.4,8,11 and 17 golds at the reconfiguration phase (Fig.2-23). Ultimately, what is at stake here is assistant the architecture design principles during the process (UN, 2022).

Figure 2-23 No.4,8,11 & 17 of SDGs Goals

Looking at the relevance of SDGs and grasping the ring environmental, economic, and social linkages, to review the progress of Taiwan's sustainable environmental development and pay attention to the performance of specific ethnic groups. Under this consideration, the revitalization of the school space will be the one to begin to follow the lead and achieve the goal of SDGs. Likewise, environment, economy and society are not single aspects, and need to think systematically, which is the same believed in the architecture design. This research is focusing on reusing the school space to revitalize the entire campus environment (Tuan & Hegedűs, 2022). On the other hand, reuse or redesign the unused school space to improve the quality education, economic growth, sustainable community, and social interaction. All four tasks can be practice through the regeneration school design process, it is also meaning that the regeneration design process is also think systematically to complete the space design (Fig.2-24).
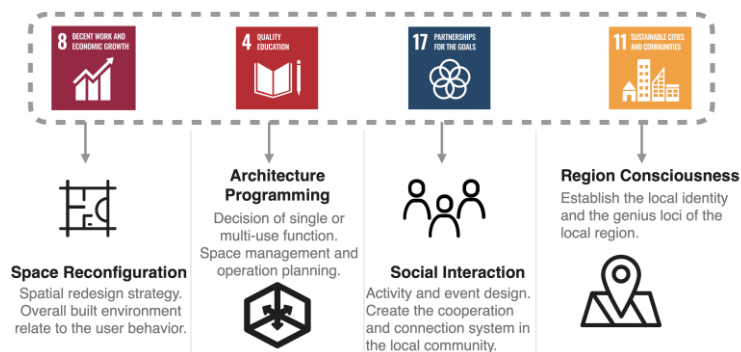
Figure 2-24 Research objectives relate to SDGs Goals

The relevance of the SDGs architecture illustrates people and the environment that is the connection between the planet and the economy dynamism. This linkage allows synergies and trade-offs between many single targets. Any plan of action, the setting must fully consider the economic, social and

environmental aspects. The influence of the orientation is not to lose sight of one or the other which is also very important during the regenerate design process. Also, the overall objective is trying to use the space reconfiguration, architecture programming, social interaction, and region consciousness to recreate a place for the public to get to gather and to make the entire environment a better living society.

In addition, the United Nations adopted 16 Sustainable Development Goals (SDGs) for the entire international community by 2030, aiming to realize a society in which no one is left behind, and to further promote efforts to address a wide range of economic, social, and environmental issues. need to accelerate. To renovate the old school space become an eco-school has total number of 237 schools from 2017 to 2021 (total of 1,900 schools combined with schools certified for the Eco-School Pilot/Model Project from 1997 to 2016). Also, the installation rate of solar power generation equipment in public elementary and junior high schools was 34.1% in 2021.Regarding the use of wood, out of 805 public school buildings built in 2020, 595 use wood as the building material. And 154 are wooden material and 441 have wooden interiors. These changes situation of architecture renewable energy to achieve the sustainable cities and community.

2.3 Overview of School Building Regeneration Condition and Program Development

In order to make proper use of the school's unused space, many strategies have planned multiple revitalization uses to handle matters related to the revitalization of the school's unused space. It is hoped that through the active participation of local authorities, communities and non-governmental organizations, the revitalization business model of joint cooperation or renting and using the unused space of the school will be adopted without affecting the normal teaching behaviors at the school (Tyack & Cuban, 1997). To Plan a concept of multiple programs and uses, it is expecting to take into account win-win and reciprocal benefits situations. Eventually, the overall revitalization project is to achieve the goals of effective stimulation and utilization of government resources (Fig.2-25).

1	Revitalize the unused space on campus and expand the benefits of space utilization.
2	Combine local resources and needs to create new value of the school building.
3	Achieve the universalization of learning objects and diversify spatial functions.
4	Create a good interactive relationship between schools and communities, and implement the goal of sustainable education management.

Figure 2-25 Four achieve goals of revitalization school project

2.3.1 Definition of School Architectures

At the end of the 18th century, the school architecture's system has changed throughout the entire educational institutions. A group of people, for instance, the academic educator, politicians, and locally active inhabitants gathered to discusses the connection between people and education. Thus, the

perception of school architecture reformed significantly in Europe and continue the local historical culture value to enhance in the society. In the 19th century, a local school gradually developed into a territorially linked school systems, which required a mass site plan with specific school building for the purpose of learning (Benito, 2003). The evidence from historical resources described when a school architecture is the major dominant of the region landscape, the school is also involved in the representation of the place. Furthermore, school architecture displays the strong position of buildings and neighborhoods (Byrne, Fairclough, Harrison, Jameson, & Schofield, 2007). When it comes to the topic of school architecture, most of man will readily agree that school is a place for education. The history of the school has existed for centuries, in the beginning, the school has a limitation for a group of people are known by the elite that they could go to the school. Obviously, the religious institution was the center of culture for the society that also made the school became the most important faith center to the environment. According to the Greek's history, school in Greek is a meaning for playing, a man who have the leisure time will show up at school.

From the past time, the school also has been conceived to be like a place of common living for a religious purpose, a place of production, or a Domus. Both mentally and physically support the entire social environment (Coelho, Cordeiro, Alcoforado, & Moniz, 2022). The school facility is no longer the student's privilege, it is also offered for the publication to involve the regeneration design process and program development, revitalize the needs for the elder and variety of activities for the children. School architecture has been purposing to another level of usage, after the management strategy and safety issue concern, the school architectural space can be transformed for a verity purpose functions as well, such as a museum, a community center, a guest house, and an experience market. Furthermore, many private foundations use as their office, communication center, welfare facilities, etc., school is not just the place to learn (Adegoriola, Yung, Lai, Chan, & Yevu, 2023).

As the domestic fertility rate has declined year by year in the past decade in Taiwan, the population growth trend of fewer children has directly affected the source of students in each school and each educational level. Recently, the number of students will decline sharply every year, which is bound to have a serious impact on the survival of every school. As the previous sections' result, schools will face inevitable consequences such as mergers, transformations or abandoned. Therefore, it is indeed urgent and necessary to promote the integration, transformation and abandoned mechanism of schools. Also, the planning and strategy of regeneration of abandoned schools are the significant subject and primary task to work on.

2.3.2 Revitalization Space Design Progress in Abandoned Schools

Revise the working process of arrange the unused space on campus, there are several tasks as shown on Figure 2-26, at the beginning of the project application stag. All local governments take a comprehensive consideration on the use condition of school buildings below the senior high school level in each county and city, then report to the Ministry of Education after prioritization. The responsible units will review the feasibility and completeness of the plan before granting subsidies, and list and manage each subsidized school the implementation progress.
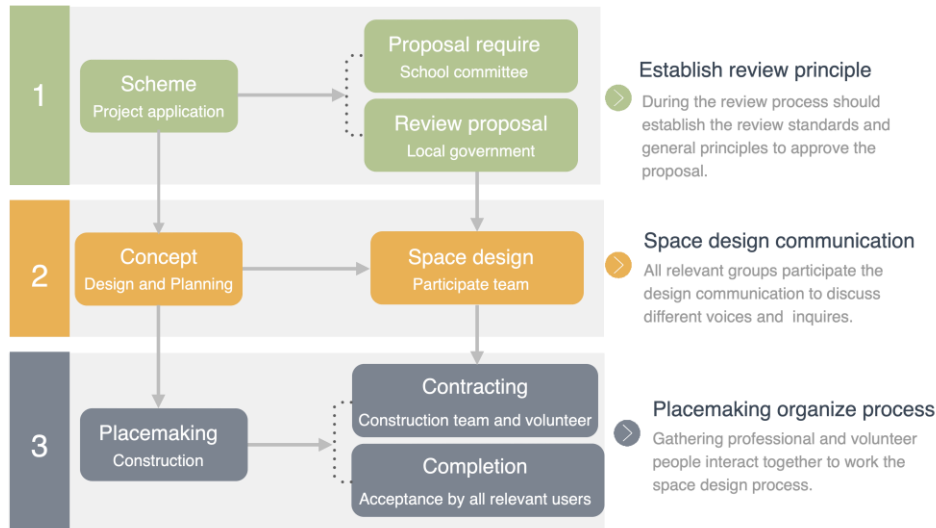
Figure 2-26 Project's task progress flow chart

Secondly, Planning and design stag. If the reuse project proposed by each school involves space improvement needs, the school should seek relevant architectural space planning designers, the most important is not only participate in two-way joint planning and design but also discussions among the school organization committee members together. Especially, a comprehensive understand the reuse purpose and then complete the concept of redesign and planning. After deliberation and approval by the competent authority, the reuse proposal and drawings will be submitted to the competent and responsible units of the Ministry of Education for future reference.

Finally, Construction Execution Phase. After the school completes the review and deliberation of the budget plan for space reuse, it will start contracting and construction. The school and the designer carry out control according to the three-level quality control. After the completion and acceptance of the project, the school can carry out teaching promotion and display of project results as an example to other reuse school space project.

Due to class reduction, all municipalities, counties (cities) governments should guide the revitalization and utilization of lost space and abandoned buildings. The regulations on revitalization or management agencies (institutions), lease (borrowing) and related matters shall be stipulated by the competent authority of the school. Moreover, the municipal and county (city) governments shall raise funds each year as needed to support various necessary expenditures for the revitalization, utilization and management of lost space and unused buildings. Unused space and abandoned buildings shall be managed and file in classify for the future use. All municipalities and county (city) governments should keep abreast of the actual activation of each listed case on a monthly basis and fill in the latest information on the website of the Ministry of Education (M.O.E, Policies, 2022).

There are also some expectations can be reconsidered during the redesign process. First, the land and buildings in the original campus are in normal use according to the planned use. Secondly, the property rights of the original school are not owned by the school or the school authority, and the property rights of the school have been returned to the landlord or the management authority, and the ground

objects have been demolished, and the property rights or use rights have been transferred. Third, the original school location has been identified as a dangerous area, which is not suitable for revitalization. Last, due to changes in urban planning or other reasons, the original school site has been converted to non-school purposes.

During the management process in reusing the school space, if there is any situation such as the execution of the original revitalization plan has been stopped. In the case of contract conclusion, the contract has been terminated or terminated abnormally, causing the unused space to become a lost space again. The unused space is only partially used during the activation and utilization process and low usage, with an average of less than four uses per month. Research has found out that it is important for the Ministry of Education may invite experts and scholars to conduct on-site surveys and provide necessary counseling and suggestions in order to understand the status of the revitalization of various idle spaces and whether they will continue to be managed. Experience sharing activities for good revitalization cases can be organized for promotion.

Also, all municipal and county (city) governments should reward those projects who have contributed to the revitalization and utilization of unused space. Precautions for multiple activation of school campus space, the purpose of this precaution's regulations are trying to solve both the social economic resources reutilize and make full use of the diverse and revitalized sustainable campus space. The principles are as follow descriptions (Fig2-27).

1. Cultural and educational public welfare. To meet the needs of regional education development, and ensure official, public welfare and public purposes.

2. Campus (school building) safety is the most important thing. The school building is open with safe use as the primary consideration. At the time, circulation and scope of space use should be properly planned. In the event of natural disasters or other emergencies, evacuation plans for various disasters should be formulated in advance and necessary safety precautions (such as early evacuation or prohibition of continued use) and maintenance measures should be drilled.

3. Open and transparent information. The campus (dormitory) space is provided for use by external units, and relevant information should be made public.

4. Signing an administrative contract. For the use of campus (dormitory) space, a contract should be signed with the user, specifying the purpose of use, the contract period, the rights and obligations of both parties, fees and refunds, termination and cancellation of the contract, breach of contract or penalties, and contract renewal Conditions and assessments and applicable laws, etc.

5. Considering multiple needs. Considering the governance needs of governments at all levels. Social development and community needs, and other revitalized uses to promote the multiple use of educational resources and public assets and benefit the community.

6. Community Participation Dialogue. Through multiple community participation dialogues, it demonstrates the niche of campus space diversification and improves the use efficiency of

public spaces.

7. Implement sustainable development. through diversified and innovative development, promote the sustainable development of local community elegance and culture.

Figure 2-27 Principles of revitalization school design

In order to effectively integrate resources and jointly plan multiple uses, governments at all levels handle matters and the division of each person are as follows, there are two major groups, Central government and Local government to describe.

(1) Central government

1. Regularly investigate the status and progress of the space activation of schools and campuses.

2. Invite experts and scholars to set up a special case group to conduct on-site visits to the school campus space and provide necessary counseling and suggestions.

3. For excellent activation cases, conduct experience sharing activities to promote them.

(2) Local government

1. Formulate relevant laws and regulations on the revitalization of the campus space of the affiliated school.

2. Formulate the relevant regulations for the rental (borrowing) of school venues and establish the conditions and matters of paid and free, as the basis for using or renting (borrowing) school venues.

3. Investigate the number of campus spaces of the affiliated schools every year, and regularly cooperate with on-site inspections and hold meetings.

4. Announce information on the use or rental (borrowing) of the campus space of the affiliated school, and horizontally contact the relevant local authorities (bureaus) about the feasibility of activation and utilization.

2.3.3 Classification of School Architecture Regeneration Programs and Regulations

The expectation about redesigning the school space has the limitation purpose of nonprofit usage regulations in Taiwan. Therefore, most of the regeneration school has transformed into similar

architecture program which is relating to more like the community utilization, subject experience place, and exhibition space. All categories' detail in reusing the school building space are shown below (M.O.E, Study In Taiwan, 2021).

1. Kindergartens. Non-profit legal persons or non-governmental organizations are entrusted with the establishment of the places required for kindergartens in accordance with law.

2. Experimental Educational Institutions. Primary schools and junior high schools entrust private individuals to handle the provisions of the regulations to handle the places required for experimental education. Primary and junior high schools in accordance with the implementation regulations of non-school type experimental education and the implementation regulations of school type experimental education at the education stage.

3. Social Educational Institution. For instance, parent-child center, senior center, newcomer learning center, library (room), museum, cultural relics exhibition room, science museum, Scout Park, ecological park, demonstration farm, tribal language and cultural inheritance center, etc.

4. Community Colleges. The program is to provide the fundamental skills learning and various subjects to understand the basic education knowledge.

5. Leisure Sports Facilities. Gymnasiums, fitness centers, LOHAS sports stations, swimming pools and other venues to enhance physical health, etc.

6. Social Welfare Facilities. Childcare centers, day care for the elderly, day service institutions for the physically and mentally handicapped, childcare for children and adolescents, early treatment, psychological counseling or family counseling, and other social welfare places.

7. Sightseeing Service Facilities. Tourist and cultural parks, memorial parks, tourist service centers, camping areas, and other places required for sightseeing service facilities.

8. Arts and Cultural Exhibition Places. Art and cultural exhibitions, artists' studios, art galleries, music halls and other communication places to promote art education, etc.

9. Industrial Development Institutions. Youth Entrepreneurship Preparatory Office, Cultural and Creative Industry Preparatory Office, Science and Technology Research and Development Center, and Vocational Skills Education Promotion Venue, etc.

10. Community Gathering Places. Disaster shelters, community parks, village meeting places and community activity centers related to township (town, city, district) offices, etc.

11. General Office Premises. Places for offices or archives stored by government agencies (institutions), individuals, legal persons, organizations or private organizations.

12. Off-campus Dormitories. Nearby dormitories required by schools of all levels.

13. On-campus Facilities for Non-teaching Purpose. Cooperatives, nursing rooms, on-campus dormitories, places required for administrative and related purposes.

14. Venues required for major policies of local governments, social development, and community needs that do not involve commercial activities, etc.

There are also some relevant regulations about architecture design that will influence the design

process. Especially the space area limitation, fireproof-resistance construction, and school buildings arrangement. Following content will give a brief description of relevant regulation during the school building design process.

1. Building Technical Regulations in school buildings and their limitations.

    -No.120. Rooms in buildings that frequently use combustion equipment, such as kitchens and bathrooms, shall not be located below the value of the stairs.

    No. 133. Regulations on the configuration, orientation and equipment of school buildings.

    ①. The building should leave the arcade space, and 1~1.5 meters from the building line including the arcade space is the bishop's building line.

    ②. Those who are adjacent to the construction line or adjacent boundary shall be more than three meters from the construction line or adjacent boundary line.

    ③. Classrooms should be properly positioned and equipped with appropriate artificial lighting and shading equipment.

    ④. The configuration of the school building should avoid the phenomenon of mutual interference between sounds.

    ⑤. The height of the building shall not be greater than one and five times the horizontal distance between the centerline of the outer walls of the two buildings, but there are no openings relative to the outer walls, or there are openings but are not intended for teaching users.

    ⑥. Stairwells, toilets, fences and bachelor dormitories are not subject to the restrictions set forth in paragraphs 1 and 2.

2. Building Technical Regulations in fire protection of buildings.

    -No.63. scope of application.

    ①. The fire protection of buildings shall be in accordance with the provisions of this Chapter.

    ②. The fire prevention zone referred to in Article 102 of this Law refers to the area designated by the municipality or county (city) government directly under the Central Government for the needs of fire prevention and safety in the area where this Law applies.

    ③. Buildings in the fire prevention zone shall, in addition to complying with the provisions of this Chapter, be handled in accordance with the regulations of the local competent construction authority.

    -No.63. Fire protection limits for miscellaneous work objects. Non-combustible materials shall be used for the main part of billboards (towers), decorative objects (towers) and similar work objects with a height of more than three meters or installed on the roof.

    -No. 69. Fireproof construction. The buildings in this regulation shall be fireproof structures. However, the factory building, except according to the provisions of Category C, the floor area of the operating plant building exceeds 50 square meters, and its main structure should

be built of non-combustible materials. School building is belonging to Category D, the floor area above 2000 square meter or building above three floors should all be fireproof structures.

-No. 70. Fireproof construction. For fireproof buildings, the columns, beams, load-bearing walls, floors and roofs of their main structures shall have the fire protection time specified in the Table 2-4

Table 2-4 Rule of fireproof construction in every school building element

Building Element		Each floor shall not exceed four floors from the top floor	From the top floor, the floors exceeding the 4th to 14th floors	Each floor exceeding the 15th floor from the top floor
walls	Load-bearing	1 hour	1 hour	2 hours
	Beams	1 hour	2 hours	3 hours
	Columns	1 hour	2 hours	3 hours
	Floors	1 hour	2 hours	2 hours
	Roofs	0.5 hour		

2.3.4 School Consolidation and Educational Resource Shortage

In the consolidation policy of schools in a small scale, people usually have different identity for schools in suburban or rural areas at different stages. Since the implementation of citizen education in 1968, Taiwan's elementary schools have been established in various places. The policy is hoping to achieve many tasks such as one elementary school per village, abundant teaching resources, promote children to go to school nearby their home, improve citizen's academic ability and quality. Eventually, to promote social mobility and interaction in local community. Small scale of schools is mostly distributed from suburban to rural areas such as villages, mountains, seaside, and outlying islands. However, in such economically and culturally disadvantaged areas, these schools are not only places for students to learn, but also a spirit symbol of community accumulation. Even though there is nothing cultural custom reason, the school is always a center of community life. The existence of small-scale schools allows students to enroll nearby that is guaranteeing students' right to education. As a result, it helps to achieve the concept of national education taking care of the disadvantaged and implementing equal educational opportunities (M.O.E, Study In Taiwan, 2021).

Public elementary schools are established by the county and city governments, at the same time, the regional resources depend on the financial budget in each county and city government. However, the Ministry of Education has always tried to subsidize all rural schools, schools have located in rural area that is also not valuable both in culture aspects and with a high teacher turnover rate, the education priority area plan is also used to subsidize the school's characteristic development in these schools. Furthermore, the policy is also supporting various parts of educational resources. For instance, parental education funds and teacher dormitory repairs. There is also an after-school hand-in-hand plan to assist

the students and education resources. Small-scale schools receive no fewer public resources than metropolitan schools. Hence, there has always been education is an opportunity to help poor children move upwards in the society, on the other hand, children in rural areas especially need this kind of opportunity. In addition, rural schools are responsible for most of the family education, and they are also the center of community culture. Abolishing rural schools is tantamount to destroying communities or abandoned villages, and making communities lose hope. There are many local residences think fairness and justice are extremely unfair to remote schools and neighboring communities.

The downturn has become a situation in the past decade, the burden of education expenditure is getting more heavier than before. The economic downturn has made the central government, and the county and city governments directly face the dilemma of reduced tax revenue, widened fiscal gap, and increased debt ceiling. According to statistics from the Ministry of Education, the central government's education funding increased by 22%, and the local government's self-raised funds increased by about 33%. Such a heavy financial burden is no different for county and city governments with poor tax revenue. Under the demands of zero fiscal growth, the central government, the county, and city governments have accelerated the promotion of elementary school consolidation, which is the current policy direction. Also, small-scale schools have high operating costs. If students' academic performance is not good, it will be difficult for students to familiarize themselves with social and interpersonal relationships. Coupled with insufficient equipment and lack of sense of achievement for teachers, students' interest in learning is low. Furthermore, there are many non-professional, young and junior teachers in small schools in rural areas. The turnover rate of teachers is high, which shows that the teaching scene is very different, which hinders the stable learning of students and the proper operation of school affairs.

Political party rotation brings policy changes, except for the fact that the economic situation in the real society is not good, resulting in active small adjustments and merger policies. In order to speed up the abolition and merger of schools in various counties and cities in Taiwan, the government has included the subsidy items for the abolition and merger of schools in the budget calculation table for the subsidy funds for educational facilities in each county and city. In 2009, under economic considerations, the small consolidation policy was maintained and accelerated. Moreover, the economic situation is not good, and local governments rely more heavily on central education subsidies. Under the realistic consideration of seeking subsidies from the Ministry of Education and reducing the pressure of self-funding, local governments of counties and cities have adopted the principle of the consolidated version of the Ministry of Education and formulated plans that conform to this principle, which is even stricter integration or key points from previous regulation.

Non-government education groups have not stopped attacking and defending the consolidation of small-scale schools. The transformation of rural schools can also help prevent rural schools from becoming abolished. Alternative education models, such as promoting mixed-age experimental education, indicate that such an approach can take into account both economic benefits and sustainable development of schools. Education is not a business operation; it should not be considered purely based on economic benefits. Whether the Local residence or experts appeal to the competent authorities at any

level. Please do not implement this kind of decision-making that only evaluates immediate interests, resulting in stifling children's right to remember their future growth said by one of the school committees. Elementary school is the basic education for the younger generation to begin to understand the society. As a consequence, the government should take the responsibility of rural education and should not allow local governments to abolish any rural schools based on financial considerations (Fig.2-28).
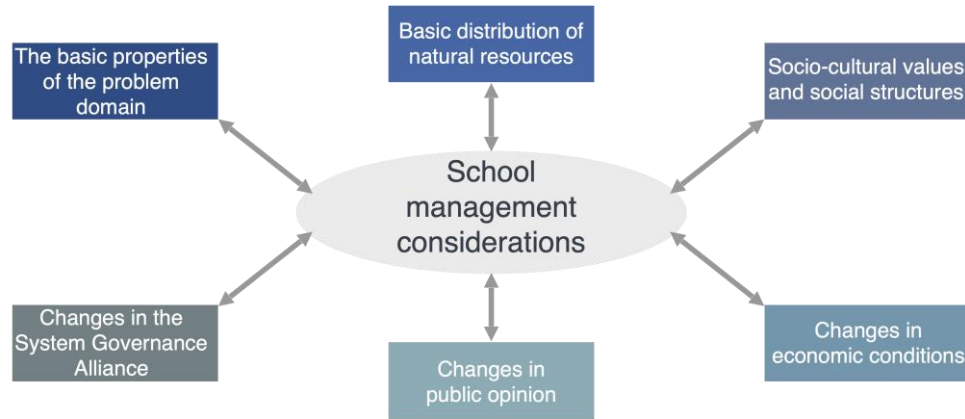
Figure 2-28 Social influence of the rural school management considerations

The meaning of school consolidation is that consolidation is a commonly used strategy in business management for the purpose of reducing cost and increasing uniformity. In education filed, consolidation is usually either regional integration or closing schools and sending students to other schools (or building a newer, bigger school). Recently research showed school consolidation in the United States is all about "size of the school", which means that the consideration of educational effectiveness is higher than economic efficiency (Howley et al., 2011). Discussions on the integration of elementary schools, as mentioned above, public policy has a high degree of uncertainty, and the decision and implementation of any educational policy will inevitably attract arguments for and against it. Most of the discussions are based on financial considerations, school size, economic benefits, business management, adaptive education, student education, community development, student learning, etc. The pros and cons for the merger of small schools are in Table 2-5 as follows:

Table 2-5 Comparison of the small-scale school consolidation

	Pros	Cons
Student	● The existence of small schools can ensure that students are enrolled in the nearest school and help national education to take care of the disadvantaged and implement the concept of equal educational opportunities.	● Due to the shortage of education funds, there is not much left after meeting the fixed expenditure costs. ● The operating costs of remote schools will be condensed and jointly incorporated into the funding of other general schools.
School scale	● Adaptive teaching, small schools can better implement the concept of small classes and small schools in teaching, field teaching is more feasible.	● The small scale of the school and the shortage of manpower make it difficult for students to achieve the goal of diversification of learning by one person. in addition to

113

		administrative work, which also must teach several classes and subjects at the same time, which affects the teaching situation, and it is difficult for students to achieve the goal of learning diversification.
Financial	• Teachers have sufficient time and energy to pay attention to and properly take care of each student, and conduct experimental teaching, and it is more in line with the concept of equal educational opportunities. • Operating and managing small schools is more convenient and easier to achieve results in school administration, and students live closer to the school, which can also reduce the occurrence of school accidents.	• Administrative work, which also must teach several classes and subjects at the same time, which affects the teaching situation, and it is difficult for students to achieve the goal of learning diversification.

In terms of community development, schools are usually the activities of rural communities, and the waste of schools is not only inconvenient for children to go to school, but also represents the disappearance of the community, in rural mountain peaks or capes, schools play the center of learning and culture at the same time. In 1988, there is an expert named Rincones, he describes that the consolidation of schools will cause frustration and dereliction of most community residents, population outflow, decline, deterioration of community friendship, and reduction of various government education subsidies. The abandoned campus will become a blind spot in public security, and local people will have the consciousness of "abandoning the school and the community". From Meier 's viewpoint in 1996 that education cannot be repeated, there are 7 reasons why small schools can provide better curriculum and teaching which are governance, respect, simplicity, safety, parent involvement, accountability, and belonging (Fig.2-29).
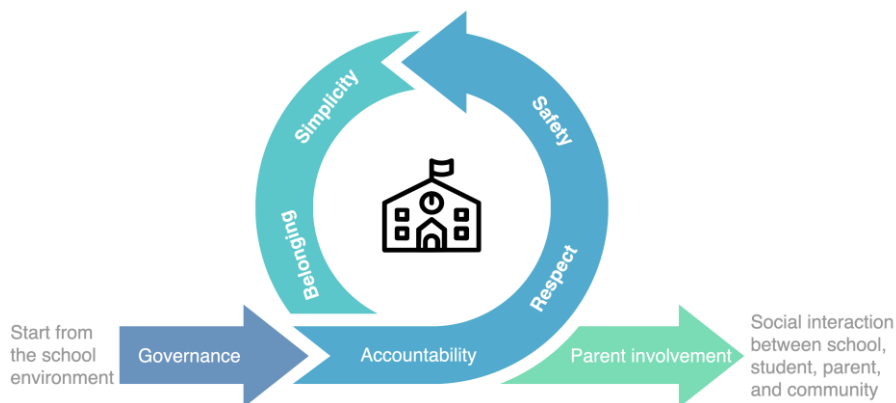
Figure 2-29 Seven reasons of schools' benefits.

Discussing the situation of changes in the consolidation policy of elementary schools, the research review shows first conclude three proof points: (1) The policy-oriented learning that experts and scholars intervene does not affect the goal of the consolidation policy of small schools. (2) The core belief of the Ministry of Education, which represents the policy elite system, has not changed due to external public opinion or major events, and still insists on implementing the small school consolidation policy. (3) The policy donors represented by the county and city governments are not helpful to resolve the conflicts caused by the consolidation policy of small schools, even become the executors of the consolidation

policy in the end.

Secondly, in terms of the connotation and changes of the policy beliefs of the central government, local government, schools and parents of community residents in the process of small-scale school consolidation: the central government consolidates small-scale schools in the process to save education funds. The core belief has never changed, and the core of its policy of controlling the dominant mode of funding has not changed. However, the local government did not hold the same core belief in the concept of consolidation as the central government. However, under the policy core of striving for central budget subsidies and reducing self-raised education financial resources, it proposed school transformation, development of characteristic schools, experimental education and small school consolidation. and multiple solutions. The parents of the school and the residents of the community firmly resisted the core beliefs of school integration from the very beginning.

After petitions, protests, door-to-door begging students to study and other ineffective measures, their deep-seated beliefs have changed, they have turned to transformation plans and experiments. Education to keep the school alive, or eventually accept the result of school consolidation or abandoned. The implementation and current status of today's small-scale school transformation and consolidation policies can be described as the result of the interaction of policy-oriented learning produced by secondary systems such as county, city governments, and school community parents. Finally, the Ministry of Education and the city governments should regularly review the implementation status and extended issues of the small school consolidation policy (such as the follow-up maintenance and revitalization of school buildings, student learning conditions, community changes and decay, etc.), and use feedback mechanisms to make practical improvements and corrections.

2.4 Discussion and Summary

Over the past ten years, the population structure of Taiwan has changed rapidly. Under the influence of the declining birth rate, the number of births has gradually dropped from 415,069 in 1981 to 321,932 in 2019. Especially the number of births in 2013 was only 193,844, resulting in an increase in the abandoned school buildings year by year. This section summarizes the causes and numbers of the abandoned school buildings in recent years. Also, understand the organizes the government's promotion of the "Campus Revitalization and Reuse Counseling Program after elementary school, junior high school, and high school consolidation" proposed by the Ministry of Education in Taiwan. The following paragraphs have more detail explanations to address the existing revitalizing of abandoned school in Taiwan.

This research conducts several educational architecture analyses with respect to their redesign programs in order to evaluate the relation between space and local community (Gattupalli, 2022). Also, the spatial hierarchy, scale, and characteristics of locality are further investigated in the hope of gaining a deeper understanding of how different revitalization approaches might lead to diverse interaction patterns in the areas. At the same time, priority should be given to school scale and community needs adjustment strategies, and the overall feasibility of rational distribution of educational resources should be evaluated from the perspective of sustainable communities and balanced distribution of resources, to

avoid excessive concentration of resources and uneven benefits. Therefore, the following principles should be paid attention to when planning campus space in the future.

1. Reduce the risk factors in the campus environment.

2. Enhance users' sense of domain and belonging to the campus space.

3. Improve users' ability to predict and control the campus environment.

4. Respect the privacy of users and avoid excessive monitoring or protection.

5. Protect the rights and interests of gender minorities and promote the development of gender diversity.

6. Ensure users' fair participation in the campus planning process.

7. After the completion of the project, conduct a questionnaire survey to investigate the satisfaction of students of different genders and teaching staff with the improvement of gender-friendly facilities.

8. Require contractors to implement the provisions of the Gender Work Equality Act when awarding contracts for construction in the future.

This study shows that different spatial characteristics can affect how people perceive the public space and the way they interact with it. In addition, an effective redesign progress should enhance both space utilization and human-environmental interactions since it can not only promote regional development but also the overall environment Thus, an abandoned architecture can be a potential element to invigorate the local community either economically or emotionally.

CHAPTER 3
Research Methodology

3.1 Case study

3.1.1 School Regeneration Cases in Taiwan

  This research evaluates five abandoned schools in Taiwan. However, since the population in different County is unevenly distributed, with nearly a quarter of the population lives in southern or eastern part and the remaining, which mostly is elder people, resides in suburbs. Despite the fact that leading industries in Pingtung County involve a variety of agriculture production and nature scenery, more is needed to attract people to visit or live in the region. The interdisciplinary cooperation of the local residents in interaction with the new participant.

  Therefore, many local city governments start to rethink how to assist the region and develop a strategy to improve the regional economic in Taiwan. For instance, the Pingtung Government has promoted a regional development plan that starts to convert, redesign, and renovate the abandoned school in several townships in Pingtung County. Each project is established with a gold to create a space for skills training, studying, and exchanging daily life. In the transformation process, the unused facility such as an abandoned school and its campus can play a role of matchmaking in a region, not only the space offers different programs but also creates a place to reinforce the local resources, identities, and regional characteristic. Just as important, the school facility has been redesigned as well as the phenomena of the region is reformed to reconnect the social relations. Moreover, this built environment is rebuilding the community consciousness to interchange the ideas through the regeneration period. The detailed background of the regeneration schools is shown in below Table 3-1. (Li & Samuelson, 2020)

Table 3-1 History of all five schools' information in Taiwan

Administrative area	Keelung City	Kaohsiung City	Pingtung County		Taitung County
	S1	S2	S3	S4	S5
School	TaiPing Elementary School, Zhongshan Dist.	Chiashin Elementary School, Kansung Dist.	NanHua Elementary School, Gaoshu Township	CheCheng Elementary School WenCyuan Branch, Checheng Township	ZhongYongn Elementary School, Changbin Township
School age	49 years (1968～2017)	44 years (1963~2007)	53 years (1967~2020)	69 years (1951~2020)	49 years (1964~2013)
Regenerate date	2021.10.23	2010.01.11	2021.01.11	2022.09.25	2017.11.21
Building material	Reinforced Concrete	Reinforced Concrete	Reinforced Concrete	Reinforced Concrete	Reinforced Concrete
School area	3024.42 m2	615.33 m2	1984.06 m2	934.94 m2	3217.47 m2
Total Classrooms	10 (24 Before)	10 (6 Before)	20 (18 Before)	4 (5 Before)	8 (19 Before)

In Table 3-2, five detailed renewal programs in Taiwan. School number 2 and 5 are the ones that reused the school space at the earliest time compared to others. Also, their regenerative building function follows the standard of the 14 rules of government policy which the architectural program is related to the social welfare use for different generations. School numbers 1,3, and 4 are the latest regeneration cases which are responded to by the local government's regional revitalization project in Keelung City and Pingtung County.

Table 3-2 Regeneration programs of school case in Taiwan

No.	Image of School	Renewal Program	Building function detail
	Taiping Elementary School, Keelung City, Taiwan		
S1		Taiping Exhibition Center	Building only reuses for part of the space for commercial space, half part of the building is closed for now. Mixed use with bookstore, café, and exhibition center.
	Chiashin Elementary School, Kansung Dist., Kaohsiung City, Taiwan		
S2		Home for Care and Love (Kung Ma Ma: EXSIT FOR LOVE)	Single use with day care function such as basic living skill such as cooking pizza, making eggroll and sharing daily goods.
	NanHua Elementary School, Pingtung County, Taiwan		
S3		Pingtung AI Agri Hub	Single use with digital technic learning and Agriculture knowledge exchange purpose.
	CheCheng Elementary School WenCyuan Branch ,Pingtung County, Taiwan		
S4		Pingtung Education Innovation Unit	Single use with educational learning and instructor skill training purpose. Also, local commercial market for the community.
	ZhongYongn Elementary School, Taitung County, Taiwan		
S5		Long-term Care Center	Single use with long-term health care service. Center offers a bus to assist the patient who need to come and back home every day. The space has providing gather rooms for the neighborhood and elder to get together during the daytime for sharing meal and exercise. İt is offering a simple medical and caring service during the night too.

3.1.2 Overall Regeneration School Cases in Japan

Japan and Taiwan have similar social conditions in the overall country, Japan has been entering a highly aging society since early 2011. According to the statistics from the Japanese government on April 1, 2023, Japan's population was 125 million, and the population is concentrated in three metropolitan areas, including Tokyo, Osaka, and Nagoya. However, the declining birth rate and an aging population have continuously declined which affects the total population and working population for the entire society. Kyushu is the south main island in Japan, it is the third largest island in Japan, with an area of 36,636 square kilometers, which is not much larger than Taiwan's 35,980 square kilometers, second only to Honshu and Hokkaido, and larger than Shikoku. Thus, the field survey is also focused on some of the regeneration schools in Kyushu as well (MEXT, 2022). All schools are 5 in Kyushu which are school number 6-10, other school beside Kyushu are in Japan, there are school number 11 to school number 15. A location map to indicate the school shows in Figure 3-1.
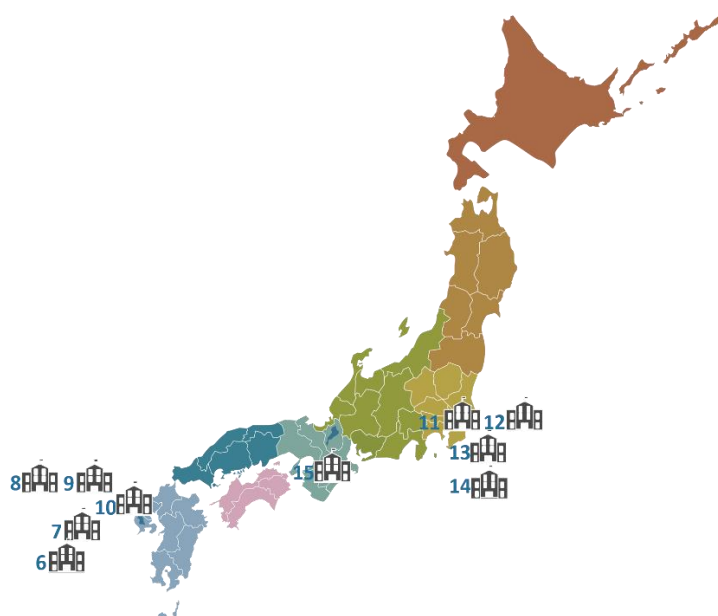
Figure 3-1 All school cases in Japan.

All cases in Kyushu are shown in Table 3-3, this research has a chance to visit one of the islands in Nagasaki Prefecture: Goto Island. There are two school regenerative design cases that have been reused for a while since 2008. Due to the special location and the geographic history of Goto Island, these two school regenerative design cases have been reused for the purpose of improving the local industry or culture. Also, one of the special characteristics is the school architecture is built of wooden material which is not often seen in Taiwan. The other three cases are located in Fukuoka Prefecture, one in an urban area and the other two are in a suburban area. School numbers 8 and 10 are cases in which the regenerative design process was supported by the city government of Fukuoka Prefecture. School number 9 is a case that has been reused by a local citizen who just came back from Tokyo, and he wants to give his contribution to his hometown (廃校再生ストーリーズ, 2018).

119

Table 3-3 History of all five schools' information in Kyushu, Japan

Administrative area	Nagasaki Prefecture (Goto Island)		Fukuoka Prefecture		
	S6	S7	S8	S9	S10
School	Tao Elementary School	Funa-mawari Elementary School	Daimyo Elementary School	Iikane Elementary School	Ashijiro Elementary School
School age	unknown	132 years (1875~2007)	141 years (1873~2014)	~2001	~2014 closed
Regenerate date	2018.08	2008.07	2017.04	2018.08	2020.07
Building material	Wooden Architecture	Reinforced Concrete	Reinforced Concrete	Reinforced Concrete	Reinforced Concrete
School area	535.41m2	2191.17 m2	2985.45 m2	3144.60 m2	2215.26 m2
Total Classrooms	10 (9 Before)	14 (21 Before)	42 (23 Before)	23 (24 Before)	24 (19 Before)

Goto island has a special history and beautiful scenery with a lot of tourists will visit to this island, the school case 6 has become a camping ground to attract people who are enjoy the outdoor activity and the nature scenery. The school still keep the original school building and renovate the building façade and interior space. The outside area of the overall campus turns to the glamping site which is a very different phenomena to see as a regular camping site and the original classroom change to a function for people to stay and experience the school building with an entirely different space design (Fig.3-2).

Figure 3-2 Glamping site of Tao Elementary School

Another case is the Daimyo Elementary School that the only southern part of the school building has preserved and become a new place to use. But the interesting view is the redesign process remains the old school wall from the old time. Moreover, people can also see the history form the new exhibition design way from the old brick wall on the pedestrian. People not only to realize the Daimyo elementary school but also recall the history of the school. The design of the school transformation process is improving the school building's value by showing the image of the old school, the material of the school building, and the interaction behavior from everyone (Fig.3-3).

Figure 3-3 An old wall still remains after the school regeneration process.

Also, the interior space has also renovated in different way to meet the new regeneration program such as office space and discussion area, people still can see the layout of the original school and also the structure of the building. Moreover, the furniture is keeping to use now which is creating some memory collection from the past and continue to affect people's emotional interaction through all these chair, black board, school tables. The message is still couniting to tell the story of this Daimyo elementary school. A new space function has been reinserted into the school building to meet the requirement of the present society's environment. For instance, a shared space in Daimyo Elementary School and the corridor space has changed to a place for relax. Because a new space use limitation, the open room for everyone to visit is only a few. Most of the room in this school requires a permission to enter the space and use the space for the new function (Fig.3-4).

Figure 3-4 Interior renovation of the Daimyo elementary school

In table 3-4 shows the history of all fives school's information in other city, Japan. Those schools are located either in the city area or rural area. All cases are distributed in Osaka, Chiba prefecture, and Tokyo. Most of the schools become a successful case to show how the regeneration school can be transformed into a welcome and useful place for the local community. Furthermore, these schools are also creating a phenomenon that is either visitors or citizens will visit the school by the famous school transformation process. Also, these schools have been reused and last for more than 5 years at least; in other words, the regenerative process has brought an excellent example to learn the pros and cons from these school cases. All of school cases are regenerative at least more than five years that means all these cases are becoming the example case for those abandoned school to have a thought, according to the

different perspective and standards to reuse the school space for their own satisfactions, both in the regional economic development and built environment value.

Table 3-4 History of all five schools' information in Japan

Administrative area	Tokyo, Japan		Chiba Prefecture		Osaka, Japan
School	S11 Yotsuya Elementary School	S12 Rensei Junior High School	S13 Hota Elementary School	S14 Nanaura Elementary School	S15 Daitou Elementary School
School age	71 years (1936~2007)	27 years (1978~2005)	~2001 Closed	~2015 Closed	~2001 Closed
Regenerate date	2008.04	2010	2018.08	2017.11	2018.08
Building material	Reinforced Concrete	Reinforced Concrete	Reinforced Concrete	Reinforced Concrete	Reinforced Concrete
School area	1663.83 m2	7281.76 m2	3486.73 m2	1599.53 m2	5466.48 m2
Total Classrooms	13 (13 Before)	36 rooms	27 (18 Before)	10 (Before)	13 rooms

All cases in Japan are shown in Tables 3-5 and 3-6, Schools are being reused for many different purposes to regenerate the overall space in each school's location. The regeneration program of reusing schools in Japan has been shown to be a diversity programming and space redesign idea too. Whether the school regeneration project is regenerated by a private company or organization, the regeneration process has shown the effort and value of reusing the school space again.

Table 3-5 Description of Redesign School Architecture, Kyushu, Japan

No.	Image of School	Renew Program	Building detail
	Tao Elementary School, Nagasaki Prefecture, Japan		
S6		Nordisk Village Campground & TAOFLAT KITCHEN	Mixed use: experience of luxury camping style, traditional goto activity and local food.
	The Funa-mawari Elementary School, Nagasaki Prefecture, Japan		
S7		Kasamatsu Hirotomo Memorial Hall	Collection artwork of Kasamatsu Hirotomo artist who was born in naurshima, goto island.
S8	Daimyo Elementary School, Fukuoka Prefecture, Japan		

		Fukuoka Growth Next	co-working space, restaurants, entrepreneur service, and office for rental.
	Iikane Elementary School, Fukuoka Prefecture, Japan		
S9		iika Palette	experience of music subject learning, restaurant, guest house (long tern rental), studio and office.
	Ashijiro Elementary School, Fukuoka Prefecture, Japan		
S10		Kahoalpe Hotel and K-WALL center	Single use program. Hotel, meeting room for local community. Especially offer the K-WALL sport with different scale of training.

The most important to learn from these cases is the attitude who are willing to put the effort into thinking about how to make their living environment better by using the school space again. Even though, the regeneration process needs to consider not only how to use the space but also how to keep the renewal school space continuously operating in the future. The passion of the community, professional experts, and local government is willing to get together to solve the abandoned school and regenerate the space to become a distinguished place in the built environment, Table 3-6 also shows the different creation of the school regeneration design in Japan, which is different from the Kyushu area.

Table 3-6 Description of Redesign School Architecture, Japan

No.	Image of School	Renew Program	Building detail
	Yotsuya Elementary School Tokyo, Japan		
S11		Tokyo Toy Museum	Single use: different style of toys collection and experience of playing.
	Rensei Junior High School, Tokyo, Japan		
S12		3331 Art chiyoda	Mixed use: art studio, art gallery, café, and roof farm.
S13	Hota Elementary School, Chiba Prefecture, Japan		

		Roadside Station Hota Elementary School	Mixed use with hotel, restaurant, hot spring, and local farmer's market.
	Nanaura Elementary School, Chiba Prefecture, Japan		
S14		Nanaura Clinic	Single use: local clinic and nursing service.
	Daitou Elementary School, Osaka, Japan		
S15		Gym and local event place	Mixed use: experience of sports, restaurant, guest house and local community office.

In Table 3-6, all cases are located in Tokyo, Chiba Prefecture, and Osaka, some of the cases have already become an example to illustrate a school regeneration project for the other case that has been thought to reuse the school space again. School numbers 12 and 13 are two cases that have become a reference as a school regeneration project and a regional revitalization case. School number 12 is located in Tokyo city and reused the school space to represent a special theme about the local art festival at the beginning and extend the same idea to explore the field of art. The regeneration program has attracted many people who are related to the artwork. On the other hand, school number 13 is located in a rural area, but the school regeneration project has cooperated with the local community, and they are asking the local university students to join the process of the regeneration. Not only the space design but also the program development planning. The regeneration progress of school number 13 has turned the disadvantage into an advantage which is the school's location.

The location of this school is located on the side of the local highway and there is no attraction from the existing location. However, after the regeneration process, the result shows that many people will visit the school on purpose and enjoy the new facility on the site. School number 11 is an interesting case that it is hard to know that this school has redesign the school space, from the visiting and the interview of the school staff, the interior space didn't change not much until the visitor enter the main floor of the toy museum. To enter the toy museum that needs to buy the ticket, therefore, the interior phenomenon has totally different than before. This gives the user a brain new space experience than just staying at a school building that is fully surprised while visiting each case.

3.1.3 School Building Reconfigure Condition between Taiwan and Japan

In addressing the quality of the reconfigure design process from the field survey, first of all, this research uses the Fitch's "determining the gradient of intervention according to the degree of damage to the building" as a reference to measure the building reconfiguration design process. Because of Fitch's

124

proposed as to measure for historical building, this measure's method will adjust to meet the require for this research survey. Reconfigure of architecture features can be classified into 8 categories to measure the school building. The detail definition is shown on Table 3-7. These building reconfiguration measures and methods are giving an idea while visiting the case in the field, which is observing in another perspective to analysis the school building.

Table 3-7 Building Reconfiguration measures and methods

Category	Definition of the process
1.Repair	Restore the object to a certain historical state.
2.Renovate	Carry out a physical or structural repair to ensure that it can be used normally.
3.Reorganize	Reassemble the original components of the building at the original or new site.
4.Transform	Give old buildings new functions.
5.Rebuild	Rebuild the disappeared building on the original site.
6.Reproduce	Build a replica of an existing building.
7.Remain	Building remains the original layout and facade.
8.Demolish	Building is destroyed.

Transformation of architecture space in all cases are found several similarities. Classrooms are combined to several use with few light structures will change. Because both schools exist for a long time, the mechanical system is the main issue while redesign the function, school furniture are often reserve to reuse again. Architecture façade and landscape can be modified depend on the budgets and construction time before the management begins. About each case's participant and who is in charge to design the school space is shown in Table 3-8.

Table 3-8 Building regenerative design team and participant group in all case study

school		New name of school building	Building regenerative management and operation condition					
			Spatial design team			Government involve	Private enterprise	Community organization
			P	A	C			
Taiwan	S1	Taiping Exhibition Center	√	x	x	√	√	√
	S2	Home for Care and Love (Kung Ma Ma:EXSIT FOR LOVE)	x	√	x	None	√	None
	S3	Pingtung AI Agri Hub	√	x	x	√	√	None
	S4	Pingtung Education Innovation Unit	√	x	x	√	√	None

	S5	Long-term Care Center	x	x	√	None	√	None
Japan	S6	Nordisk Village Campground & TAOFLAT KITCHEN	√	x	x	None	√	None
	S7	Kasamatsu Hirotomo Memorial Hall	√	x	√	None	√	√
	S8	Fukuoka Growth Next	√	x	x	√	√	√
	S9	iika Palette	x	√	x	None	√	None
	S10	Kahoalpe Hotel (K-WALL center)	√	x	x	√	None	None
	S11	Tokyo Toy Museum	√	x	x	None	√	√
	S12	3331 Art Chiyoda	√	√	x	None	√	√
	S13	Roadside Station Hota Elementary School	√	x	x	None	√	√
	S14	Nanaura Clinic	√	x	x	None	√	None
	S15	Gym and local event place	√	√	x	√	√	√
	*P=professional, A=amateur, C=craftsman							

In addition, this research study is interviewing the users, designers, and relevant people to help to clarify the satisfaction of the school regeneration process and the outcome between Taiwan and Japan. Trough the investigation period from 2021 to 2022, the interview starts a questionnaire, but the survey time has a hard to really ask someone to fill out the questionnaire. Therefore, the interview becomes like the hearing process instead of filling the questionnaire. The hearing interview can be in depth of discussion or a short time talking, it depends on the interviewee's condition. Also, because of the school location, the surrounding resources are also affecting the interviewee's number such as the human resources and appointment scheduling.

This research starts the survey in Kyushu area that is including Fukuoka perfecter, Goto Island, Nagasaki prefecture and there are five regeneration schools had been visited in April and August 2021 and January 2022. The second investigation period was Jun in 2022 that I visited three schools in Tokyo

and Chiba prefecture. The third investigation period was August to October 2022 in Taiwan with 5 different types of regeneration school cases that was located from the north and south part of Taiwan. The last investigation periods were November in 2022 that I had visited two schools which are in Osaka and Tokyo. The invitation period detail shown in Table 3-9.

Table 3-9 Investigation period of school regeneration cases

Investigation Date		Investigation Time		Total Observation / interview hour
		0900am-1200pm	1300pm-1800pm	
period 1	2021/4/13	-	Daimyo Elementary School (S8-JA)	2 hours
	2021/4/14	Daimyo Elementary School (S8-JA)		5 hours
	2021/4/15	Daimyo Elementary School (S8-JA)	-	2.5 hours
	2021/8/10	Tao Elementary School (S6-JA)	-	2.5 hours
	2021/8/15	-	Tao Elementary School (S6-JA)	4 hours
	2021/8/18	The Funa-mawari Elementary School (S7-JA)		4.5 hours
	2021/8/19	The Funa-mawari Elementary School (S7-JA)		5 hours
	2021/8/23	-	Tao Elementary School (S6-JA)	3 hours
	2022/1/16	Iikane Elementary School (S9-JA)	-	2.5 hours
	2022/1/16	-	Ashijiro Elementary School (S10-JA)	4 hours
period 2	2022/6/20	Hota Elementary School (S13-JA)		6.5 hours
	2022/6/21	Nanaura Elementary School (S14-JA)		6.5 hours
	2022/6/22	Yotsuya Elementary School (S12-JA)		6.5 hours
period 3	2022/8/20	Taiping Elementary School (S1-TW)		6 hours
	2022/8/21	Taiping Elementary School (S1-TW)		5 hours
	2022/8/27	ZhongYongn Elementary School (S5-TW)		5 hours
	2022/8/28	-	ZhongYongn Elementary School (S5-TW)	4 hours
	2022/9/17	NanHua Elementary School (S3-TW)		6 hours
	2022/9/18	NanHua Elementary School (S3-TW)	-	3.5 hours
	2022/9/20-21	CheCheng Elementary School WenCyuan Branch (S4-TW)		10 hours (2days)
	2022/9/26-27	Chiashin Elementary School (S2-TW)		12 hours (2 days)
period 4	2022/11/29-30	Rensei Junior High School (S12-JA)		14 hours (2 days)
	2022/12/1-2	Daitou Elementary School (S15-JA)		12 hours (2 days)

The investigation hours are including the interview and observation. If the school location is located in a wub or rural area, the investigation time can be last two days in order to understand more activities in the school space. Also, the Table 3-10 shows the questions and answers are category into three parts: information about the school design and school function, data about the

user's perception of the school regeneration process such as school management or operation, and the willing of participate the school redesign project. There is total 237 interviewee with 5 different regeneration school cases in Taiwan and total 299 interviewee with 10 different regeneration school cases in Japan (Table 3-10).

Table 3-10 Overall interviewee in all 15 school cases.

School number	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15
Interviewee number	108	25	56	37	11	37	18	56	40	20	20	28	30	15	35
Total in Taiwan	237					-	-	-	-	-	-	-	-	-	-
Total in Japan	-	-	-	-	-	299									

Table 3-11 Result relevant to school space redesign and the regenerated function.

Q1: what is the reason for you to use or visit the school?				
	Taiwan	Percentage	Japan	Percentage
A1: The characteristic of school building. (include façade and interior)	61	25.7%	41	13.7%
A2: The space function of school building.	65	27.4%	118	39.5%
A3: The Activities held in the school space.	83	35.0%	71	23.7%
A4: The surrounding environment and landscape resources of the school.	23	9.7%	25	8.4%
A5: The amount of paid space used by the school is cheap.	5	2.1%	44	14.7%
Total interviewee	237		299	
Q2: What are the areas that need the most improvement in this school space?				
A1: The style of school building.	13	5.5%	17	5.7%
A2: The structure of school building.	19	8.0%	14	4.7%
A3: The physical equipment of school building.	52	21.9%	107	35.8%
A4: The flexibility usage of interior school space.	52	21.9%	41	13.7%
A5: The circulation in the school building.	44	18.6%	59	19.7%
A6: The furniture utilization from the original school building.	22	9.3%	23	7.7%
A7: The signage system of school space.	18	7.6%	28	9.4%
A8: The landscape is of overall campus.	17	7.2%	10	3.3%
Total interviewee	237		299	
Q5: Which of the following should be considered as a priority in the process of reusing school space?				
A1: Design style of the school space.	72	30.4%	23	7.7%

A2: Renew all physical equipment and architectural structure system.	52	21.9%	62	20.7%
A3: Clearly delineated space functions and territory property.	27	11.4%	91	30.4%
A4: Combined with local demand and environmental resources.	56	23.6%	76	25.4%
A5: Management in line with local economic benefits.	30	12.7%	47	15.7%
Total interviewee	237		299	

According to Table 3-11 the different reasons for the public to visit or use the school space between two countries, the answer number 3 for Taiwan and answer number 2 for Japan are the highest answer options. This analysis means people in Taiwan are attract by the activity that is held in the school and people in Japan are attracting by the space function of the school space. Also, the characteristic of the school building is another reason for people to visit the new school in Taiwan. On the other hand, people in Taiwan are also consider the style of the school architecture becomes an attraction reason to visit a regenerated school building (Fig.3-5).
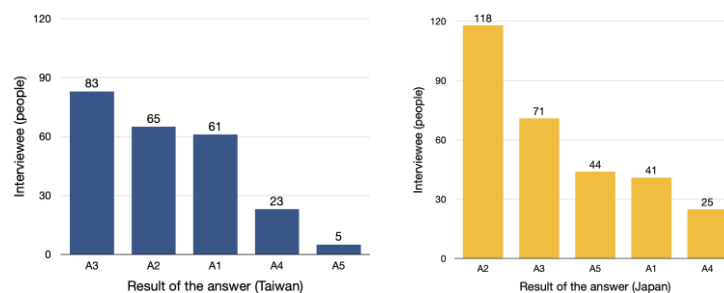
Figure 3-5 Result of user's reasons to use or visit the school building between Taiwan and Japan

About the school space redesign outcome, the reaction from the questions number 2 shows almost the public are consider the safety issue of the building include the physical equipment renewable or not. The detail design consideration are the division of the space layout and a clear circulation. This answer shows the user may have some issues during using the school space after the redesign process. The division of the space may include the variety utilization of the space function and the territory authority, this result gives this research a hint that normally when doing a space design may not really consider enough about the relationship between the space function and user behavior, moreover, the user's perception about the overall space they are used (Fig.3-6).
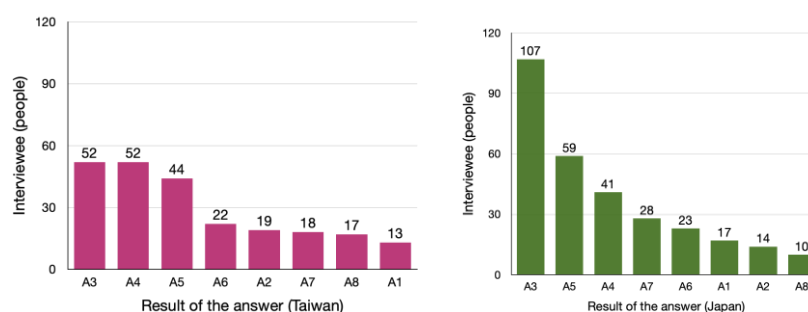
Figure 3-6 Result of the most improvement category in the school building between Taiwan and Japan

When asking the question about which of the following should be considered as a priority in the process of reusing school space? The answer shows people in Taiwan are really focus on the design style of the school space, but people in Japan are respond as clearly delineated space functions and territory property. This is very interesting that people are having different respond about how to see a school building while it has a chance to reuse. This different can be relate to the culturally different about how to react the idea of regenerating the school building in a community. Moreover, the difference can be also reflecting the policy of two country's government, which is influence the regeneration achievement in different perspective (Fig.3-7).
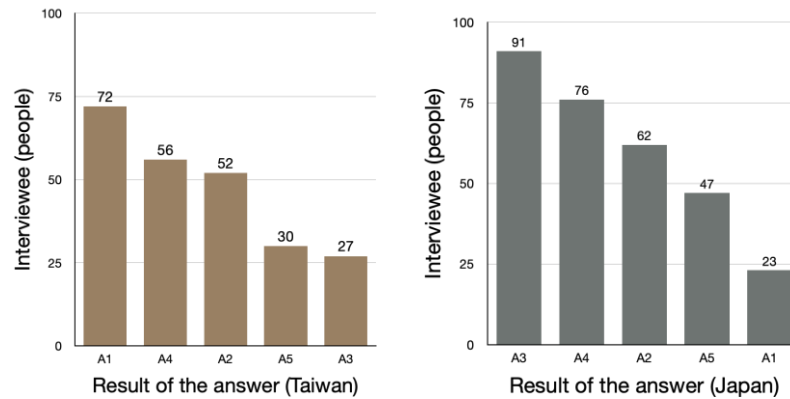
Figure 3-7 Result of the consideration as a priority in the process of reusing school space between Taiwan and Japan

Table 3-11 are the organization information about user's perception of the overall school regeneration project. The overall questions are including how people feel about the new space, how do they feel about the new arrangement of the program, and the management of the school building as a new facility such as the service operation and activity held by the school manager or organization. In this part of the investigation, it is rarely to have a high score of the extremely unsatisfied answer because of almost all 15 school's cases are regenerated for a while besides three cases in Taiwan are regenerated less in two years. But there are still have some chances to discover the user's perception are more consider in which part of the school regeneration project. It is also related to the new use of the school space which means the new architecture program becomes the main consideration during the school regeneration criteria factors. In figure 3-8 shows that almost all people are satisfied with the new design space in the school and how do use the school space for the new regeneration outcome.
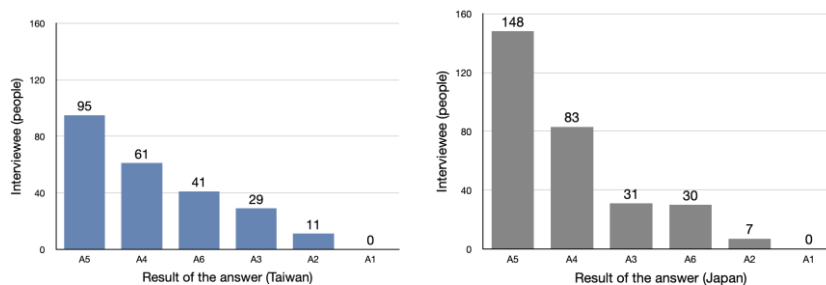
Figure 3-8 User's satisfaction result of reusing the school space between Taiwan and Japan

According to Figure 3-9 shows most people are satisfied with the service and activity that is hosting in reusing the school place. In Taiwan, there are 83% of people happy with the result and 87% satisfied in Japan.
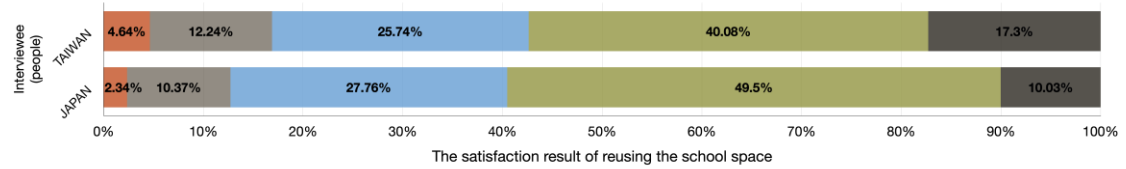
Figure 3-9 A comparative result of the user satisfaction percentage by reusing the school space between Taiwan and Japan
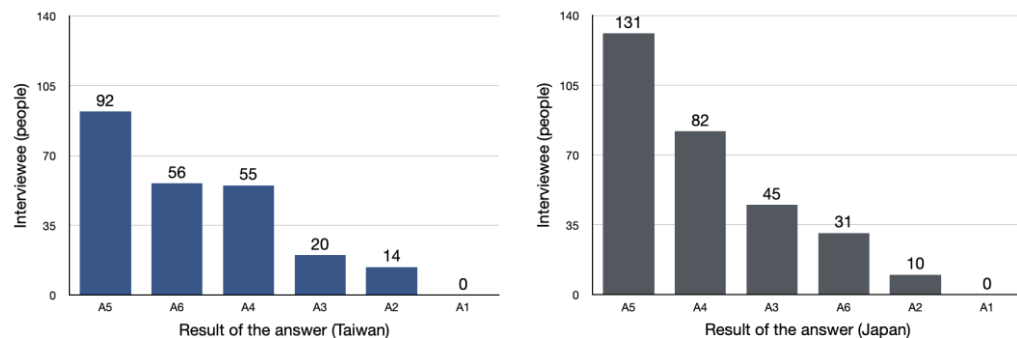
Figure 3-10 User's satisfaction result of school space design between Taiwan and Japan

However, even the redesign school space and its space function are satisfied by the public, there are still having some unsatisfied recommendation in school management, activity, and service aspects. These can be recall back to the beginning of the architecture programming setting. the architectural program or the school management in Taiwan has about 10% to 20% which can be improve more will become the consideration too. But, in Tabel 3-12 shows the most important part is during the answer of A3, a little satisfied has almost 30% to 40% average in the issue of the school management, service, and activity (Fig.3-11 and Fig.3-12). This survey result shows people may don't really have a connection or truly reaction with the regeneration school space. It may cause the public may just want to use or visit one time, maybe it only comes once a lifetime. This kind of situation will not doing good for reusing the school space to revitalize the neighborhood. This may cause the second time of abandoned problem to the overall school building and the surrounding. Therefore, begin to regenerate the school should think through a long-term plan to reuse the school.
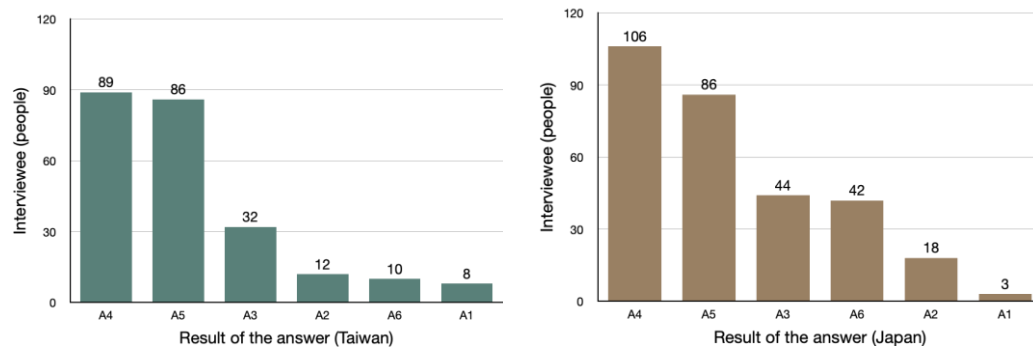
Figure 3-11 User's satisfaction result of overall school management between Taiwan and Japan
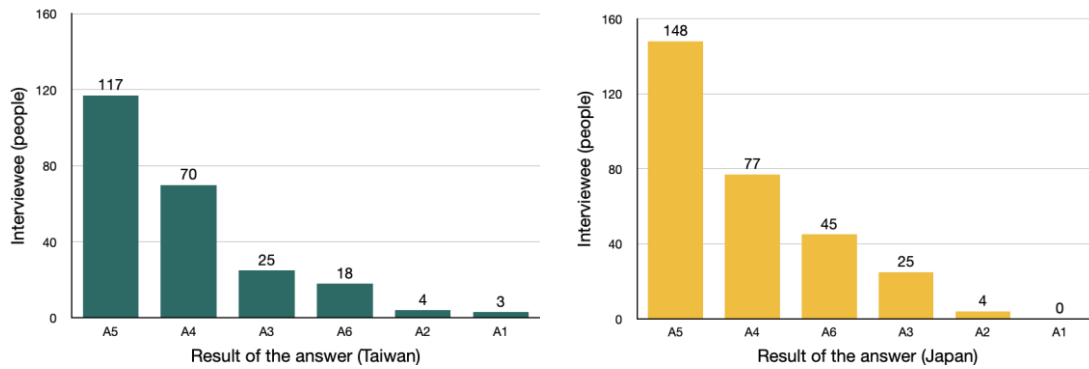
Figure 3-12 User satisfaction result of activity and service in the school between Taiwan and Japan

According to Figure 3-13 shows most people are satisfied with the service and activity that is hosting in reusing the school place. In Taiwan, there are 79% of people happy with the result and 90% satisfied in Japan.
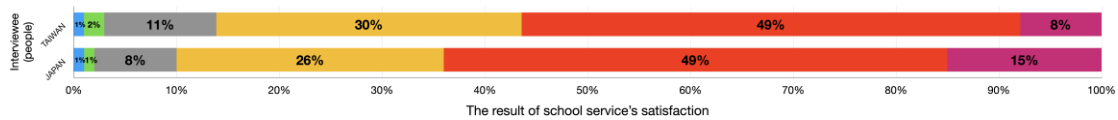
Figure 3-13 A comparative result of the user satisfaction percentage between Taiwan and Japan

Table 3-12 Result relevant to user's perception about the overall school regeneration project.

Q3: How do you feel the satisfaction of reusing this school space?				
	Taiwan	Percentage	Japan	Percentage
A1: Extremely unsatisfied.	0	0%	0	0%
A2: Unsatisfied.	11	4.6%	7	2.3%
A3: A little unsatisfied.	29	12.2%	31	10.4%
A4: A little satisfied.	61	25.7%	83	27.8%
A5: Satisfied.	95	40.1%	148	49.5%
A6: Extremely satisfied.	41	17.3%	30	10.0%
Total interviewee	237		299	
Q4: How do you feel about the satisfaction of this school space design and function?				
A1: Extremely unsatisfied.	0	0%	0	0%
A2: Unsatisfied.	14	5.9%	10	3.3%
A3: A little unsatisfied.	20	8.4%	45	15.1%
A4: A little satisfied.	55	23.2%	82	27.4%
A5: Satisfied.	92	38.8%	131	43.8%
A6: Extremely satisfied.	56	23.6%	31	10.4%
Total interviewee	237		299	
Q6: How satisfied are you with the overall school space management and operation so far?				
A1: Extremely unsatisfied.	8	3.4%	3	1.0%

A2: Unsatisfied.	12	5.1%	18	6.0%
A3: A little unsatisfied.	32	13.5%	44	14.7%
A4: A little satisfied.	89	37.6%	106	35.5%
A5: Satisfied.	86	36.3%	86	28.8%
A6: Extremely satisfied.	10	4.2%	42	14.0%
Total interviewee	237		299	

Q7: How satisfied are you with the services and activities offered by the overall school facilities as a whole?

A1: Extremely unsatisfied.	3	1.3%	0	0%
A2: Unsatisfied.	4	1.7%	4	1.3%
A3: A little unsatisfied.	25	10.5%	25	8.4%
A4: A little satisfied.	70	29.5%	77	25.8%
A5: Satisfied.	117	49.4%	148	49.5%
A6: Extremely satisfied.	18	7.6%	45	15.1%
Total interviewee	237		299	

Regarding to Table 3-13, after all the interviewee has been used the school space, the attitude about reuses the school space or not can be discover from these questions. It is also the opportunity to understand how the public think about an abandoned school and transformed into a new school building to represent to the public in the built environment. And to see how this redesign process can attract the public to join the school regeneration process, if there is an abandoned school that is waiting to be revitalize in their neighborhood. Most people do think that to regenerate a school in their community will help the region to revitalization, but there are still around 24% in Taiwan and 26% in Japan that people don't have a feel about reusing the school is a social value to improve the built environment (Fig.3-14). Even though people are saying they will think of do participate the school regeneration project, it still needs more effort to establish how a public school can have a second life to show reuse the school space is not only to continue a school building but also enhance the social culture in people's daily life.
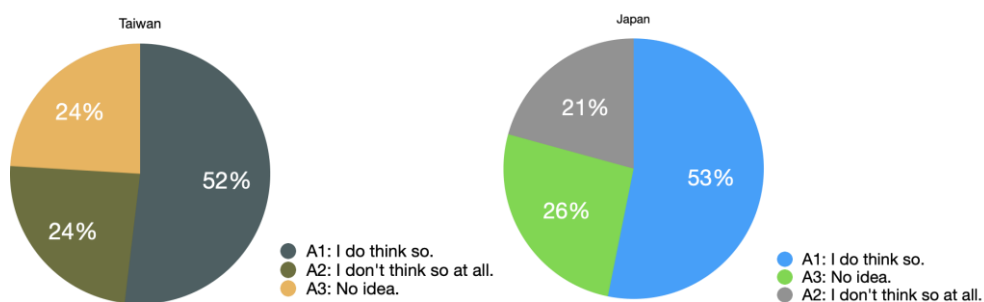
Figure 3-14 Result of the school's role in regional revitalization between Taiwan and Japan
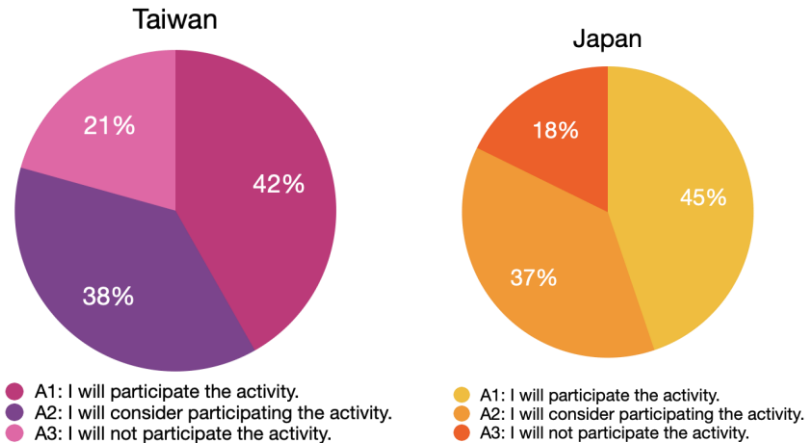
Figure 3-15 Result of the school's activity participate percentage between Taiwan and Japan
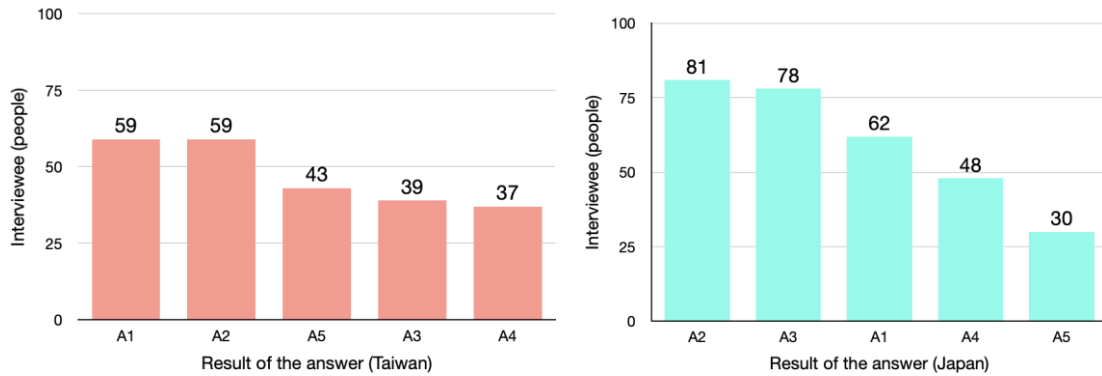
Figure 3-16 Result of the expectation to transform the abandoned school space into for reuse value between

Taiwan and Japan

Table 3-13 Result relevant to the willing to participate the school redesign project.

Q8: Does this school facility play a role in regional revitalization?				
	Taiwan	Percentage	Japan	Percentage
A1: I do think so.	123	51.9%	159	53.2%
A2: I don't think so at all.	57	24.1%	62	20.7%
A3: No idea.	57	24.1%	78	26.1%
Total interviewee	237		299	
Q9: If there were any reused schools in your area, would you participate in activities to revitalize them?				
A1: I will participate the activity.	99	41.6%	134	44.8%
A2: I will consider participating the activity.	89	37.6%	112	37.5%
A3: I will not participate the activity.	49	20.7%	53	17.7%
Total interviewee	237		299	
Q10: Which of the following goals do you expect to transform the abandoned school space into for reuse value?				
A1: Industrial and commercial cooperation.	59	24.9%	62	20.7%
A2: Diversity activity interaction.	59	24.9%	81	27.1%

A3: Regional engagement and cultural exchange.	39	16.5%	78	26.1%
A4: A place to absorb knowledge and skills training	37	15.6%	48	16.1%
A5: Community service related.	43	18.1%	30	10%
Total interviewee	237		299	

3.2 Space Syntax Method to Examine the School Space Layout

Architecture space reconfigure intention is to create more space layout possibility to reuse the space more flexible way. Space is the part that a participant uses in the building. The designer configures each building space through different architectural design techniques and the use of building elements (Bibri, Krogstie, & Kärrholm, 2020). The user's movement in the space completes the action of space use, the movement of the person is the combination of the body movement and the line of sight. However, the configuration of objects in space affects the circulation and line of sight of movement. Space syntax defines the human movement circulation and line of sight as the axial line in a space, representing the countless possible spatial axes in each space as one axis, expressing the circulation system of each space unit in the building in the most streamlined way. Also, space syntax is organizing the overall spatial axis as a spatial organization (Hillier, Leaman, Stansall, & Bedford, 1976).

From the perspective of space, using space as a medium between form and function, space syntax is exploring how to define the relationship between form and function through the mode of space (Bafna, 2003). Attempts to understand whether form determines function or function influences form. For example, whether the form of material space can affect the socio-economic and cultural operation, and whether the social and economic behavior itself needs to be completed through physical space. Morphology and syntax are the two most important parts in the space syntax. Form (Penn, 2003)refers to the composition of words, affixes, roots, names etc., and syntax refers to the arrangement and combination of the word in sentences, clauses, and phrases, and the rule that controls the relationship between different sentences. Therefore, spatial syntax has become one of the most important analytical theories and methods such as spatial configuration analysis and urban morphology.

3.2.1 Definition of Space Syntax

Any type of building can basically be divided into two categories: occupants (inhabitant) and visitors, and visitors. This type of user is the most important concept of space syntax when discussing the social relations of so-called space (Li & Samuelson, 2020). The occupant has the right to control the visitor's access to the indoor space, according to the familiarity of the visitor to determine the space he can access, the visitor can only enter the interior space temporarily and has no power to control the building. Though, together, the two have a common interface space. For instance, the entrance of the residential building, the reception room of the office building, the entrance foyer of the building, these spaces are the space were occupants filter visitors. In this research, the similarity space of the school building could be the administration office or atrium in the past, but after the regeneration design of the school building, the interface space might be different than the original plan layout.

Compared to other spaces in the building, these spaces are located in the relatively shallow spot of the building and are also located between indoor and outdoor interface spaces which most of designers call the interface space. Only visitors who are allowed in by the occupants can reach the deeper spaces inside. So, the depth of the space can illustrate the social relationship between the occupant and the visitor. In addition, the type of interface space between occupants and visitors is the basis for the classification of building types. The concept of depth can also indicate the social relations and hierarchies between the occupants. For example, the spatial organization of banks is an example. For example, the higher position has a deeper space, the lower position is shallow, the clerk sits at the counter and faces the customer to deal with related affairs, the higher position is in the space originally located behind the clerk, and the higher position is in the independent space of other independent office buildings.

On the other hand, visitors, most of the people who enter the bank are waiting in the bank lobby and paying bills or withdrawing money. In other words, visitors are usually confined to the shallowest space and synchronized space: the lobby. Occupant has a specific spatial location (spot) in the building, whether it is a desk, a room or a space shaped by furniture. These are local spaces within the building. The social relations and connections between the occupants must be connected by other circulation systems in the building, such as walkways, and the so-called axes of spatial syntax. This also becomes the spatial axis map of the building, and at the same time, it is also the overall spatial organization (global space organization) and social image. The relationship between spatial axis map is also developed from the concept of depth, and the interplay between its spatial elements will be analyzed in more detail below. Thus, spatial relationship diagram is the theory of space composition to represent each space in a circle, abstract expression of its spatial range, ignoring the actual scale size (Batty, 2004). The permeability relationship between spaces, such as the spatial symbolic connections formed by elements such as doors, are linked by linear symbols. There are four fundamental types of the spatial relationship (Fig3-17). This figure is giving an idea to analysis the school space in another perspective to understand the relationship between each room, door, and circulation area (Van Nes & Yamu, 2021).
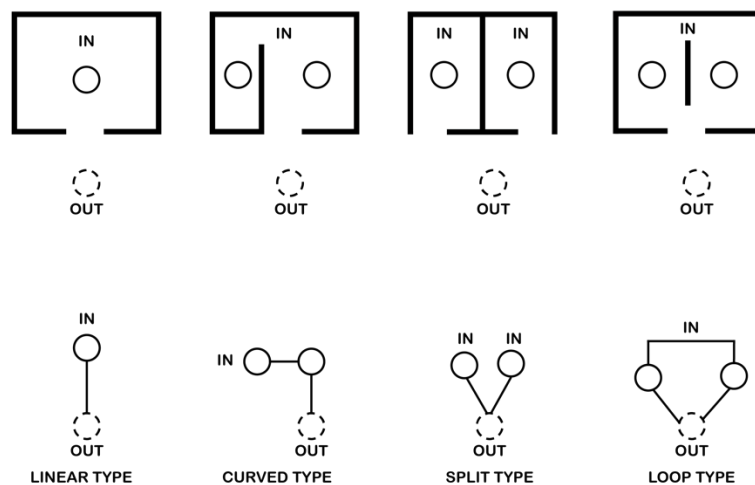
Figure 3-17 Justified graph of the basic spatial relationship.

3.2.2 Analytic Classification of Symbols' Identity and Characteristic

According to the previous definition of the space syntax in section 4.3.1, this research has designed spatial property symbols in order to assist the research process to understand the space's property faster and simply to identify during studying the spatial hierarchy relationship; also, while analyzing the plan layout, the symbol could be read easily on the drawing. Before starting to analyze the school layout space, the symbols are threefold: node as a circle, space as a square, and triangle as a device space. Furthermore, Space's characteristic can be defined from the solid line to the dashed line to represent the space property from solid to void. This symbol design in this research is created in the hope of creating a tool to assist the future designers or redesign participants read the space in a professional way (Fig3-16).

Along with the threefold of the spatial definition by the geometric form. The solid line and the dash line are also illustrious as the interior and exterior space. Every symbol represented the architecture design element which can be imaged directly by the user. As a space designer, obviously, the symbols can link to the knowledge of architecture graphic design, symbols are often to show in the architecture drawing. Also, the design idea has the basic concept of the user interface design, which people are well known as User Interface Design (UI system).

When the user sees the symbol can have the image to think of the space characteristic. For example, the stair either the interior or exterior is drawn as three parallel lines as people often to see during the architecture graphic plan layout. Likewise, the symbol can be designed by anyone who is motivating to understand the spatial relationship. As long as each symbol has clear definition before start to redesign and figure out the space. The advantage of the analysis is extremely visualized and understandable for the public. And during the symbol creation process can be fun and easy to communicate to all participants. Last of all, it does not necessary to require a very high professional skill to process the task. User interface design has also created a simple, understand, and fast to learn without using many computers technology, all the participants can just use a simple tool such as a pencil and a paper to define their understand figure of each symbol during the process of reviewing the school space or redoing the school space layout. This process can offer the user to think and communicate to themselves or other easily be defining the meaning of each symbol. As long as they follow the idea of solid, intermediate space, and void definition. Also, the space, room, and device space to represent the space identity.
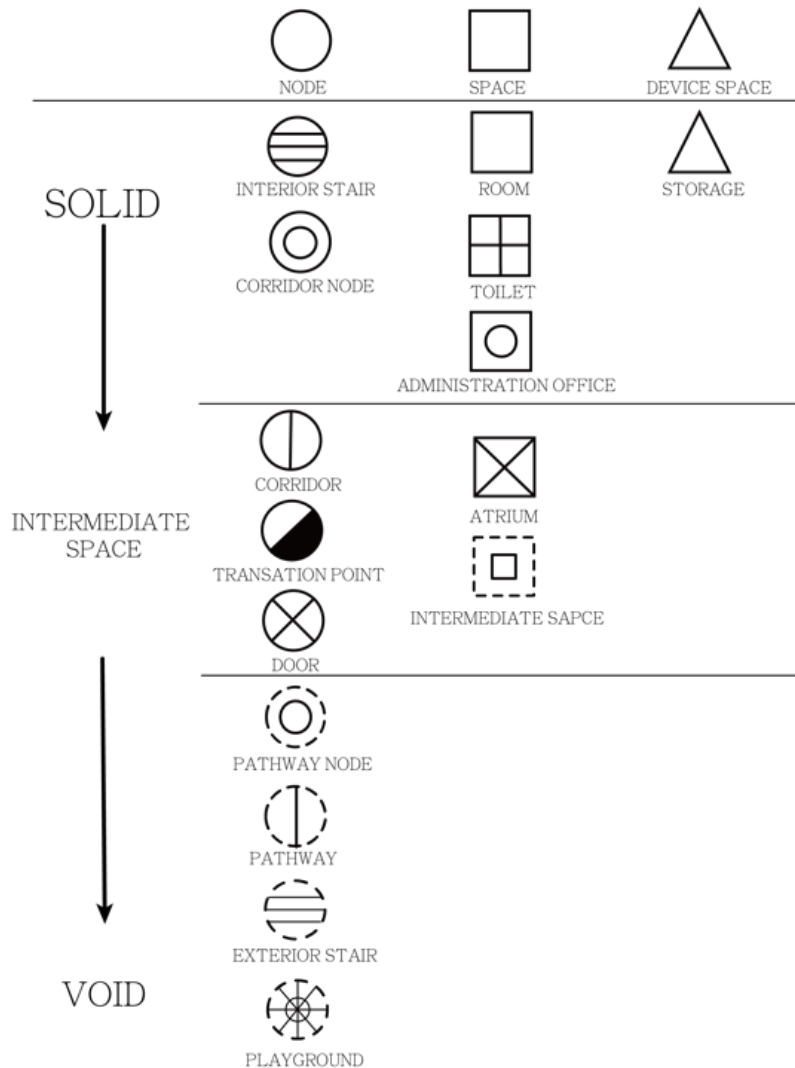
Figure 3-18 Legend of space syntax symbol.

3.3 Proxemics Method to Organize the Relationship between User's Behavior and Territory

3.3.1 Redefine the Territory Transformation Property

When the building space is transformed into different utilization from the solid to the void space, the approach between design thinking and architecture placemaking in an existing limited layout could happen in different formats, scale, and property. The different use of space can enhance the importance of spatial hierarchy's arrangement; also, the spatial organization during the regeneration process would be challenged (Welch, O'bnen, & Brown, 1991). Undoubtedly, humans possess the spatial-cognitive ability to understand and manipulate the environment, and this ability allows people to understand the space around their daily lives. Following the idea of the territory transformation in figure 3.1 shows this section's analysis is discussion the spatial qualities in the school facility. The facility is redesigned to offer the new architecture program for everyone. A reborn space like the school keeps the architecture

form but the inner spirit of the space has exchanged to meet the require of the present time. Spatial quality in between the public and private can be represented different social value such as the self-responsibility, the sense of the space and the identity of the environment (Ramezani & Hamidi, Privacy and Social Interaction in Traditional Towns to Contemporary Urban Design in Iran, 2010). On the other hand, the words of public and private can be described as the interact relationship between collective group and individual group. The concept of the territorial differentiation in this research methods are divided into four categories: personal space, limited service space, functional service space, and public space (PLS, LSS, FSS, PBS is the abbreviation for each territory zoning).

Meanwhile, share space can be designed in numerous forms, spaces, and order. During this research process, the study divides the share space into two types, semi-public and semi-private spaces that refer to functional service space and limited service space which is the middle part of the diagram from Figure 3-19. Thus, through the analysis of this study, the redesigned architectural plan after the building construction and the campus reconfiguration uses four dissimilar territory categories to examine the new territorial function property and spatial management. The property of territory transformation idea in a school building is hardly to notice that every space or every territory will be influencing many aspects, for instance, the user's behavior to act in the right space can be trace back to the space design's decision, the space arrangement may not think further enough to predict the user's movement during the regenerative school design process. Thus, to think clear about the territory form the personal or private property to the public space become the essential design thinking in the overall school reuse design phase.
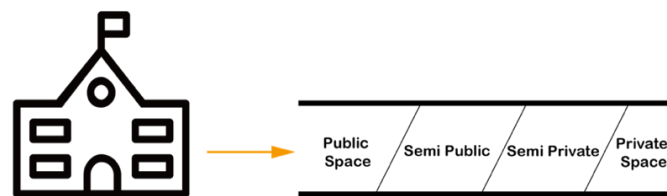
Figure 3-19 The Property of Territory Transformation Idea in a School Facility.

The research result shows a serious of characteristics of redesign policy, user's authority of the space, and the frequency of interaction quality. In Table 3-14 as an example to show the private claims on public space in each case has identity and emphasized different territory property from personal space, limited service space, functional service space, and public space in the research analysis process. Also, each of the category is giving a score to show the quantity of the territorial usage. Moreover, the score will compare to the score in each case's space syntax analyze outcome. The definition of these four categories is based on essential idea of the space syntax: only visitors who are allowed in by the occupants can reach the deeper spaces inside. On the contrary, the public space in this research study is defined as a space can be access or use at any time of the day, even during the nighttime, there is no limitation in this free space. The next class is called functional service space, the characteristic is the space is open at a period of time, it is depending on the architecture program of the school building after the reuse strategy purpose. The third group is called the limited service space. This meaning the space has the limitation to

enter the space, it needs to have the authority by the occupants. Also, in this group, the occupants might have signed the contract to the school committee or the management people. The space in this level can have the specific architecture function or characteristic that needs to be distinguished from the other school space. Final category, personal space. Personal space in this research study can become very interesting or tricky. The definition of the personal space can be addressed as when the user uses the space can feel relax and comfortable. Personal mental emotional is the primary consideration to divide the space into this category. At this stage, the occupant either have the full authority or a specific role to use the space. The meaning of the specific role in this study can be find as the gender issue, the special person, the school commit, etc.

Table 3-14 Definition of territorial frequency quality

Category	Abbreviation	Score	Definition of each territorial zoning
Personal space	PLS	1/4	Personal use space with a comfortable circumstance.
Limited service space	LSS	1/3	Specific objective with the permission to enter.
Functional service space	FSS	1/2	A period of time to allow to access the space. (Usually 6-8 hours per day)
Public space	PBS	1	24 hours access the space without the limitation.
*Score=1, fully open space to the public with free access.			

3.2.2 Criteria Impact of User's Behavior and Territory Design

This research is focusing on the reconfiguration process with architectural placemaking design strategy (Busbea, 2020). In order to continue to use the space from the school, which is also creating a culture dynamic influence on the surrounding. Because of the influence will bring different kinds of values to assistance both school and the community; also, the region revitalization can have its potential to rethink the economic develop direction. The research flow concept is also trying to study to observe how the design takes the balance between preservation the space and cooperation with the public. While redesign the purpose for the school architectural space, the function will redesign for a specific purpose to meet the user's requirement from the surrounding. The abandoned school architecture creates an opportunity to utilize the placemaking design strategy as a communication tool to assist the neighborhood's environment resource reintegration for the future community development. (Fig.3-20) Architecture is a kind of aggregate reproduction of the relationship between the daily living objects of human beings in the environment. Moreover, it represents multiple combinations such as humankind, creatures, behavior, event, requirement, object, space and environment, and technology. There is no doubt that the formation is a unique land scenery from a space to the place during the redesign component is convert to a new landscape characteristic. In fact, this formation phenomena represents a specific period and place, for instance collective public living, culture, economic value, political affect, and space aesthetic. All singularities together reproduce the regional landscape and social epitome under the integration of aspects. Overall, social value, culture, economy, spatial aesthetics, regional politics, the trend of the times in a certain period, and the lifestyle of people in a particular district can be emphasized during architectural programming and architecture placemaking.
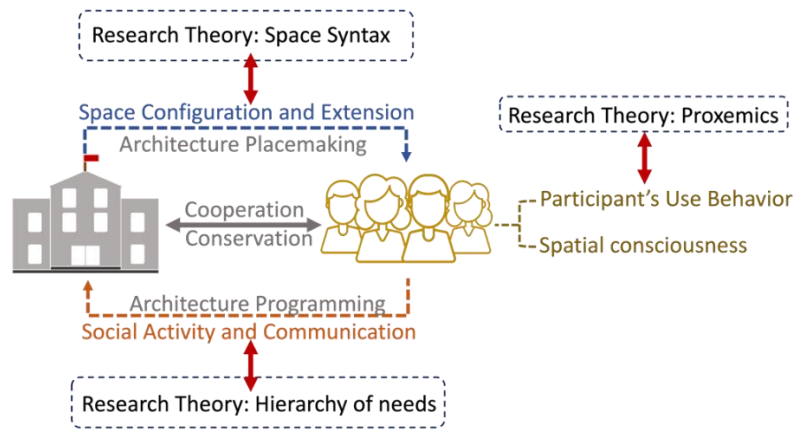
Figure 3-20 The Scope of the research study process.

The affiliation between architecture and users, people and environment, architecture and time will restructure through redesigning the architectural space process. This research aims at studying the cases of school architecture that was restored and transformed by mergers or abandonment locate in southern Taiwan. It conducts the methods of spatial order systems to predict and simulate space forms, user behavior, and requirement from the stakeholder. By extension, a comprehensive system plan is further conducted to identify critical issues related to building restoration. This research attempts to revise the restore cases from the filed survey to explore the crucial point of architectural formation layout and space reconfiguration characteristic, especially to steer the actual user behavior and architectural redesign strategy together. At the beginning to start the regeneration process, it happens rarely to attract the neighborhood to participate the movement. Usually, the surrounding will have a group of people who have the enthusiastic support of their hometown. In the research findings, either the city government or a person from the local will take the lead to join the process. There are four notifications during the process that the community care the most which are infrastructure of the space, technic of the action, interest of the attraction, and public's connection in each other. (Fig.3-21)

Figure 3-21 Concepts of Management Notifications.

3.4 Methods and Analytical Techniques of School Regeneration Design Evaluation

3.4.1 Evaluation MoSCoW Method

Normally, during an urban planning or renewal development process, architecture is often to be

141

an individual object, not like the street, plaza, or even just a lively open space in this overall urban design fabric. If an architectural space becomes unused, most of the space will become a crime place or a cluttered landscape around the environment which the city government carries an overwhelming burden. From the city's opinion, an architecture as an empty box, the government fiscal expenditures must arrange the amount of the budget to extend the building life cycle; also, the building without using the space will degeneration the building's value both in structural and physical circumstances itself. On the other hand, many buildings unfortunate will turn into the "Lost Space" as the end of the story (Trancik, 1996). Thus, in this study the abandoned school building can be a potential to renovation the existing built environment as a social infrastructure. School as a public and social infrastructure can become the place to revitalize the present neighborhood (Zhang, Yu, & Wang, 2022).

Due to the precipitously urban development environment, society has been facing a rapidly shrinking and aging population. Declining birth rates combined with a rising life expectancy, it becomes the main reason why the population is shrinking and aging, overall issues have been slowly affecting the utilization of educational architecture spaces, especially in rural areas in Taiwan and in Japan. The achievement of this study is to give an outline of the reconfiguration quality of abandoned campus redesign from the different architectural programs which is also assisted the underdeveloped area. Previous findings show a building without any utilization turned into a lost space and terminated its life cycle without any detailed inspection and planning, in order to continue as a sustainable architecture, during the rebirth process should concentrate on the spatial quality of the abandoned school features, reconsider the valuable component to extend the life cycle of the architecture in the reconfiguration process. This research mainly focuses on investigating the regenerated campuses and school building; moreover, to use the building reconfiguration measures and methods to analyze the reconfigure design process through different phases. During the architectural conversion stage, the design strategy and method either help to represent the architecture feature or improve the district development. The hypothesis is to review and reinforce the architecture design strategy before the overall space will be construction; additionally, the findings are willing to expected to strengthen the linkage between the new architecture program and future architectural space in the local area. Also, after the school has regenerated, the comprehensive planning and design in an overall concept is using the school as a space to represent the supportive place in the functions of ordinariness, linkage, security, and sustainability. To create the genius loci and continue the suitable operation and design mechanism. Furthermore, after the transformation of the school can be one of the social infrastructures to influence the surrounding and improve the living condition in the built environment (Norberg-Schulz, 1995).

At this stage, the evaluation score will use the MoSCoW method. This MoSCoW method is a way to prioritize stories, features, tasks, or requirements. This evaluation system makes the participants break all their features into four categories. The technique works nicely for different scales of projects, it can be either a large project or a small mission, in which the tasks can be fixed or tight limits of time and is a good process for assisting the entire production process. There are server targets to understand how the MoSCW method can be assisted. First, to manage a project's goals, resources, and time. Second,

distinguishes the users' wants and needs; simultaneously, it can also prevent feature requests from juggling. Third, to figure out if a project's idea is worth further investment or not to think through the project's milestones. Fourth, thinking about how to meet the overall environment market needs, for instance, the neighborhood's characteristics and the local region's economy. Five, to create a dialogue between project priorities with school staff, stakeholders, students, community, and government. last, to retain the core user base and release the next version to clarify the overall thought. All MoSCoW prioritization categories are based on the six descriptions above, which can assist the participant in recognizing during the redesign of the school space, function planning, and user needs.

3.4.2 Reestablish the Evaluation Criteria by Use Space Matrix Method

The discoveries are the foundation for developing a series of elements for the redesign execution process and establishing a design dialogue system for the designer, community, and government to communicate and understand what the best advantage is to maintain the building for the area, what should be improved to make it better, what is the potential or strength to utilize the space in future area enlargement. The comprehensive architectural environment redesign system should include the marketing and management scheme, the distinguishing elements of environmental setting, and realizing the basic needs of the humankind. Field survey in each case's study has shown many varieties of regeneration usage both in Taiwan and Japan, all of them have many different characteristics to show the school building's identity. But the space inside of the school building, the design is rarely to show the spirit of the space which means that the designer or the user are only thinking the arrangement of the space instead of the meaning of the space. Thus, using the basic idea of space matrix method, when people is starting to design the school space, they can use this method that is mentioned in this study to really think more about the connection between each symbol's represented meaning and arrange the design element by using the symbol's property such as node, room, and device space (Fig.3-22). Furthermore, each level of the space symbol can also have a clue before going to the next detail design phase (Griffiths, 2012).
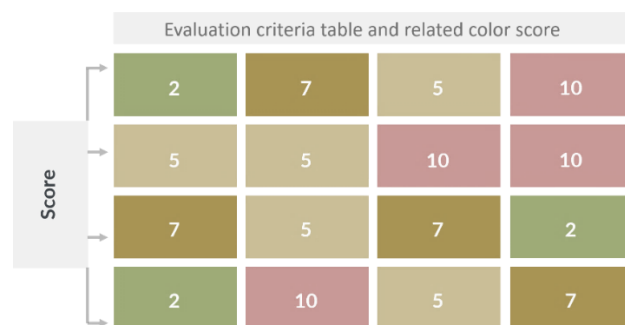
Figure 3-22 Assessment the regeneration criteria of space matrix method.

Territory differentiation is a method to seek the user's behavior and authority in a space. In this study, to clarify the territory usage by the proxemics theory, the social space is the space in between the public space and personal space, which takes a further step to think about the social engagement and user behavior in the school space. On the other hand, social space can be thought as the shred space among

the public space and the personal space. Therefore, the territory analyzing process can assist the space design participant to realize the boundary setting of the school space. Territory differentiation has also related to the space function that shows the user behavior can be act in a specific way. In order to make appropriate space design for different user and their inquire purpose, this analysis process can arrange the school space for each category division. Moreover, after finding the impact of each research subject, the analysis of research finding can establish the criteria in each category (Fig.3-23).

Figure 3-23 Scope of evaluation criteria formation by using MoSCoW and space matrix method.

3.5 Discussion and Summary

In this research, the spatial reconfiguration design is one of the sustain approach to enhance an abandoned architectural value in a built environment. Also, this architectural redesign process reconnects the social activity and human aspiration with the variety of natural system. The methodology in this study assumes the connection between next-generation architectural planning and environmental behavior design is the crucial design task during the regenerative design process. Its purpose is to describe and explain how the existing architectural configuration should respond and adapt in a timely manner to support the current overall environmental design space (Jiang, Ma, Dingyang, Qinglei, & Ruijuan, 2017). Also, the regeneration results echo the changes in the current social structure and challenges. Ultimately, what is at stake here is that the redesigned school architecture could assist the region in revitalizing and enhancing the community's identity by using the analysis method to understand the regenerative design progression more direct to find out the connection or require for the participant.

The finding that the regeneration process creates an attractive purpose for the community. The school building can become a space for the interactive exchange of information. Social practice can be one of the connection transforms and reuse the building which can attract people to the community. Moreover, inject more young vitality for the abandoned school. However, some circumstances will accidentally occur that developer needs to have the skill to know how to do is a benefit for the local community both in an urban and rural district. The keystone is to modify the designer's attitude and actions during the design and placemaking progress. A region remains many older generations who live there for their entire life; due to the history and culture, some stories will bring the advantage (Hoggart & Paniagua, 2001). Undeniably, the budget shows the influence of regenerate limitation. Also, volunteers or handyman represent the resource to maintain the operation of the school building. In summary, this

research study shows that proposes a complete program demonstrates an appropriate perception among the physical sense plus mental cognitive is significant during the architectural redesign process, but what is a good strategy deeply involved in the regenerate process is still an open wild question to discuss. How to maintain the school building fully functional and reborn into another architecture characteristic building remains unresolved.

CHAPTER 4

Analysis of Space Reconfiguration in Regeneration Design Process

4.1 Introduction

In order to understand the space utilization pattern and the regenerated school architecture utilization, case studies from the field survey indicate that user's convenience experience is the main consideration in all spaces design. Also, the characteristic of the space has been transferred and directed into a new usage function during the architectural regenerated design process and its new architectural programming strategy through different design method. This research starts with few analysis steps to explore the abandoned school architecture through its reuse space arrangement. To understand the original use of the space in these school architectures, this study begins to analyze the floor plan layout and campus plan between the original and the new design plans. Also, the research uses the building reconfiguration measure and methods to review the overall changes of the school architecture such as space use, architecture facade, structure system, mechanical system, and campus landscape.
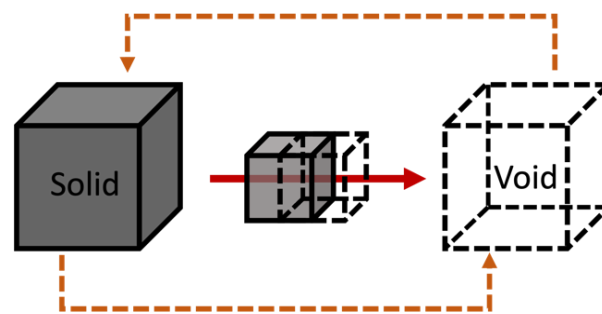
Figure 4-1 Space order from solid to void

4.2 Spatial Hierarchy and Design Elemental Properties

The relationship between space reorganization and spatial hierarchy is a set of hierarchical order to discuss the importance of space, and this design will discuss the hierarchy after regenerating space according to the research method of space syntax and combine its spatial elements with design techniques. Elements do not need to be related to each other, but for the purpose of using the entire building, it is necessary to create a spatial hierarchy order, and the spatial scale is not only a change, but also the configuration and unique form of the elements in the connotation. Space designers need to understand the hierarchical relationships implied by the basic geometric composition, but also because of the geometric figurative nature in different positions in different spaces, it will have different spatial values, such as the center, corner and outer element have a self-essential.

At the same time, the spatial hierarchy also implies that there is a difference between primary and secondary elements. However, there is a dependency between elements. When the elements are diverse and diverse, hierarchy is a powerful unifying element. Many elements can be combined into a larger, more concise and more recognizable overall space. Hierarchies can be implied through virtual bodies or entities, and users only need to use ropes and relationships to organize ideas about the use of space. If there are too many levels of equal value, the value of the original space will be lost, so the spatial hierarchy can also be regarded as the reference basis for spatial positioning in architectural design.

146

4.2.1 Spatial Hierarchy in Different Reconfiguration Design

As the result, all plans show that the main structure remains the same as the original, but the interior space is rearranged with different purposes and functions. A few cases have made the plan layout different than the original because the new architecture function. Usually, the classroom area is easy to divide into a small room by using light walls to separate the rooms. Therefore, some interior spaces are reorganized into several private rooms, while other classrooms are transformed into an exhibition room or are kept empty for flexible usage such as learning classroom, retail store, communication rooms, and auditorium rooms. All above space rearrangement can be discussed as different use purposes to realize the spatial hierarchy can also be modify and think more about what is the most desire inquire when people have a second chance to plan and clear understand the placemaking relationship in every room and the design step (Wolff, Mdemu, & Lakes, 2021). This research starts to use the space syntax method to analysis the spatial hierarchy after the school is regenerated in different interesting architecture programing.

In order to understand the space utilization pattern, the regenerated school architecture utilization, two case studies from the field survey indicate that convenience is the main consideration in space design. Also, the characteristic of the space has been transferred and directed into a new usage function during the architectural regenerated design process and its new architectural programming strategy. This research starts with few analysis steps to explore the abandoned school architecture through its reuse arrangement. To understand the original use of the space in these school architectures, this study begins to analyze the floor plan layout between the original and the new design plans. For example, one of the cases in Pingtung County (Fig.4-2). The case shows the different before the school's regeneration plan and the original school plan layout. It is showing that the school plan can be changed a little because the overall design is still under the restriction of the school building structure system. In this case, it only changes a few classrooms become more bigger than before.
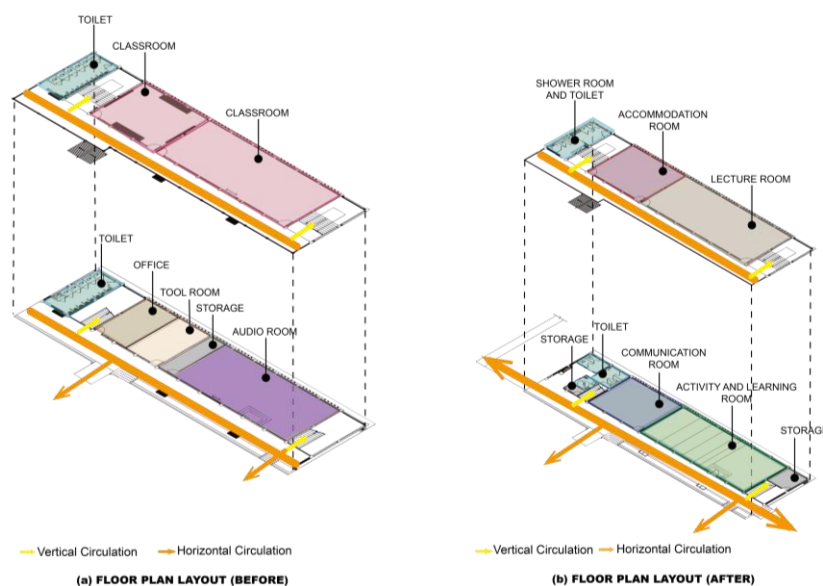
Figure 4-2 Floor Plans: (a)(b) CheCheng Elementary School WenCyuan Branch Floor Plans.

Another case is the school in NanHua Elementary School. After the regeneration design, the interior space of the overall school building has increasing more small-scale spaces to meet the new architecture program function. This case is also focusing on the outdoor are of the overall campus. In this research analysis of the space order for the overall 15 school cases area going to focus on the first floor building after the school regeneration process.
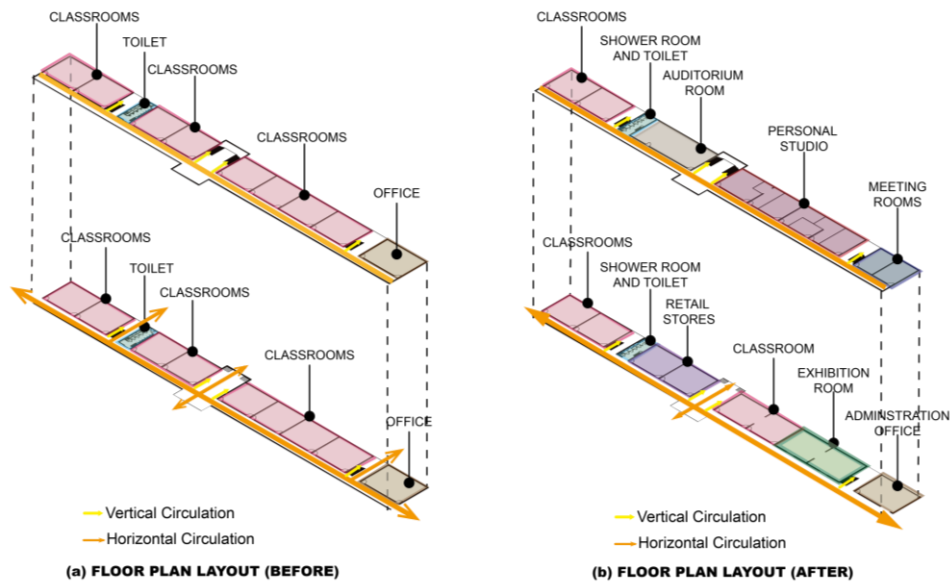
Figure 4-3 Floor Plans: (a)(b) NanHua Elementary School Floor Plans

All school cases studies are choosing from Taiwan and Japan which they are located from the scale of urban to rural region. Abandoned school architecture not only happen in the rural area but also the city center too. Therefore, in this section's analysis is finding the space relationship in different reconfiguration purposes with different built environment scale by author's own observation of the perception to the school scale and its region location. Single purpose or multipurpose architecture program is decided by the built environment situation of the school itself and the regional condition. In the urban scale, the school's space may become valuable due to the land value such as the case in Daimyo Elementary School, Fukuoka （A-2 and 3331 Art Chiyoda in Tokyo A-3）.The new reconfigure space layout show the spatial apply in design outcome is not excepted friendly user experience. The analysis perspective starts as the regeneration school in different scale of regionality. On the vertical part of the graph represent the depth of convenience and the horizontal part show the number of the space in the same level. The yellow line represents the connection to each space symbol, include the meaning of node, rooms, and storage. The detail show in Table 4-1. There are three groups which are urban area, suburban area, and rural area. The division is decided by the city's scale of each school's location, which is meaning that every school's location will show the address to present the city's scale of the environment. This can be category to the three different types. The types do not represent the school's scale and the population of the students. The detail information about the school still need to find form the government's database. Unless, the school is been abandoned already, otherwise, the database of the school will remain as the same from the city government.

Table 4-1 Analysis of Spatial Hierarchy by space syntax method

Urban Area (Type A)	Suburban Area (Type B)	Rural Area (Type C)
A-1: Level A-I	B-1: Level A-J	C-1: Level A-H
A-2: Level A-H	B-2: Level A-F	C-2: Level A-H
A-3: Level A-I	B-3: Level A-J	C-3: Level A-M
A-4: Level A-G	B-4: Level A-G	C-4: Level A-G
A-5: Level A-K	B-5: Level A-G	C-5: Level A-F

From the analysis result shows that the social resource from the existing area can be influence the space arrangement layout, for example B-2: Level A-F is analysis from the 1st floor plan of Nan Hua Elementary school in Taiwan, it shows in these levels, the level C has the highest spatial symbols which telling in this level has the most active user behavior action (Fig.4-4) and C-1: Level A-H, it show the accessibility is not really convenient to access, which means each space level may start to have different space symbol property and authority in each space (Fig.4-5). Also, the priority function of the regeneration architecture programming is the main key to decide the space reconfiguration. Architectural functions effect the design layout. In the group of Type, A, all schools are located in the urban area, even in the center of downtown. As the graph shows most of all cases from A-1 to A-5, the spatial hierarchy has the deepest result compared to Type B, urban-rural area and Type C, rural area. In type A, the depth level in each case from A-1 to A-5 are Level I, Level H, Level I, Level G, and Level K. The A-5 case is the one having the deepest depth is shown in the Type A, the reason to cause this result is because the original architectural plan layout. The A-5 case is Daitou Elementary School, Osaka, Japan. The school is redesigned for multipurpose functions with several organizations are operating the variety programs, the major architecture program is focus on the sport activities both interior and exterior space. Thus, the school is reused as a gym center as the overall regenerated concept to reconnect the local people and the school space.
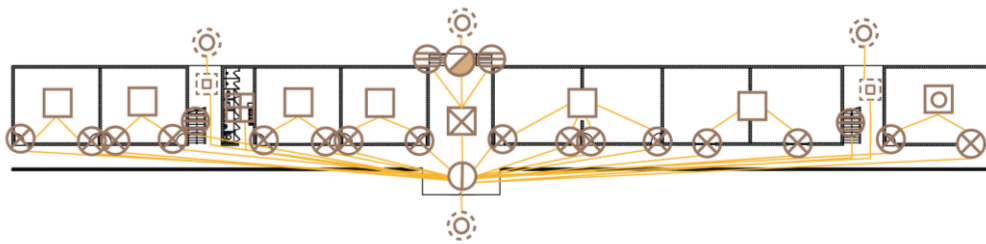
Figure 4-4 1ˢᵗ floor plan of NauHua Elementary School in Taiwan
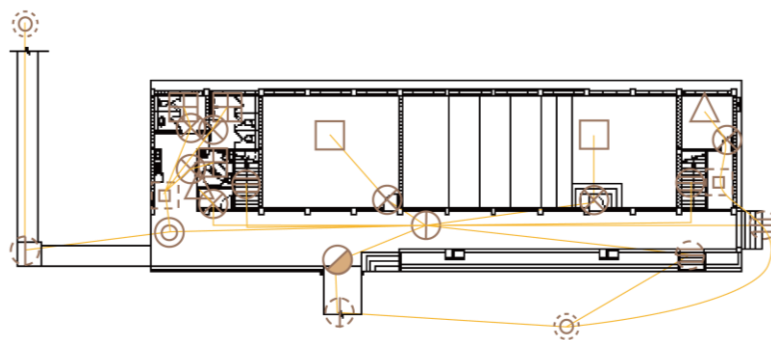
Figure 4-5 1ˢᵗ floor plan of Che Cheng Elementary School in Taiwan

The main organization host is the local city government which is also having a management office and staffs work in the facility after the school regeneration. Other organizations are responsible in different program such as restaurant, guesthouse, sport activity, and citizen live support event. The redesign layout doesn't change much, it still remains the U shape of the original school floor plan, but

150

the interior spaces are divided by different organizations due to their require of the space to work. Therefore, when the visitor enters the main door of the building, the most far distance or room in the facility is on both side of the building. Moreover, the most inconvenient room in this new design is the restaurant on the right corner of the building. Because the room is changed to a retail use to refresh the space phenomenon, the room is more complicate by adding the interior stair to make the space become more interesting of the space design (Fig.4-6)
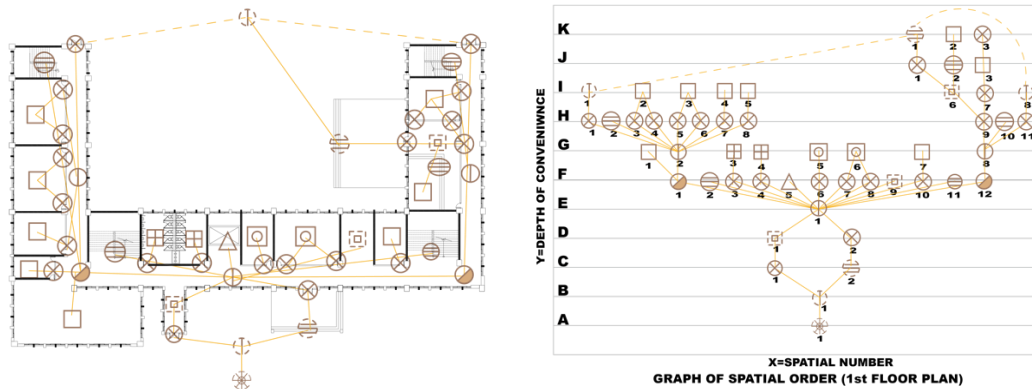
Figure 4-6 1st floor plan of Daitou Elementary School (Left) and Spatial hierarchy (Right)

In Type B, the analysis result shows the case in B-3 has the deepest depth too. In this case, the floor plan is similar like the case in A-5. The original school floor plan shows the same U shape form with two entry doors to enter the indoor space. The corridor has been changed into three level from Level D, Level F, and Level H which makes the overall space become more deeper to reach the interior room (Fig.4-6). Thus, the original floor plan with a new architectural program, for instance, the multipurpose utilization will make the spatial hierarchy become more complex.
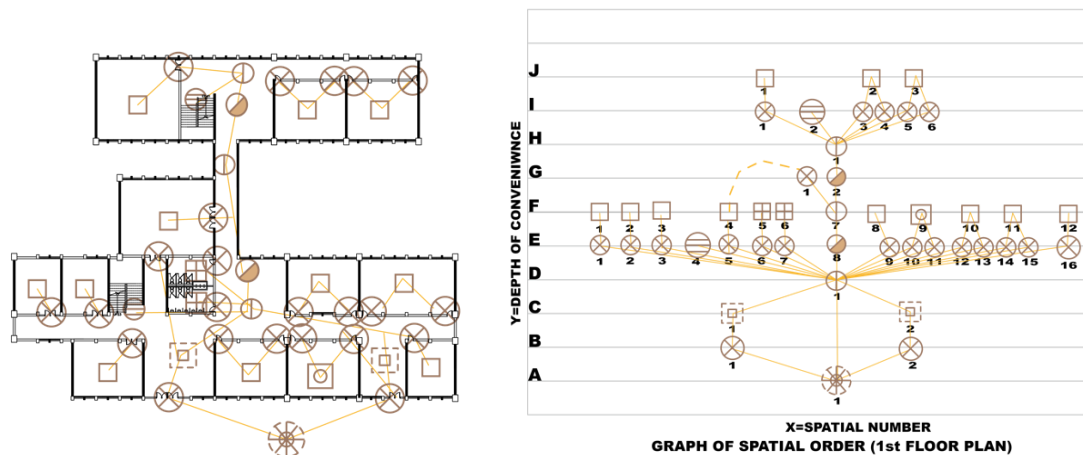
Figure 4-7 1st floor plan of Iikane Elementary School (Left) and Spatial hierarchy (Right)

Another interesting finding form Table 5.1 is Type C, the case in C-3. The case in C-3 is Tao Elementary School, Nagasaki Prefecture, Japan. This school is located in Goto Island, Nagasaki Prefecture. Goto is an island that is famous for its nature scenery and the history of the Christian migrants from sotome settled in a valley near the seacoast. In addition, Goto Island is well known about the hidden Christian sites and was nominated as the World Heritage List in 2018. Thus, the tourist industry become

one of the businesses for the local people which is attracted to some visitors and private enterprise to visit and invest the business. Tao elementary school is redesigned to become a glamping site for those who enjoy the outdoor activity. The organization is one of the biggest travel agencies in Japan, they also cooperated with a popular outdoor company Nordisk to reuse the school space as a new tourist spot. The school layout is simple rectangular shape with one main entry (Fig.4-8) and the space on the right is a restaurant serve the fresh local food. Left side of the building become the hotel room for people who want to experience the old school space in a nature environment.
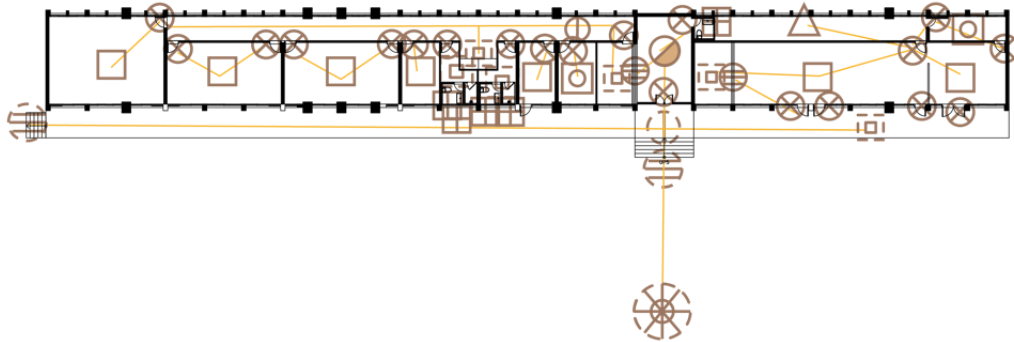
Figure 4-8 1st floor plan of Tao Elementary School

In this graph (Fig.4-8) shows that due to the hotel business reason that the space order becomes more deeper than other cases. Even though the campus is open to the public to visit but the interior space has the limitation because the security consideration for the guest who stay in the room. Not only the security factor but also the management of the inside space. The more inconvenient the more private properties of the space.
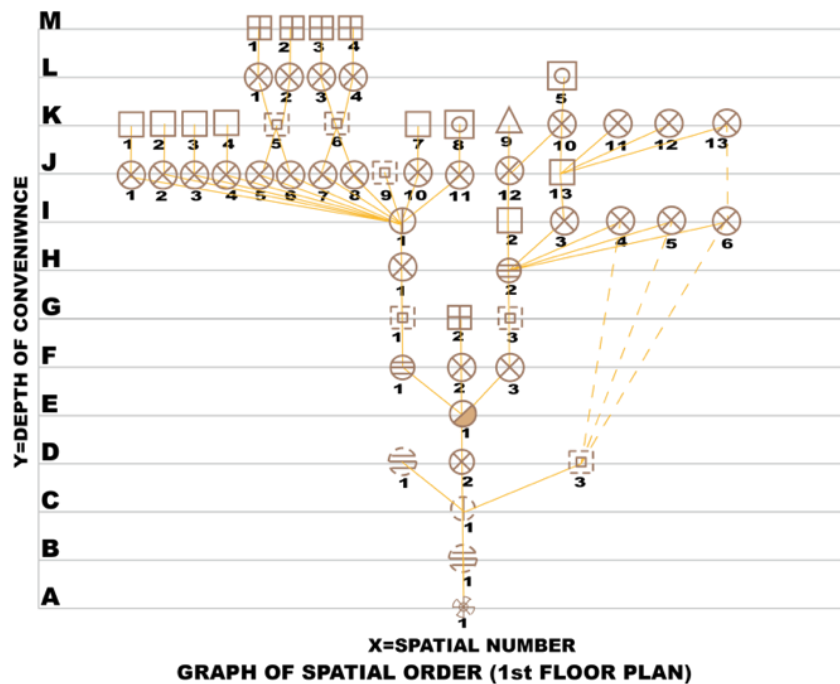
Figure 4-9 Spatial hierarchy in Tao elementary school

The corridor at Level I-X1 is the node to start to divide more individual and private characteristic of the space function. Furthermore, since the limitation of the original school plan, sleeping area and sanitary space is separated. Therefore, the sanitary spaces turn out to be the deepest spatial order in this case. The hierarchy of the space in this multipurpose architectural program, especially the hotel function which need to consider more thought about the behavior of the guest both in mental and physical condition. Because the reaction of the user can be affecting the service quality of this business. On the other hand, the intention of reusing the school space is the advantage but if the management service is bad can also affect the school space become abandoned again in the local area. In sum, the regular thinking of the space design order can be reflecting the variety of environmental resources distribution of the school building. then, the resources can assist the utilize of the space, design method can become more order to show the characteristic of the space reconfiguration.

Additionally, in Table 4-2, the settlement scale of development is having a different perspective from the field survey and personnel observation which is showing the observation by visiting each case's site and city. In Table 5-2, the distribution is defined by the administrative divisions of population in each city. According to the administrative divisions in Taiwan, a city has more than 125 million people can be category in level one, urban area, 500000 people to 125 million people is level 2, suburban area, and less than 500000 people is level 3, rural area. This level ranking can be seen by each school's location by its location such as a municipality, county, or township.

It shows the cases in Taiwan, school number one that is located in the suburban area school number two is located in the urban are, and other three cases are located in the rural area. All cases in Kyushu, two are located in the rural are and tow area located in the suburban, one in the urban area. Other cases in Japan, two in urban area and two in rural area, the last case is located in the suburban area. Thus, all of the cases have different site and settlement development condition that is assisting this research to understand the regenerative design process, the different school location may show the weakness and the strength of the regeneration project outcome. The finding of this survey gives a sense that the school's regenerative project can be relate to how many resources that the government input it.

Table 4-2 List of all case's settlement scale by the administrative divisions

School			Settlement scale of development			
			Administrative Divisions			Region scale of city development
	Name of school building		>125 million people (Division Level 1)	500000~ <125 million people (Division Level 2)	< 500000 people (Division Level 3)	
Taiwan	S1	Taiping Exhibition Center	-	√	-	Suburban
	S2	Home for Care and Love (Kung Ma Ma: EXSIT FOR	√	-	-	Urban

153

		LOVE)				
	S3	Pingtung AI Agri Hub	-	-	√	Rural
	S4	Pingtung Education Innovation Unit	-	-	√	Rural
	S5	Long-term Care Center	-	-	√	Rural
Kyushu, Japan	S6	Nordisk Village Campground & TAOFLAT KITCHEN	-	-	√	Rural
	S7	Kasamatsu Hirotomo Memorial Hall	-	-	√	Rural
	S8	Fukuoka Growth Next	√	-	-	Urban
	S9	Iika Palette	-	√	-	Suburban
	S10	Kahoalpe Hotel (K-WALL center)	-	√	-	Suburban
Japan (Beside Kyushu area)	S11	Tokyo Toy Museum	√	-	-	Urban
	S12	3331 Art Chiyoda	√	-	-	Urban
	S13	Roadside Station Hota Elementary School	-	-	√	Rural
	S14	Nanaura Clinic	-	-	√	Rural
	S15	Gym and local event place	-	√	-	Suburban
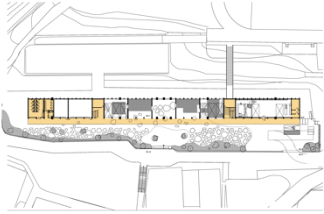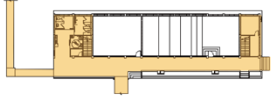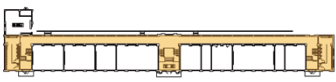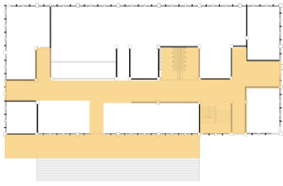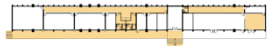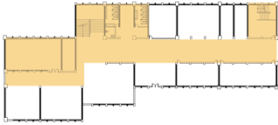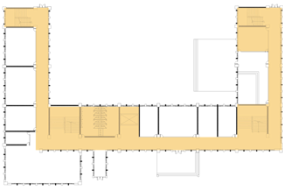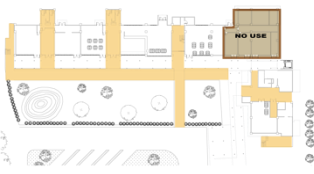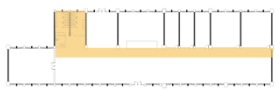
4.2.2 Relationship between Service and Servant Order

Spatial relationship must be designed for the habitation and concrete objects. While a designer trying to organize the space order. At the beginning, the space can be categorized into served and servant space. In this section, the findings show the servant space can be dominated the redesign process because the limitation of the original school plan layout (Table 4-3).

In Table 4-3, yellow color is the servant space, and the blank area is the served space in all cases. In section 5.2.1, the findings show the spatial hierarchy of each school regeneration result while the program are heading to multipurpose function, the space hierarchy can be deeper because the requirement of the user and the school building plan. However, the findings in section 5.2.2 show that the servant space also control part of the school space during the redesign process. As the definition of the servant space is supporting the major area of the school building. For instance, toilets, storage, technical rooms, stairs, corridors, duct shaft, mechanical rooms, and kitchen. All these spaces can be realized that most of

the spaces are not meant for the habitation, most of the space will be visited only by certain time and people. Under this definition, the servant space in the school space can be use only by the internal staff.

Table 4-3 Analysis of served and servant space

Urban Area (Type A)	Suburban Area (Type B)	Rural Area (Type C)
A-1	B-1	C-1
A-2	B-2	C-2
A-3	B-3	C-3
A-4	B-4	C-4
A-5	B-5	C-5

Briefly speaking, most of the servant spaces are not used for the visitors. The servant space in this research starts with the circulation node element which are the stair and corridor both includes outdoor and indoor node. Secondly, the lavatory and storage space. Because the reuse school space has limited by the original building structure and circulation, which is meaning the servant space can also limited

the visitor's space experience. Either the visual experience or walking experience through the new regeneration space. It may cause the servant space divided the space to change the user's behavior in the new built environment such as lost the direction in the building or confuse the sense of the space order in a new regeneration school building. on the other hand, the deeper space, the space properties can be more simple, important, or private.

Overall cases, the school building is not separated by more than two architectures. There are two cases show that the campus has separated by more than two buildings, these two cases are B-1 (Chiashin Elementary School in Fig.4-10) and C-2 (ZhongYongn Elementary School in Fig.4-11). Both cases' campus is organized by over two buildings, and they are first connected by the servant area. These result show both two cases are a single architecture program, they are belonging to the welfare and day care center for their neighborhood and both cases are not located in the urban area, Taiwan. On the other hand, they are located away from the center of the city and transportation is necessary need it to go to the school facility to participate the regeneration program in both cases.
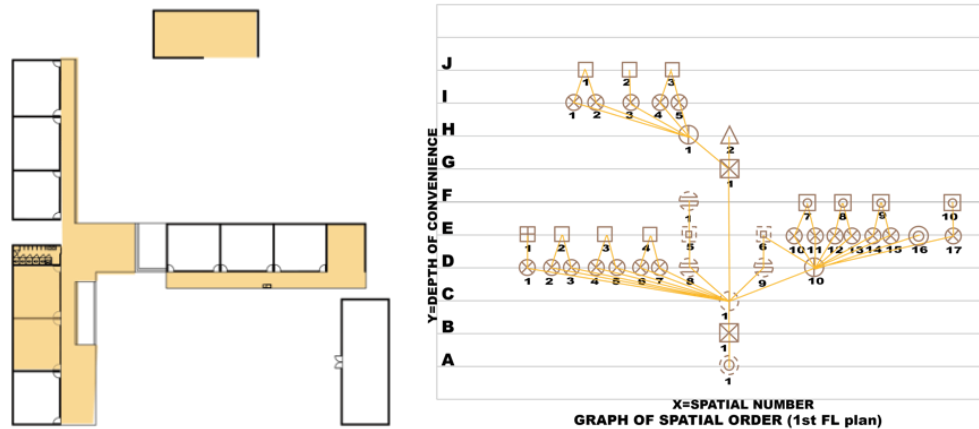
Figure 4-10 1st FL servant area of Chiashin Elementary School (Left) and spatial hierarchy (Right)

In figure 4-11, the servant space become the center to control the served space of the entire campus. When the exterior corridor is designed as a center line and divides the school area into three area, users will need to walk through the servant space than to reach the served space. In another words, the served space has hidden on the back side of the servant space that is the served space has become more secret feeling or not welcome to the stranger. Thus, this case uses the servant area as the main are to support the served space which give the impression to the people that all spaces will have a ensure expression for the first-time visitor. It also tells the campus may have a certain level of security consideration to each served space. There is also the same design idea that the servant space is the first spatial experience to meet when the first-time visit. The different part of C-2 is the right-hand corner of the servant space is the deepest space to reach.

However, in B-1 case is the storage but C-2 is a room to use as a kitchen. From both cases, the finding show that as a single program, using the corridor to take the charge to organize the entire school space can address the served space must need some responsibility to take care the served space. People

must need to have the authority to enter the room and these people will not be the visitor, it must belong to the staff who is working or operating the school building as well.
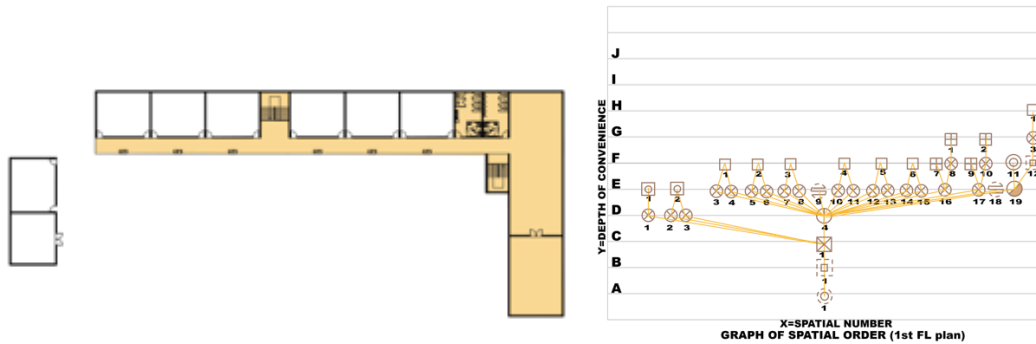
Figure 4-11 1st FL servant space of ZhongYongn Elementary School (Left) and Spatial hierarchy (Right)

Order is only meaningful when it is associated with disorder and chaos. Order itself is worthless, only in the use of space, users or social self deliberately create a sense of spatial order. The definition of the sense of spatial order often shows a unique sense of order due to the user's behavior or value, and this unique sense of order cannot be aesthetically determined as good or bad, and the most basic judgment is whether the order of the space is suitable for the space atmosphere created by the current place. The more complex of the environment, the more it needs to be simplified and integrated to understand the definition of the space. With an innate sense of order, coupled with a learning process that varies with the environment and culture, users begin to understand how to define their own spatial positioning. Space elements are arranged in ways such as repetition, resemblance, proximity, enclosure, symmetry, and orientation.

Users must have a basic understanding of the function of each space in the building, so that is Louis Kahn categorized space into two categories: Served and servant space. In the school regeneration process, the space design has limited by the original school plan or structure which the research study often finds the corridor become an important space element to lead the redesign thinking. Due to the definition of the servant space, corridor is one of the servant space elements. Since reuse the school space, the corridor become a vague space design element that is making the design method become a tricky design question in the overall regeneration development. In the research finding that corridor space can be outdoor and indoor.

The overall 15 cases study, school in Taiwan include A-1, B-1, C-1, B-2, and C-2 from table 5.2, all the corridor is design in the exterior area. On the other hand, the other cases in Japan that is all the corridor space is inside of the school building. There is only one case exception B-5, one of the exterior corridors become the intermediate space after redesign the school space. In figure 4-12, the right figure shows the Level B, X2 symbol is the atrium, before it was the exterior corridor to connect the Level C, X1 the exterior stair and Level D, X8 the intermediate space. After the redesign of the space, the exterior corridor has been designed to step out more use the intermediate space for other purpose.
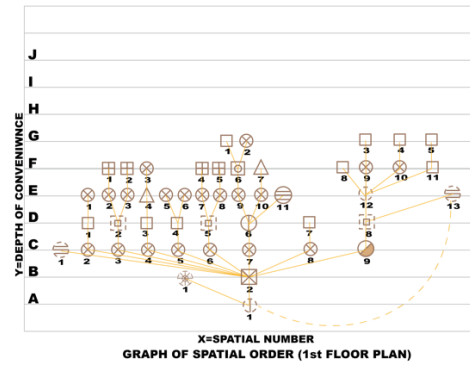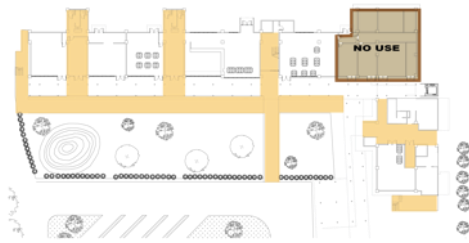
Figure 4-12 1st FL servant space of Hota Elementary School (Left) and Spatial hierarchy (Right)

4.2.3 The Accessibility Condition of the Redesign the Space Order

Therefore, the analysis of the servant space as the main design consideration during the reuse space order process, it can be category into 4 types of circulation control condition show in table 4-4. There are four types of circulation control condition, each of them is the linear type (A-2, A-3, B-1, C-3, C-4, and C-5), the curved type (A-4), the split type (A-1, B-2, B-4, and C-2) and the loop type (A-5, B-3, B-5, and C-1). Usually, the linear type can be extended to like a tree shape, which is meaning that the user's experience still follows the linear circulation for a while then it can go to another space for another circulation zone. The curved type in this study has a clear transition node, it converts the space property from the one interior corridor to another interior corridor and connect to the room.

Table 4-4 Analysis of circulation condition

This walking experience can also show a clear direction or purpose to enter the space. The split type gives the user's experience as fast to connect to the destination zone, even though the space zone still has different space property, but the space order can be easy to understand in the beginning to enter the space zone. Last, the loop type. This type of circulation can be interesting or chaos for the user to use the space at the first-time visit. Sometime, user will lose the direction because the space order may not be clear by just keep running like a circle circulation. But the loop type of circulation is having the advantage to connect each space with a complete user behavior experience. Because no matter how, the user must keep on the same loop to go out, therefore, the space order can see as a whole project to design the served space for the public. Whether the corridor space can become the weakness or potential design strategy, the corridor space can be influencing the space order later on in the future served space development. Thus, the accessibility of the new use in a school space reconfiguration will be influenced in the further design development.

4.2.4 Functionality, Flexibility and Polyvalence

School is still operating, and one of the school buildings is redesign become other use function that it represents people are trying to use the space as much as they can whether the space form is good or bad. The form of space comes from the expression of efficiency, which is one of the design thinking factors that designers or users will pay more attention to from functionalist architecture to the current architectural design process. However, flexibility in design language is often misunderstood to mean that architectural design is neutral and can be adapted to multiple uses. Conversely, architectural design can absorb and adapt to the influence of the times and changes in the situation, which belongs to the aspect of rational thinking, and such thinking leads to the transformation of architectural design results into neutral design is also vaguely containing the aspect of lack of characteristics. In other words, the result of architectural design is a work that lacks character.

Because no single design approach can solve all problems, the point of flexibility is to absolutely negate a fixed and unambiguous view. Therefore, when taking full change as the starting point of design thinking, it is necessary to regard the changing spatial form as permanent, that is, the basic space essence is a stable specific element, a form that can be used for different purposes without changing the space itself, so as to achieve minimal space design flexibility. When designing a space, it is necessary to conceive the space in different ways and for different purposes, because different activities will have significantly different special needs for the space in which the user takes place. Therefore, users will anticipate the needs and behaviors that will occur in this space, especially in the expectation that they will understand the functionality of the space in the way they want according to the needs of the users themselves. Each space should stimulate the user's imagination and be willing to think about how to use this space, which also makes the space sequence a variety of changes. In other words, space indirectly creates the genius lotus because of the user's imagination and action, which produces strong polyvalence. The variability of space lies in the fact that different functions in the space are simplified to the original architectural prototype, and through adaptation and absorption, and the ability to induce the desired function and adapt to future changes, this is the rich feature of creating space. The case of A-1, Taiping

159

Elementary School, Taiwan and A-3, Rensei Junior High School, Tokyo, Japan. Both cases can explain the functionality, flexibility, and polyvalence in this section.

Taiping Elementary School, Taiwan (A-1) is a lately case as an example of school regeneration project. The overall building has broken the limitation of the idea of a room. On the 1st floor plan of the school building (Fig.4-13), the space order still has its original regular, but the space flexibility has exchange to not just a classroom with enclosure space. As the spatial order from Level D, X9-13, the intermediate space has brought the different user experience by extend the landscape element to the intermediate space, the red arrow shows the space movement for everyone can enter the space without any door. From step 1 to step 2 and step3, people can be easy to use the space either by the space function or just walking by the free choice.
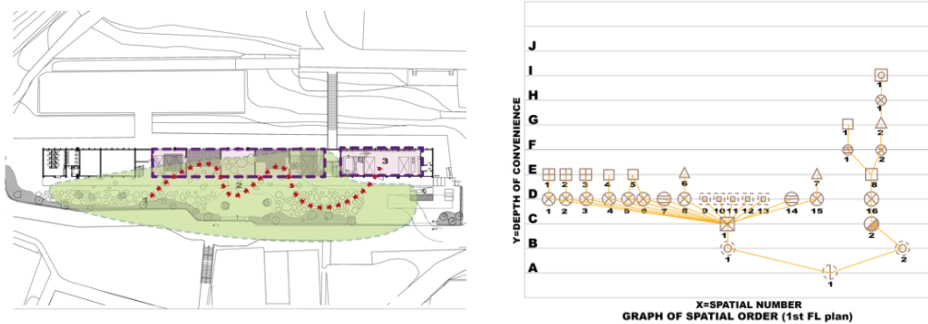
Figure 4-13 1st FL of Taiping Elementary School (Left) and Spatial hierarchy (Right)

When the user walks into the step 3, the individual space as the graph of spatial order show in right side of the figure 4-14, people enter the space to join a new architecture program that is a bookstore to provide the value of the local city. The polyvalence has been created when the public start to participate the space. The redesign of the space has not just stay in a one room. People start to have the indirect social interaction by using the new school space layout. The sense of the place can be also created by many social interactions, either the visual contact or the hearing by others, the space has been regenerated to reconnect the polyvalence for the neighborhood.
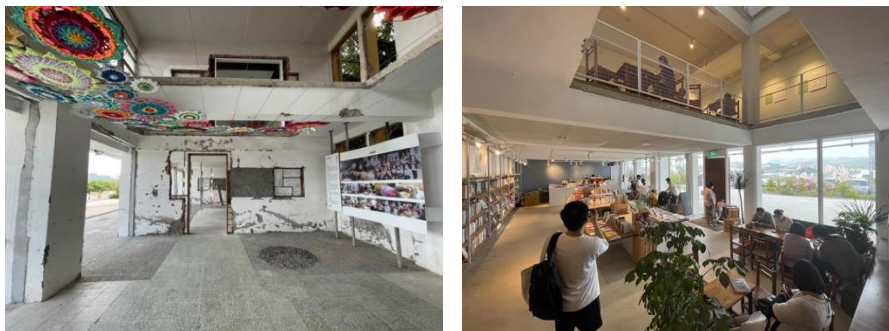
Figure 4-14 Intermediate space for exhibition (Left) and bookstore space (Right)

Another case A-3, Rensei Junior High School, Tokyo, Japan. Basically, all the space is inside of the school building, just like a big box. But the most interesting thing is even though it is a big box, but the interior space has been redesigned to use in various of purposes. It is hard to see that the original

school plan such as a normal classroom. The interior space has also broken into the users inquire. The floor plan has been more flexible to meet the different utilization. Also, the green space and the purple space can be indirect to see what's happening indoor and outdoor space (Fig.4-15).
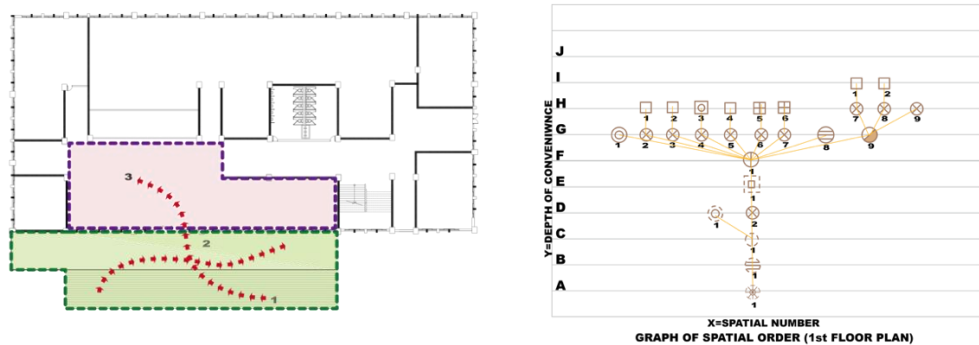
Figure 4-15 1st FL of Rensei Junior High School (Left) and Spatial hierarchy (Right)

The intermediate space from Level E create the social interaction by a flexibly space and muti functional purpose. The space in point 2, the building material in this area is a big curtain wall that is the reason how the social interaction can be attractive to participate the event indoor of the building. Moreover, the regeneration program is linking to the subject of art. Art can be wide open to attract the public and the professional people. Consequently, art can be as a daily life social event such as a food festival or wine production event, also the exterior corridor space and the exterior stair also offer a big space for the public to stay.

Thus, the servant space become part of the served space for people to have the social interaction value. The design approach should be so that the building can maintain its original character while also having the ability to adapt itself to change. That is, space should stimulate his user in the possibility of influencing himself, not only to enhance its characteristics, but especially to enhance and affirm the identity between space and user.

Therefore, the process of change is necessarily and continuously manifested in the regenerative transformation of a space to present a permanent state, which explains why variability itself a continuous element must first be, and this gives each individual architectural form a special meaning. In order for a space to withstand change, the architectural form must also be designed to allow users to have multiple interpretations. In other words, the characteristics of space can absorb or diverge multiple meanings, and then do not lose their original characteristics in the process of development. The value of school building recycling, which means that school buildings at any time must adapt to different meanings and transform into different landscapes at the same time.

Thus, this meaning can change the spirit of their place. Each form of space must be understood to be able to bear different functions, and space can only have different functions if it contains different meanings in nature. The multiplicity of forms can derive various spatial meanings, and after removing these subordinate meanings, it returns to the basic functional goal of space. In other words, form and program are reciprocally evocative (Fig.4-16).

161

Figure 4-16 Exterior corridor (Left) and intermediate space (Right)

4.3 From Design Object to Spatial Composition Transformation

Space composition has always been a special thinking topic in the operation of architectural space, in order to design the intermediary space between the solid space and void space for an architectural space, designers need to have the training of basic space operation to create the variability of space composition. Therefore, during the school regeneration process, from object to spatial composition transformation not only understand the design elements but also convert appropriate space composition is primary mission while the school architecture has the second opportunity to represent a new space characteristic. In this section, there are three topics to discuss and review the redesign school plan layout including structure space, raumplan, and the free plan (Habraken & Teicher, 2000).

4.3.1 Design Strategy of Structure Space
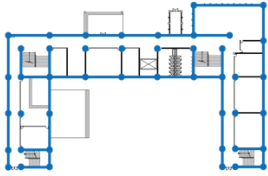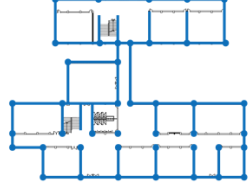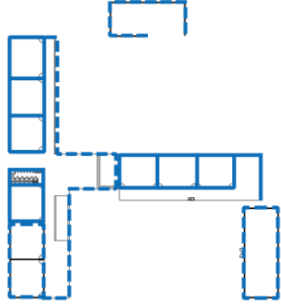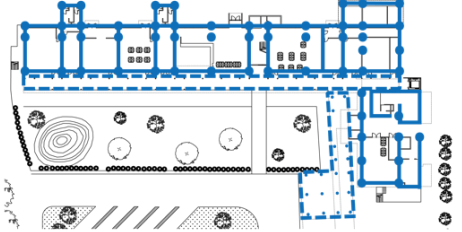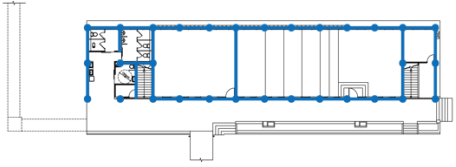
Structural space refers to the rigorous and consistent relationship between the use of load-bearing structures and the spatial graphics molded. This rigorous consistency creates a spatial composition that is not ambiguous. Such spatial composition characteristics can depend on more traditional design methods, such as following its own measurement structure and integrating the main elements of the spatial form with a variety of structures. In other words, structural spaces like to put well-organized and clear spaces together or arrange them in order, and the design strategy is to obey the structural order, and then combine by subtraction or division.

Therefore, such spatial properties will be rational and precise, and the parallel space will be sequential, and the original structural system will be used to make each space equilibrium. In other words, by reusing the opportunity of design, the designer follows the setting of making the original building express the original structural features, and perhaps even the overall building has a special style. But such a space may also appear uninteresting too. In this section, the findings from the field survey shows that the most of schools are belong to structure-space composition. There is total 7 cases (A-5, B-1, B-2, B-3, B-5, C-1, and C-2), and 4 cases are exception to the rule of the structure space. In all these cases can also divided into three groups to analyze the findings (Table 4-5).

The detail content show in Table 4-5 that the first group include the case of A-5, B-3, and C-2. Second group include B-1 and B-5 and the third group include B-2 and C-1, both groups are the exception to the rule of structure space. In group 1, the redesign plan keeps the same structure system to reuse the school space. From the architecture plan can analyze all the space keep the original classroom dimension,

especially the C-2 case. The space still looks like the same as a classroom, the reuse function is for elder generation to come and join the day care program. Since the space is specific use for the elder people, the space is requiring having a flexible space for the elder to move around.

Table 4-5 Analysis of structure space

Group 1: Original structure without any change		
A-5: Daitou Elementary School, Osaka Prefecture, Japan	B-3: Iikane Elementary School, Fukuoka Prefecture, Japan	C-2: ZhongYongn Elementary School, Changbin Township, Taiwan
Group 2: Extend or add the structure from the original structure system		
B-1: Chiashin Elementary School, Kansung Dist., Taiwan	B-5: Hota Elementary School, Chiba Prefecture, Japan	
Group 3: Under major structure with minor change element		
B-2: NanHua Elementary School, Gaoshu Township, Taiwan	C-1: CheCheng Elementary School WenCyuan Branch,Checheng Township, Taiwan	

Even though that the original classroom has approximated 63 square meter which is the minimum scale for the children when they come to the class. But the space now is using for the elder people, the elder people may need to consider the physical issue with several different conditions. For instance, some of the elder people may need to have a helper or a wheelchair to access the space in the school building. Therefore, to keep the same space's structure without any change seems reasonable but to think another way of the reusing the space for elder generation can have more improve on space composition. Under the safety concern, the structure system has dominated the user's behavior at the end.

Furthermore, the exception to the rule of the structure space that is both school building not only keep the same building structure but also adding the extra structure system from the original building to increase more spaces in the school building during the regeneration process. The blue dash line from

163

group 2 (B-1 and B-5) in table 5.4, the findings show in B-1, over than half of buildings are new build to create more spaces for the manager team to organize the welfare care functions. The new building style can tell the different by visiting the site, they also want to have more spaces for people to spend more social interaction activities. The B-1 case is also helping people to lean the working skill through various program such as cooking lesson so all the members can stay in a big room with many different cooking tools to learn the cooking skill and storages. This is the reason for them to increase the school space by placemaking (Fig.4-17 left).

Similarity, in B-5 case, the hota elementary school in Chiba is one of the popular school regeneration cases in Japan. The reused architecture program is changing to multiple purposes such as guest house on the second floor and retail stores on the first floor. The extension structure is connecting to the original building and change the original exterior corridor become the intermediate space. They use this space as a gallery to explain the progress of hota elementary school from abandoned to renovate the space, the gallery space is on the second floor which using the lightweight structure to extend from the original structural system. And the space under the gallery become an outdoor space with a roof which offer the extra spaces for the retail store to use beside the interior space. Also, this extra space become the most vivid space when the visitor to meet each other through different user behavior including dinning, chatting and rest (Fig.4-17 right).
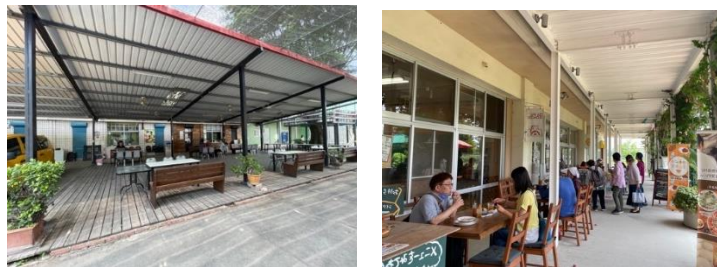
Figure 4-17 Space for gathering in case B-1 (Left) and intermediate space in case B-5 (Right)

On the other hand of the exception to the rule of structure space are group 3 (B-2 and C-1). In table 4-5, it shows that both of the interior space of the original school building is slight conversion by combining the original classroom to make the room bigger. Since the space function is doing for interaction between all users or staff, it is not too hard to understand that the space must support this kind of event to gather the users and staff. Moreover, the space can be more continuously to link the user's behavior of using the room. Either the visual contact experience or the hearing experience can be also felt in this kind of room without interrupt the sense of the spatial use behavior (Fig.4-18).
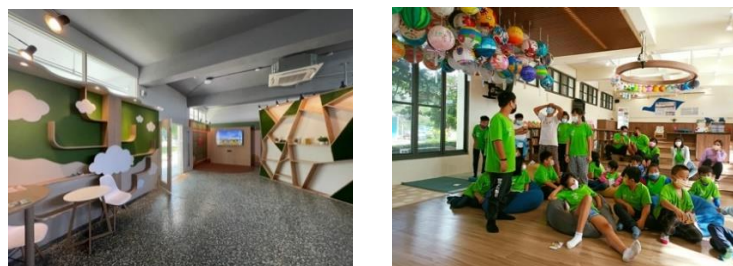
Figure 4-18 Space for gallery in case B-2 (Left) and group space in case C-1 (Right)

4.3.2 Design Strategy of Raumplan

In table 4-6, all cases are belonged to the category of raumplan. From the field survey's observation, four cases are having a very significant architecture program to transform the space design of the original school space. All cases are single architectural program the order from A-4, B-4, C-3, and C-5 are toy museum, hotel, glamping, and local clinic. After the reusing the school space, the redesign shows a new interior phenomenon, the space has renovated to meet the program characteristic. Even though the original building structure has controlled the space layout but under the safety circumstances, some of spaces modify the lightweight structure, interior wall, ceiling and floor to present the extraordinary user experience to the public. Nevertheless, these spaces are also required a certain authorization to enter the space as well. On the other hand, it also requires some professional technique support or subsidy to redesign the space too.

Table 4-6 Analysis of raumplan

A-4: Yotsuya Elementary School Tokyo, Japan

B-4: Ashijiro Elementary School, Fukuoka Prefecture, Japan
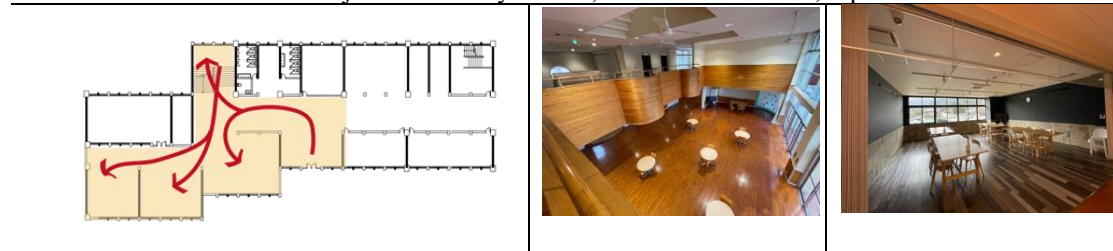
C-3: Tao Elementary School, Nagasaki Prefecture, Japan
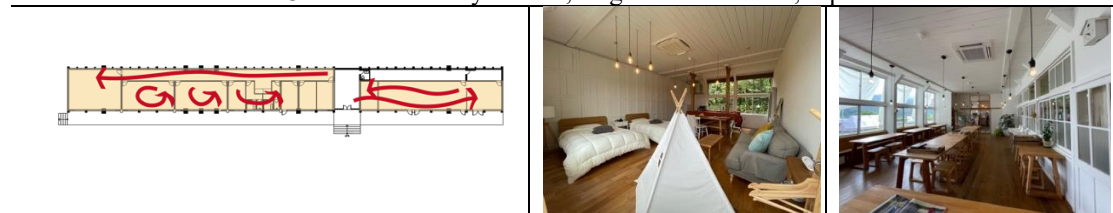
C-5: Nanaura Elementary School, Chiba Prefecture, Japan
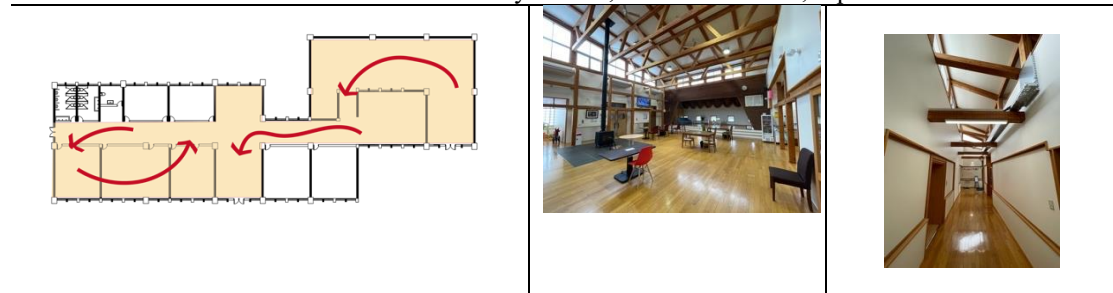
At the same time, the elements of the school architecture in these four cases have the same design element that is using the wood as the renovation material. Four cases are in Japan that the floor is a wooden floor as common design decision in the interior space. Therefore, the beginning of the redesign is renovated the wooden floor which can change the overall visual feeling. The interior design will be the major redesign strategy to create the genius lotus. Physically equipment has been adding to show the style of the design idea such as the lighting fixture, panting color, or furniture. However, the design strategy is toward the detail creation of the interior design in this design transformation method. Sometime, the design method can be felt like a space decoration that the style of the decoration is hard to define whether the characteristic is coming from the space itself or the users. Because the space without people's utilization, it is difficult to address as a good place. No dialogue between the space and user, the space can remain as a beautiful box with no spirit in the space. Finally, the space is not going to transfer to a place that linking the social interaction with the local neighborhood.

Raumplan design is a way of conceiving the interior space so that it fits the design project's goal as much as possible. The structure is nothing more than an external supporting force, just a set of systems that serve the internal atmosphere. Such a spatial treatment method will have several important characteristics, according to the nature and purpose of the place to determine the scale of space. In addition, each space has a clear definition, clearly know the responsibilities of space, this means the space is clearly defined and arranged in a sequential way. The interior atmosphere is the first important order, accordingly interior planning often overrides other design conditions. The various details of the interior space can create the atmosphere of the overall indoor space and inject new meaning into the place. Such spatial organization techniques often create an ambiguous atmosphere between structural design and spatial organization. Thus, designer needs to think carefully to understand how to create the dialogue between the characteristic of the space and the attractive subject to catch the public's eye.

4.3.3 Design Strategy of The Free Plan
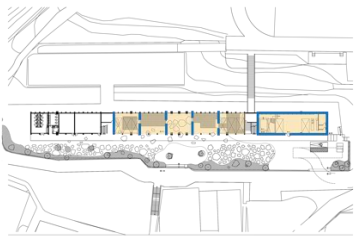
The free plan especially emphasizes the mutual penetration between spaces, rather than the juxtaposition, alignment or stacking of spaces on the section. The free plan is to deal with space in a way that is independent of structure, space limitation and envelope. This approach will create a dialogue between space elements and structural systems. Whether the result is opposition or harmonious spatial order, there will be or are invisible opportunities for interaction. The characteristic of this kind of spatial organization is that the column-slab system is most commonly used in the structure, and the column-slab system will have its own logic. Under this logic, a neutral space will be constructed.

Although the performance of the structural elements is obvious, they are no longer the protagonists of the spatial configuration, and there is fluidity between the spaces. Interpretation of space becomes more ambiguous and diverse, often because the cantilever of structural elements extends the space between the spatial boundary and the vertical structure into another ambiguous space. This kind of spatial configuration aims to create a kind of spatial diversity, fluency and a special purpose. Therefore, to organize such a space, it is necessary to clarify what the representative characteristics of the space are,

so as not to make the space lose its order and characteristics.

All cases in this category of the free plan (Table 5.7), it presents the spatial composition in many interesting design techniques and thinking. Even though the redesign space is still under the original structure system, but the plan layout has breached the maximum space arrangement. Either expose the structure system as a design style element or extend the activity behavior from a room space to the corridor space. Case in A-1 and A-2, each of the space has its own use purpose, hence, vertical and horizontal use experience become a special design method to link the all floors such as the case in A-2. The case in A-2, one of the spaces is using for bookstore, tea store, and interaction exhibition. Each use purpose is not only arranging in each floor but also everyone can see through every floor's user movement.

Table 4-7 Analysis of the free plan

A-1: Taiping Elementary School, Keelung City, Taiwan		
A-2: Daimyo Elementary School, Fukuoka Prefecture, Japan		
A -3: Rensei Junior High School, Tokyo, Japan		
C-4: The Funa-mawari Elementary School, Nagasaki Prefecture, Japan		

The free plan gives the potential to invite everyone to explore their sense of the space. The user can explore from many ways, for instance, people can have the smell perception from the tea store. Moreover, the visual experience can stimulate by seeing through not only the eye level vision but also the bird view to observe the entire built environment of the space. In addition, case in A-3 and C-4 have almost the same architecture program, which is regarding art industry, but their school location is completely opposite. A-3 is in the urban area in Tokyo, C-4 is in a Naru island, Nagasaki Prefecture, Japan. Art work such as a exhibition require a huge empty space for user can utilize the space randly and flexiblity.

To creat a partition wall easily to reach the condition of the art work size. In contrast, the space in A-3 case can have more potential to do the arrangment than the case in C-4. This is because the school's manage strategy is different, A-3 offer many spaces to invite the user who are interesting to have a art studio so artist can do whatever they are creating it. However, C-4 has s strong architectural program target, a memory museum of Naur artist that is the exhibition room has combined all the classrooms on the right side of the school space in second floor. And then the exhibition space is separated into small area to show the artwork of the artis. Both space redesign strategy is using the idea of the free plan to achieve a different user experience in the built environment.

The detail content show in Table 4-5 that the first group include the case of A-5, B-3, and C-2. Second group include B-1 and B-5 and the third group include B-2 and C-1, both groups are the exception to the rule of structure space. In group 1, the redesign plan keeps the same structure system to reuse the school space. From the architecture plan can analyze all the space keep the original classroom dimension, especially the C-2 case. The space still looks like the same as a classroom, the reuse function is for elder generation to come and join the day care program. Since the space is specific use for the elder people, the space is requiring having a flexible space for the elder to move around.

4.4 Discussion and Summary

In this chapter, according to the space analysis of each case result, this analysis process can help the design participant to simplify each space's hierarchy and its property through the school space regeneration process. To think of each symbol's represented meaning and every one of the symbol's relations in the school space. Table4-8 shows the spatial hierarchy condition in all 15 cases that can be recognized that almost all cases are having a different transit level start from level C, D, E, and F. Because during these levels, they have more spatial symbol numbers compare to the other level which means spaces in all these levels are more active than other level. And for the design participants they can be aware of this transition level relate to each space element's connection. The detail of each level's spatial number and hierarchy can see in Table 4-8.

On the other hand, this result can be shown each space symbol's boundary by the symbol's identity of solid, intermediate, and void. The greater number of the space, the denser of the level is. Thus, it can give the design participant an idea to think how compact of the spatial element they want in each level at the school space usage. Regarding to the case study, it is also showing that each design think style

can be influence by variety of reasons such as culture, different groups of generation, architecture program, regional government policy, exc. Moreover, each level represents the depth of the access in the school building. The circulation is limited by the original school layout, but the regenerative design process is giving another way to reconsider the user behavior experience in the school building. The accessibility condition between Taiwan and Japan show in Figure 4-19 and 4-20.Table 4-8 Spatial hierarchy in different school reconfiguration process

Country		X=Spatial number												
	Y=Level	A	B	C	D	E	F	G	H	I	J	K	L	M
Taiwan / School	S1	1	2	2	16	8	2	2	1	1	-	-	-	-
	S2	1	1	1	10	17	10	1	1	1	1	-	-	-
	S3	1	1	21	11	3	1	-	-	-	-	-	-	-
	S4	1	3	1	1	7	6	5	3	-	-	-	-	-
	S5	1	1	1	4	19	12	3	1	-	-	-	-	-
Japan	S6	1	1	1	3	1	3	3	2	6	13	13	5	4
	S7	1	1	1	1	1	9	6	-	-	-	-	-	-
	S8	1	1	1	1	2	1	15	10	-	-	-	-	-
	S9	1	2	2	1	16	12	2	1	6	3	-	-	-
	S10	1	1	1	14	8	5	2	-	-	-	-	-	-
	S11	1	1	2	2	2	6	3	-	-	-	-	-	-
	S12	1	1	1	2	1	1	9	9	2	-	-	-	-
	S13	1	2	9	8	13	11	5	-	-	-	-	-	-
	S14	1	1	1	1	12	10	-	-	-	-	-	-	-
	S15	1	1	2	2	12	1	8	11	8	3	3	-	-

Figure 4-19 Accessibility condition in 5 regeneration schools in Taiwan

Figure 4-20 Accessibility condition in 10 regeneration schools in Japan

On the other hand, this result can be shown each space symbol's boundary by the symbol's identity of solid, intermediate, and void. The greater number of the space, the denser of the level is. Thus, it can give the design participant an idea to think how compact of the spatial element they want in each level at the school space usage. Regarding to the case study, it is also showing that each design think style can be influence by variety of reasons such as culture, different groups of generation, architecture program, regional government policy, exc. Moreover, each level represents the depth of the access in the school building. The circulation is limited by the original school layout, but the regenerative design process is giving another way to reconsider the user behavior experience in the school building.

To start a school regenerative project, design participant can use the spatial analysis to gather the idea of the circulation, the space hierarchy, the space element's property to redefine the school space order by using this space method can provide more discussion chances to adopt the space design option. It is also giving another potential for people who are not trained as a professional architecture education, people or the community can just use this method to define their own definition in these symbols by following the node, room, and device space standard of space syntax method theory in this research. Design participant can also realize the boundary by each spatial symbol and create a new territory according to the new space function. Thus, to understand more about the space property relate to the future program use and user behavior experience prediction, it establishes a chance to reduce the inappropriate design in advance.

CHAPTER 5

Analysis of Space Function Influence in Different Territory Property

5.1 Introduction

Recently, the number of social and environmental movements aiming for local cultural identity has increased. Meanwhile, the use of public or shared space has gradually attracted people's attention. Hence, an architectural space is oriented towards diversity and cultural multiplicity in the public domain and then abandons the pursuit of ordinariness. Nevertheless, if an abandoned school is given a chance to be reborn for another purpose for the public, the space's arrangement will be affected by the new architecture programming and design priority. In this situation, the space level would be divided into different use of property, forms, and time.

The mobility of the school's space with the design methods and program demand would be the major discussion in this research. This research assumes that an abandoned school represents a node to create the sense of a place after redesigning in a neighborhood. Also, the reborn place is an intermedium to gather the user and improve the social interaction for people's daily lives. Meanwhile, this study focuses on three aspects: spatial order, territorial characteristic, and the sociability value of public places. In chapter 5, it describes the territory zone transformation process can be the potential to improve the user's interaction. Also, during the redesign thinking phase should notice the balance of these three aspects can assist all designers, inhabitants, and decision maker to have a clear insight in redeveloping the region in the future (Fig.5-1).
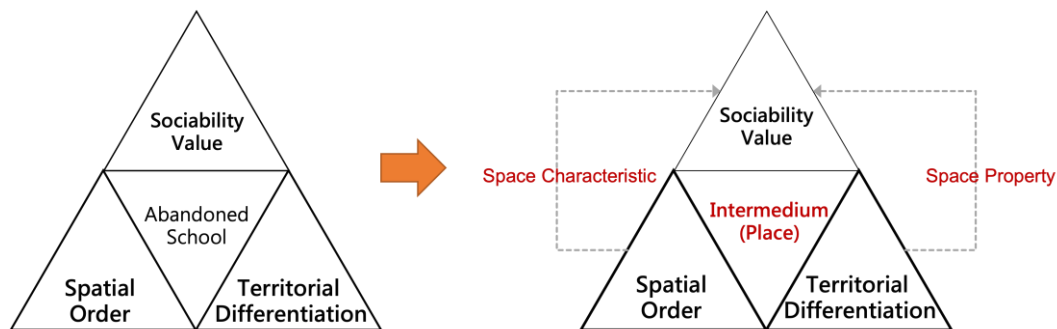
Figure 5-1 Scope of Sociability Value Development Study

5.2 Territory Redesign Claims in a School Space

When school architecture has been abandoned become just an empty space without any architecture function at all, the school architecture turns out with nothing else but just a box. The school building lost the meaning of the architecture. Therefore, in this section, this research is using the loss of the school building to seek the opportunities to rediscover the territorial relationship in a public architecture. As the introduction address the scope of sociability value can be reestablish through the school regeneration process. Schools become an intermedium place not only create the space characteristic but also clarify the boundary between each territory claims as well. This begins to distinguish the role form the public to private space during the overall regeneration process.

5.2.1 Public and Private Claims on Regeneration Space Design

The school building is regarded as one of the public buildings, and the abolition school can once again advocate the division of private and public space through the design method for the division of public and private space characteristics. The concepts of public and private can be seen and understood relatively as a series of spatial qualities, in other words, the expressive properties of space can be slowly seen, such as the relationship between accessibility, responsibility, private work, and the regulation of specific spatial units. The concepts of public and private can be translated into collective and individual terms. Public means that any individual can enter a space at any time of day, and the operation and maintenance of this space is collectively responsible. On the other hand, privacy means that a small group or person decides whether or not to enter the space, and at the same time the maintenance of the space is maintained by this small group or person. The mutual relationship between individuals or collectives and mutual responsibility for the question of spatially qualified are obligatory responsibilities.
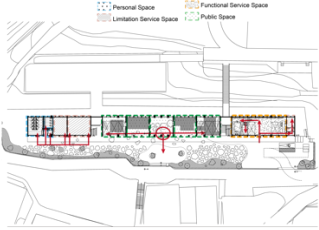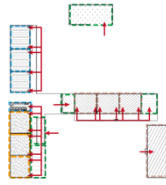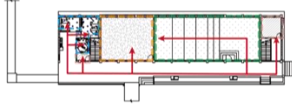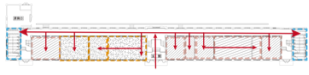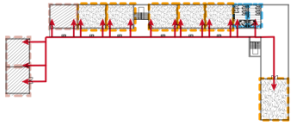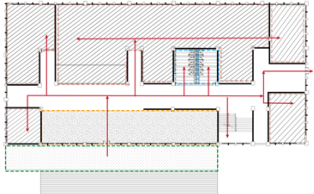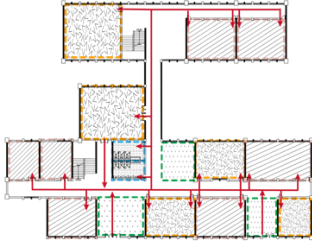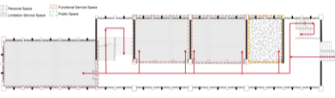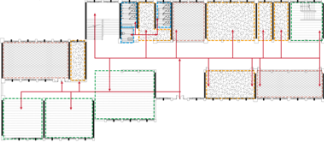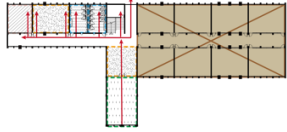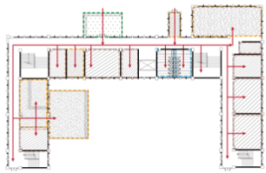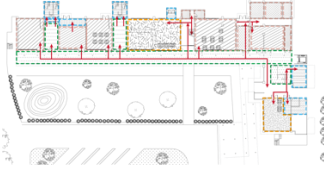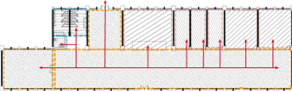
Where a public building space is considered private or public, it depends on the degree of accessibility, the form of regulation, who can use the space, who can maintain the space, and the responsibilities of each of them. Therefore, when a disused school building is regenerated and returned to the public, the domain proposition in the public building can express the meaning of the spatial domain claim through design techniques. Regardless of the location, when individuals or groups have the opportunity to use every space in a public building according to their own interests and needs, and only indirectly according to the will of the original designer, these empty objects will be known to outsiders (not the people who use the space) through the user's. No matter what kind of domain characteristics are proposed, the process from public to private space includes the meaning that users and designers want to express through their own use behavior, and the meaning of being in this space.

The setting of the theme of architectural space, the connection between spaces, through form or materials, can respond to the appropriateness of the field proposition, and indirectly create spatial order within these different spatial characteristics expression, to clearly provide different users with the cognition of different spaces, therefore, buildings clearly create different spatial levels of atmosphere, and the degree of accessibility messages conveyed by places and spaces also provides a good quantity of criteria for design. Thus, the territorial differentiation in this research analysis is divided into four categories: personal space as blue color, limited service space as pink color, functional service space as yellow color, and public space as green color (PLS, LSS, FSS, PBS). The study results are shown in Table 5-1.

From the analysis, the findings shows that most of the regeneration schools has open a lot of classrooms to the public, of course the use authority is always depending on the space property and has the architecture program been established to operate it. The first floor of each case has different design strategy to reuse the school space. The original entry usually will keep the same as the old one, but there are some cases creating a different or adding another entry to the school building. for instance, the case in Type A-1, A-3, and A-5. These cases have changed the first image of the school after the regeneration process, the school become more friendly to access or intend to welcome to the public, the impression

has been exchanging to not just a school like it before.

Table 5-1 Analysis of territorial differentiation in all case study

Urban Area (Type A)	Suburban Area (Type B)	Rural Area (Type C)
A-1	B-1	C-1
A-2	B-2	C-2
A-3	B-3	C-3
A-4	B-4	C-4
A-5	B-5	C-5

Personal space in this territorial differentiation is standing a very strange point, the definition of the personal space which has mentioned in previous chapter, as long as the space has made a person to feel comfortable circumstance, even the space is just a sanitary in this building, the space can put into a group of personal space. However, the new architecture program can change the space function become more private, personality, and distinctive for the user to seek other chances to reuse the school space among the regenerated process. Like the case in Type B-1, the classroom has become a living area, that

173

is meaning the program offer a space for people who can really stay in the school building and people have the right to use these room by themselves. The similarity of the space function can be seeing in another perspective, the case such as Type C-3 has the dwelling function for people to stay in the school building. However, in this kind of case, the program offers the space to have the living behavior because the school has transformed into a hotel; so, the territorial zoning has changed into the category of limited service space. Regard to the limited service space definition that shows the territory has a specific objective with the permission to enter the territory which shows this kind of space function or property has a limited authority to access, but the space function can be very special to represent the space.

Last, functional service space and public space has shared a common meaning that the territory is open to the public with different standard by its own space property and function. Public space without any doubt that everyone can access easily without the permission to do any activity in the public space. In other words, the functional service space may be strict by the certain type of the event or school building management. Thus, the territory zoning can be affected by the program plan and influence the user behavior in the future. During the regenerated design, to clarify the territorial property and characteristic can become the sense of orientation and user perception to stimulate the identification in a space.

Through the difference in the accessibility of different areas and spaces on the building plan, such as the fifth chapter above, each symbol in the spatial syntax is used to explore the spatial hierarchy of school building regeneration, from which the results of the field difference can be obtained, such a spatial map can clearly show that there are different degrees of accessibility in the architectural space. What are the flow guides, spatial elements or design techniques that set the different domain propositions. At the same time, it can also be understood that such a field space will have the supervision responsibility and division of different spaces, and the characteristics of such a field division can also indirectly express who decides the furnishing and arrangement of this space and is responsible for the maintenance and management of the overall space environment. The influence of users can be stimulated, when design refers to the hierarchical difference of these factors, which can be used in the circulation design, domain proposition, space organization and division of responsibilities, through different design techniques to stimulate the influence of future users to effectively participate in the spatial layout and create unique characteristics of the space.

5.2.2 Space Program Planning During the Regeneration Progress

In this section, it starts to analysis 5 redesign school cases in Taiwan. The overall results show every case has different territorial design after redesign of the school project. Also, the territory level from personal space to public space has a deeply connection relate to the redesign architecture programming. User behavior is also showing unexpecting result of how they use the function of the space. Translating the concepts of public and private into different levels of responsibility makes it easier for space designers to decide within which ranges users or occupants should be provided with opportunities to contribute to the design of the environment. In the conception of a spatial design, the decisions made between floor plans, elevations and sections can create more responsible spatial conditions by providing

different design principles, so that users can stimulate their own environmental awareness and care for the environment. Different levels of spatial design guidance will provide different levels of participatory opportunities. Therefore, in this chapter, we will discuss the experience and spatial characteristics created by the transformation of the original school space into different levels of participation.

The findings of all case's regeneration program are shown in Table 5-2 and 5-3 are the regenerated program and the space function have the certain relationship to separate the public and private space by different uses. Also, the single purpose and multiple purpose may affect the quantality of the public and private space. The require function may also influence the shape of the territorial zoning too.

Table 5-2 Score of the accessibility in each space level relate to the territory zone.

	Score	Territorial zoning			
		PLS=1/4	LSS=1/3	FSS=1/2	PBS=1/1
Depth of the space order level	A=1/1	1/4	1/3	1/2	1/1
	B=1/2	1/8	1/6	1/4	1/2
	C=1/3	1/12	1/9	1/6	1/3
	D=1/4	1/16	1/12	1/8	1/4
	E=1/5	1/20	1/15	1/10	1/5
	F=1/6	1/24	1/18	1/12	1/6
	G=1/7	1/27	1/21	1/14	1/7
	H=1/8	1/32	1/24	1/16	1/8
	I=1/9	1/36	1/27	1/18	1/9
	J=1/10	1/40	1/30	1/20	1/10
	K=1/11	1/44	1/33	1/22	1/11
	L=1/12	1/48	1/36	1/24	1/12
	M=1/13	1/52	1/39	1/26	1/13

In analyzing of this school architecture cases of the relationship between placemaker and program planning, the influence cannot be separated by which options is better than the other one. Therefore, to understand the matter of both space design participant and program planning determination, it is one of the phases to rethink of the influence of each principal condition. From placemaker to program planning, the redesign process involved the move of the user behavior, how does the user will act in a space and have the interaction with others are important to create a space to place to be succeeded in the built environment.

Table 5-3 List of case study's regeneration program function

School		Regenerative space function requires and territory zoning quantity						
		Purpose (S/M)	Name of building	Require space function	Territory zoning			
					PLS	LSS	FSS	PBS
Taiwan	S1	Multiple	Taiping Exhibition Center	Bookstore, exhibition	3	4	1	4
	S2	Single	Home for Care and Love (Kung Ma Ma: EXSIT FOR	Lecture learning, office, social interaction and	4	4	3	5

175

			LOVE)	gathering, storage, kitchen				
	S3	Single	Pingtung AI Agri Hub	Agriculture presentation & learning, office, exhibition, gathering, studio	1	2	5	2
	S4	Single	Pingtung Education Innovation Unit	Lecture training, social interaction and gathering	3	2	1	1
	S5	Single	Long-term Care Center	Gathering, office, health care, kitchen	2	3	6	0
Kyushu, Japan	S6	Multiple	Nordisk Village Campground & TAOFLAT KITCHEN	Hotel, toilet & shower, dinning, kitchen, office	3	10	3	1
	S7	Single	Kasamatsu Hirotomo Memorial Hall	Painting gallery, office, painting storage, art working	1	2	2	1
	S8	Multiple	Fukuoka Growth Next	Retail, office, co-working, storage, studio	2	6	3	1
	S9	Multiple	iika Palette	Restaurant, office, living, music learning and playing, lecture, living, social gathering	2	7	5	3
	S10	Single	Kahoalpe Hotel (K-WALL center)	Living, dining, storage, office, gathering and interaction,	3	3	6	4
Japan, (Beside Kyushu area,)	S11	Single	Tokyo Toy Museum	Toy gallery, experience room, retail, office, storage	0	3	1	0
	S12	Single	3331 Art Chiyoda	Art gallery, studio, office, retail, roof garden	2	5	1	1
	S13	Multiple	Roadside Station Hota Elementary School	Restaurant, retail, office, gallery, storage, living, hot spring, lecture	6	10	2	4
	S14	Single	Nanaura Clinic	Clinic room, office, rest area, dining, kitchen, lecture	3	6	3	0
	S15	Multiple	Gym and local event place	Office, gallery, hotel, sport activity, restaurant, studio, lecture	2	8	5	1

Begin the case study from Taiwan, the two southern cases find out that even the school is located not in a city, the new program with a school renovation can bring the area a new atmosphere. In addition,

these two cases have asked to cooperate with the local, it can be the industry development or the educational theme to help the citizen to learn the new things. The main structure in Pingtung Education Innovation Unit (PEIU) remains the same. The new programing target is aiming on the education purpose for those who are willing come to the Checheng region. People are willing to come to the town which is focusing on the local resource utilization and educational knowledge training. On the other hand, the territory property requires a space with different level of interaction. As the results show, the main circulation system in charge the user's circulation behavior from a single linear pathway to enter each room, directly which seems very convenient. However, the single linear circulation type also declines the chances of interactional behavior because this design reduces the opportunity for exchanging the ordinary dialogue for every participant. The most functional spaces show that the space's form is hard for users to notice what is happening inside and outside since the exchange information experience provide only in each space. Under these circumstances, activities hosted in the space are limited to the shape of the territory zone. To put it another way, the user's behavior becomes one-way in and out because participators stay in a room without the linkage with outdoor.

Contrariwise, the functional service space in this case indicates a specific service for the new programming such as require a certain time condition of space management. The case in the Pingtung Education Innovation Unit increased the functional service space more than before. Functional service spaces become the new territory zone for user to use the space. The results show different design thinking to arrange the territorial zone. On the first floor, the functional service space and public space are decided to attract the visitor to use. Everyone comes to this facility can be easy to understand the activity. Also, the functional service space is continuing to the second floor, which is trying to maintain the user behavior to visit the second floor of the school building. The interesting part of this school building that is shown on the second floor too. The redesign space creates more personal spaces due to the reason of teaching assistant training program. The operation team is a professional expert of teaching, assisting, and learning training skill. Therefore, their training program require a period of time to stay with the team with the new trainer. On the other hand, this mean the school facility will be continuing to use the space during day and night. Hence, the space design property of the territory offers more possibilities for a user to have their own space or authority to perform their own needs.

To create a self-sustaining place, placemaking is a good strategy to start with the project, especially people are aiming to achieve a sustainable city for the future. Subsequently, when visited these school regeneration cases shows the architectural placemaking has a strong attraction to attractive people to utilize the space, the placemaking process can be flexible to use whatever the resources they have on the site. Basically, the architectural façade keeps as the same as the original, beside to maintain the surface of the exterior. However, the interior plan layout will be following the new function to design the school space. Like the field case in several elementary school, before, each individual classroom has been demolished the inner wall into a wide-open space for a co-working place or guest house room. The designer also brainstorms to use the furniture from the old school time becomes part of the working table in a living room, also took out the wall between the hallway and classroom. Additionally, all cases show

one interesting strategy is using social media as a tool to share what's happening at the school can be one of the attraction factors to express the school again. Even after the school regeneration, the cognitive emotion of the school space can be recall connecting the community and place; meantime, extra software like social media is also helping the business propaganda faster to grow without any doubt.

The results show all cases are not reinforcing the public space in the building much since the architectural programming has been decided before the user or the community will participate. Also, two cases still retain the outdoor space that provide the public's property (sometime this kind of space will also seem like a public space). The shared space is an intermediate space, which has a full of opportunities to make the ordinary behavior link the social connection between users and visitors. While the shared space in some cases have a few limitations such as the architecture layout and environmental control system, either making a space or leaving a space is always a reason to rearrange the form, style, and order in a shared space.

Additionally, all cases have several different types of living behavior shows in the personal territory differentiation, which is assuming a group of the user will stay overnight or live in a school building during a period. The Pingtung Education Innovation Unit has provided accommodation room on the second floor, and the Pingtung AI Agri Hub has offered the shower rooms on the second floor. Also, the same case in Iika Palette, Fukuoka prefecture, Japan. The Iika Palette provide a long stay program and visiting program on the second floor. This function provides a rental business to support the school's operation too. Thus, the dwelling service can be one of the basic require program when the school facility is going to redesign the space. This idea can be discussed as two perspectives: one is the physiology aspect, and the other is the economic phase. School facility has the maximum safety regulation, and most of the design layout are very module pattern; in fact, it is easy inhabiting the form to meet the basic human needs. On the other hand, the school facility provides the fundamental obligation, but the inhabitant exchanges social duties such as maintaining the environment and being responsible for assisting the neighborhood. In making this comment, the circulation of school facility and inhabitants can also produce the social value in a various of outcomes.

As the transformation of territory functions shown previous, the numbers of the space between limited and functional services have been designed for more spaces to interact on the first and second floor in this case, especially after the new education program require. On the contrary, public space has been decreased to put more emphasis on proving individual space. Pingtung Education Innovation Unit shows personal space is represented as both toilet and shower rooms for basic human physical needs on the second-floor plan. More detail demonstrate that the Pingtung Education Innovation Unit's architecture redesign plan shows the building has added an exterior pathway on the left corner and one exterior stair on the right-side corridor to connect the outdoor territory. The entrance of the green area on the first-floor plan is also close to the new exterior stair that is representing the distinguishing of welcoming the visitor from the exterior. After the space has been redefined as an activity and communication functions, this public space is reinforcing the social interchange between the facility and neighboring environment. Additionally, on the second-floor plan, the building's territory differentiation

is increasing a room for personal space to show a different spatial order in a public accessibility of private space.

While the interdisciplinary cooperation is a huge mission, it involves more tasks in order to communicate with everyone in different redesign phases. Still, co-creation and interdisciplinary cooperation have the potential to collective local wisdom and perform the sociability of public places. Therefore, the abandoned school facility becomes a node to accomplish the quality of ordinariness, linkage, security, and sustainability in one place for the future regional development. Furthermore, everyone has the opportunity to determine the spatial design methods of conservation, program transformation, and region revitalization will assemble a friendly place and sustainable environment system in the neighborhood. According to the field survey, all programs can be distributed into five categories of the development plan relate to the local cooperation. Some of the characteristic of the program can be more specific to a certain subject such as the industry development plan to help everyone to understand the knowledge of industry business practice. Others program can be developed the plan like a social engagement to eliminate the boundary between school building and surrounding neighborhood. Therefore, the detail features of the development plan are shown below in Table 5-4

Hence, the architecture program plan can be performed the characteristic of the school building during the regenerated design process, all 5 categories become the standard to review all 15 cases between Taiwan and Japan, to give an evaluation score to see how the program decision making does can affect the satisfaction and close interaction with the local development through the new regenerated process, especially let the school building become the intermedium place to connect the participant, citizen, and school building. Ultimately, the gold is using the placemaking action influence to recreate the school as a place to represent the local region. The overall evaluation scores are shown in Table 5-4.

Table 5-4 Concept of a development planning relate to the local cooperation.

Category	Fusion Function	Industry Function	Learning Function	Exhibition Function	Diversity Function
Features	Elimination of boundaries between school and communities	Provision of places for industry knowledge practices related to local livelihoods.	Regional facility and learning combination with school	Establishment of a local culture exhibition corner.	Establishment of muti purpose spaces that can accommodate the diverse uses of residents.

Table 5-5show the finding the highest score of the category is multi-function idea as 90 points and the lowest is the fusion function idea as 47 points. Development plan idea of industry function and learning function, both scores are very similar which is meaning that these two ideas of planning should be more carefully to respond the inquire of the local environment. Exhibition function idea is depending on the area's characteristic and what kind of the message that the display wants to show to the public. Thus, the program planning can also stimulate the spatial reconfiguration of the overall school facility. Furthermore, the performance of the school's regenerated characteristic can also attract to people, company, and private organization to involve the investment of local environmental development, which can create more social value to the society.

Table 5-5 Evaluation of school redevelopment planning outcome achievement condition

School		Category of development planning utilization (Scale of the score: Really good=10. Good=7, Marginal=5, Unrelated=1)					Grade	
		Fusion use	Industry use	Learning use	Exhibition use	Multi-function use	1st	2nd
Taiwan	S1	7	1	5	10	1	E	F
	S2	1	5	10	1	7	L	D
	S3	5	10	5	5	7	I	D
	S4	5	1	10	5	7	L	D
	S5	1	1	5	1	10	D	L
Japan	S6	1	7	1	1	5	I	D
	S7	1	7	5	10	1	E	I
	S8	5	7	5	1	10	D	I
	S9	5	7	10	1	5	L	D
	S10	1	5	1	1	7	D	I
	S11	1	5	7	10	5	E	L
	S12	7	10	5	5	1	I	F
	S13	1	10	1	5	7	I	D
	S14	1	5	7	1	10	D	L
	S15	5	5	10	1	7	L	D
Total score		47	86	87	58	90	-	-
Highest case		2 cases (S1, S12)	3 cases (S3, S12, S13)	4 cases (S2, S4. S9. S15)	3 cases (S1, S7. S11)	3 cases (S5, S8, S14)	4I,4L, 3E,4D	2F,3I, 3L,7D

Although, the analysis result finds out the utilization score of the develop plan include multi-function, learning, and industry are the most popular usage to relate to the local cooperation work. Still, each case has the micro factor to make the linkage with the people and the region become more stronger connection. When school regenerated, it also provides the school become an intermedium platform to offer the communication for any reason, the only one target is not only to reuse the school space but also to offer a place for the citizen to get together, to help the living space become better, and also extend the lifecycle of the architecture itself. However, schools of number 1 and number 12 have been showing up that both they have two combinations of the planning idea of the building function which is transformed the school building become a successful regenerated case in the overall 15 cases. School 1, Taiping Exhibition Center, Taiwan and school 2, 3331 Art Chiyoda, Tokyo will have more detail discussions in next paragraph.

Taiping Exhibition Center, Taiwan has a combination function of fusion and exhibition use. This case has been supported by the city government of Keelung. The powerful influence factor is the school building become one of the popular sceneries to observe the Keelung city. The school is located on the top of the hill which has a great view to overlook the whole town and the Keelung harbor that is the strength of this school architecture, the existing view as the first advantage. The second advantage is the characteristic of redesign strategy, it changes the building façade, the landscape, and the original space. All changes give to the public a new attraction reason to visit the place after the placemaking movement, people are enjoying the walk distance from the Keelung station to discover the area with different experience of exploring on the way to the destination. Last, small amount of nice retail stores to provide

the service for the public to stay in the school building, enjoy the exhibition about the story of the city development and the transformation of the school. Also, the service like enjoy the reading or coffee from the store arrangement. Taiping Exhibition Center has brought a different phenomenon to the area that reconstruct the identity of the school itself after the regeneration design. Another case, school 2, 3331 Art Chiyoda that is located in the Chiyoda area, Tokyo. Usually, this area is famous for variety electronic equipment and also the animation goods. When the school was going to abandon, many people and professionals thinks the building was too old to use, but the art and culture event in 2005 has given the idea to renovate the school as a local art industry base to keep support the art business and offer a daily artwork to citizen.

The construction process take time to renovate the school space even the landscape design too with the government support, the school building become a fresh new look from the exterior to the interior space. Correspondingly, the transformation process had to gather many willing to join the project to provide the idea and operation of the school, citizen and students came up the idea such as a green roof to learn how to plan the vegetable or design many different events to ask more people to join and to recognize the school place again. Thus, the program plan of the fusion use to eliminate the boundary between the school and community is catching the point to let the public to walk into the facility again. The industry plan idea focuses on the art theme and cooperate with the local traditional event is a great success, it is not only marketing the artwork but also change the school building's environment by attracting more and more visitors to come. To understand more about the school regeneration process's influence reason, all 15 schools can divide into three groups to investigate more about the impacts of placemaking progress. Overall evaluation of 15 cases (Fig.5-2) and figure 5-3 shows three groups of school case study in Taiwan, Kyushu, and others in Japan. Schools are located form the urban to the rural area which has a variety social factor can be involved the school regenerated process. Under this circumstance, the comparison results of these three groups find out some interesting outcomes to discuss about it.
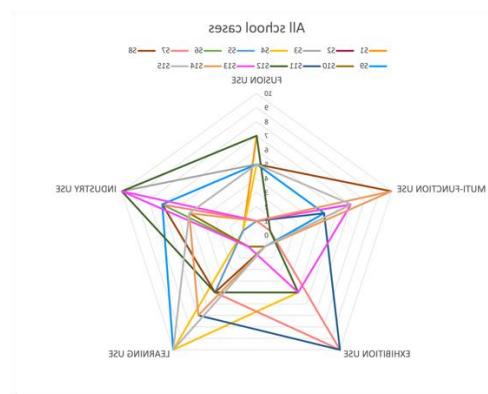
Figure 5-2 Evaluation result of the development plan idea in all school cases

First of all, schools in Taiwan have shown that the fusion idea of the plan is less think subject while reuse the school space, the thoughts are limited in the diversity combine with learning function. The case in Taiwan is rarely to think the boundary between the school facility and the community which

has the potential thread to affect the management strategy in the future after the school has been transformed to a new architecture program. Moreover, the industry function idea to plan into the program has also shown the weakness score that is reinforce the idea of fusion function become more obviously. The obstruct or the disconnection dialogue to the neighbor turns the school facility convert isolate again.
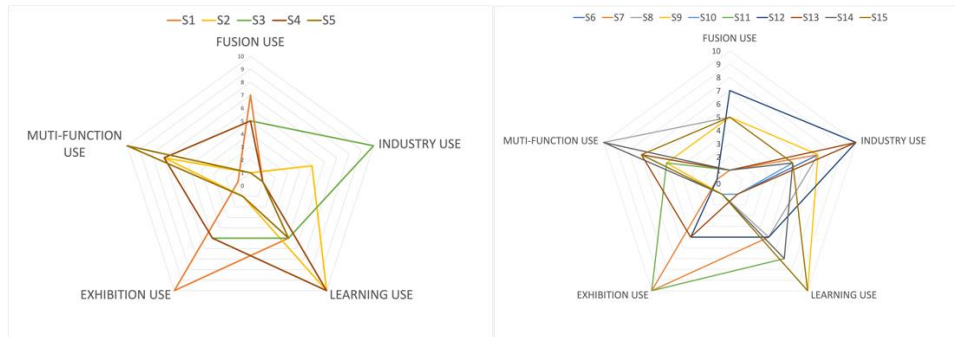
Figure 5-3 Comparison results of the space function use situation in Taiwan and Japan

On the other hand, cases in Kyushu and others in Japan have given a distinctive insight to think program more wide-ranging strategies to reach the gold of improve the school placemaking outcome and regenerated planning idea. Diversity and industry functional use ideas have been more emphasized to use in the regeneration design process of the school transformation. Most of the cases are insert the industry relevant either invite the commercial company into the school facility or establish the local industry to reinforce the local industrial business to have another way to approach the task. The cover area between Kyushu and other cases in Japan also shown that other cases in Japan are using more various of functions into one program, the reason maybe because the school's location has more resource and population to cover more potential requirements (Fig.5-4).
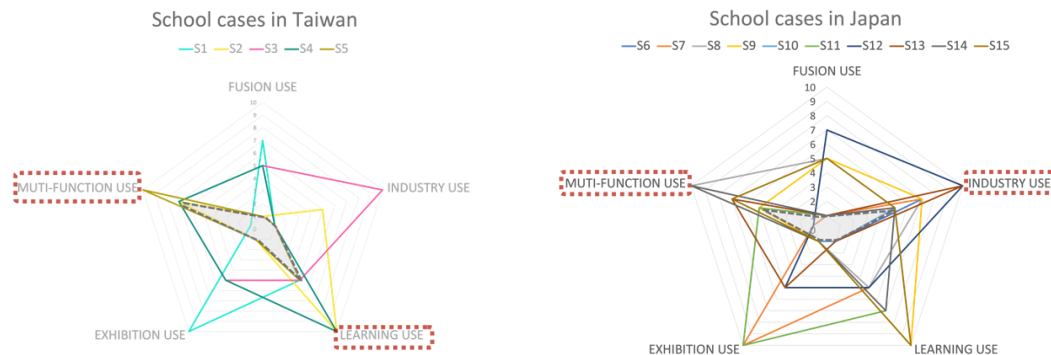
Figure 5-4 Minimum require development plan idea in Taiwan and Japan.

5.2.3 The Genius Loci of Space Form and Users' Engagement

Rebuild the Built Environment and Public Interaction is connecting the relationship between form and users. According to the study of reviewing and examining the process of school building regeneration condition, the purpose was to observe and understand a local community through the method of redesign at abandoned school buildings. When a school building faces the transformation of today's social structure and, the transition of political standpoint and the development towards economic benefits, an

abandoned school earns a new chance to prove its potential to the social environment. However, the meaning of the school itself in a region should not be limited only to the value of historic architecture, historic sites, and aesthetic judgment values. No matter whether the school building is being preserved or demolished, as long as it has fewer safety issues to worry about, the inspection criteria and evaluation judgment are suggested to leave the opportunity to the community or the public to decide the maintenance or removement of the school building. Instead of discussing the school architectural style value, building's sustainability is the priority issue for people to consider in our built environment (Ickinger & Morris, 2001).

Usually, a school is the center of territory in a neighborhood, a shelter when a natural disaster happens, and a place for the community to host cultural events. Attending classes or participating community activities in local schools are considered to be a common experience in most of the resident's lives. People have spent tremendous time on participating activities in the school from childhood to adulthood. Also, the place human interaction in everyone's memory of a place should called by promoting the revitalization of the area. By extension, school architecture is alike an intermedium vessel to fill the daily lives of the environment and neighbors, whether from the past or now. Many people used to think that the abandoned school should just be destroyed in the best way from an economic opinion. But within the past few years, several cases suggested that reusing the abandoned school building can create extra value to local communities, which becomes a concerning topic for every government in every country.

Currently, if the public or designers stop thinking about the important meaning of school architecture as an image of the city, many of them might simply assume that school architecture is just an ancient artifact with no value, not to mention the popularity of new fashion and style of architecture among the public. However, many new government policies proved that an abandoned school could bring several impacts on social interaction and improve the region's development. Architecture as a space plays a role in understanding the relationship between its user behavior and the daily activities around it. Therefore, the following interpersonal behavior and spatial behavior after the abolition of a school are the basic points to understand the direction of the architectural redesign plan and further enhance the connection of the neighborhood. The architectural space used in daily lives should reflect the reality of social life and the essence of life events. When the building shows only a three-dimensional geometry space without any function, the building is simply an empty shell of the structural volume. When the building volume begins to be associated with the construction process, architecture design form and living, the architecture space evolves and reflects a place of living style, presents a cultural story, and social trend that represents the current generation. The building begins to have the existence of a life force and represents the rise and fall of a period to which the present belongs. This is also a process of alternating regional cultural fields, and it is also the most direct existence of the intangible culture in the era, and the value of such buildings will be evaluated according to more impact assessment factors, including policy, history, culture, economy, society, and other aspects.

Social event design and its effect in this investigation and analysis explain the school

architecture's regeneration process, which shows the genius loci of an architectural space should be preserved. In fact, the spirit of the space must be renovated to assemble the resources from the neighborhood environment. At this research level, what can be discussed is the perception factor occurred after the built environment has been transformed (Table 5-6). As the results display, either the entire campus has redesigned or the building has been renovated, and the service and aesthetic perception factors are improved from before. However, in the beginning of this filed survey, it was noted that both regeneration projects belong to every local Government, who is also the central decision maker including program design, design team, time management, and construction budgets. In the current discussion of the school's transformation, a controversial aspect has been discussed since people are more concerned about the benefit of the new architectural programming and the marketing profit. Moreover, the public often assume that a new space is better than an old space. By focusing on the new architectural property impression, people overlook the deeper problem of community identity, resource evolvement, and local autonomy.

Table 5-6 Perception factor after the school transformation design process's satisfaction

Criterion	Aesthetic	Culture	Economy	Service
Features	The beauty of the building and landscape show the characteristic of the surrounding built environment	Preserve or transform to reinforce the region culture to keep continually in the social environment	Regional development to provide various opportunities to improve the economic status	Establishment the service design through various platforms to increase the social bonding

This research believes the abandoned facility such as a school can replay a role of matchmaking to promote the joint development benefit of the neighborhood environment. Meanwhile, the social value of the abandoned school's transformation shows the improvement after the redesign process. The discussion of the four different aspects to reevaluate the environmental value analysis shown in Table 5-7.

Table 5-7 Evaluation score of school regenerative design perception in the neighborhood

School		Satisfaction of the environmental senses (Scale of the score: Really good=10. Good=7, Marginal=5, Some=1)				Grade	
		Aesthetic	Culture	Economy	Service	1st	4th
Taiwan	S1	10	5	7	1	A	S
	S2	1	7	5	10	S	A
	S3	5	7	10	1	E	S
	S4	5	1	7	10	S	C
	S5	5	7	1	10	S	E
Japan	S6	7	1	10	5	E	C
	S7	1	10	7	5	C	A
	S8	5	1	10	7	E	C
	S9	1	10	5	7	C	A
	S10	1	5	10	7	E	A
	S11	7	1	10	5	E	C
	S12	1	7	10	5	E	A
	S13	1	5	10	7	E	A

S14	1	5	7	10	S	A
S15	1	5	7	10	S	A
Total score	52	77	116	100	-	-
Highest case	1 case (S1)	2cases (S7, S9)	7cases (S3 S6 S8 S10-13)	2cases (S14, S15)	1A,2C,7E,5S	8A,4C,1E,2S

Since the government achievement of these cases are redeveloping the place by redesign the abandoned school in the rural region. Not only the physical facility needs to be considered but also the social humanities event and the reaction of the feedback, the balance between the school architecture and human activity are necessary for the redesign program and strategy, the overall score from the school regenerated perception outcome has been shown in Figure 5-5 that aesthetic perception is the last factor for the public to recognize it. Visitor or users are having more awareness about the school regenerated progress in relating to economy improvement and service factor.
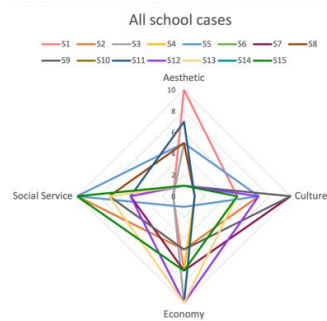
Figure 5-5 Overall design perception senses of school regenerated outcome in the neighborhood.

In figure 5-6, all three graphs show the overall school cases in Taiwan, Kyushu, and other area in Japan, to discover the feedback form the participant's reaction. After the school is giving a chance to transform the new program and space function, how does the school become an intermedium to represent the characteristic and improve the social profit to the surrounding neighborhood. It seems the result shows the aesthetic perception of the building, and the landscape cannot really show it to the public. Each group has only one to two case that has a high score of the aesthetic perception respond. Other cases are more relate to the economy reaction and service respond. People feel more sensitivity about the service opinion and the money profit which is understandable. Economic issue is always the priority concern to judge the building's benefit, but at the same time, the economy profit has always come to another problem to the local community. Thus, the regeneration process needs to think ahead what the most important satisfaction of this renovation design to the region is.
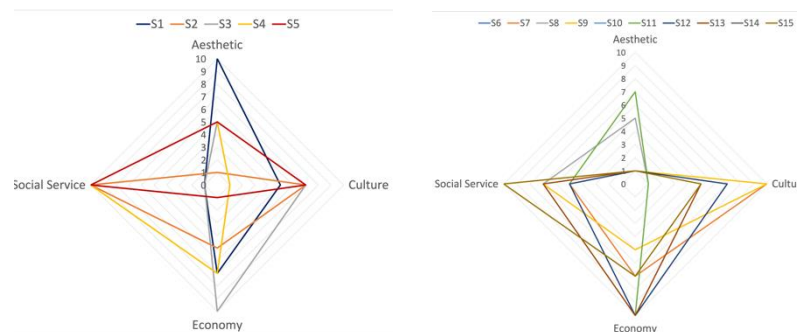
Figure 5-6 Comparison of the design satisfaction in Taiwan and Japan.

To have the economy benefit is important but focusing on only the economy factor can be overlook the deeper problem of the regional identity. While thinking the outcome of the regeneration process can bring, the analysis result also finds that an interdisciplinary cooperation through the placemaking movement can at least try to approach each of the perception factor after the environment of the school transformation. In the figure 5-7 shows that the minimum cognition of the school regeneration project in Taiwan realize renovation a new facility can be more attractive to the public to come to the place, the economy should be concerned a little bit more during the space reuse plan.
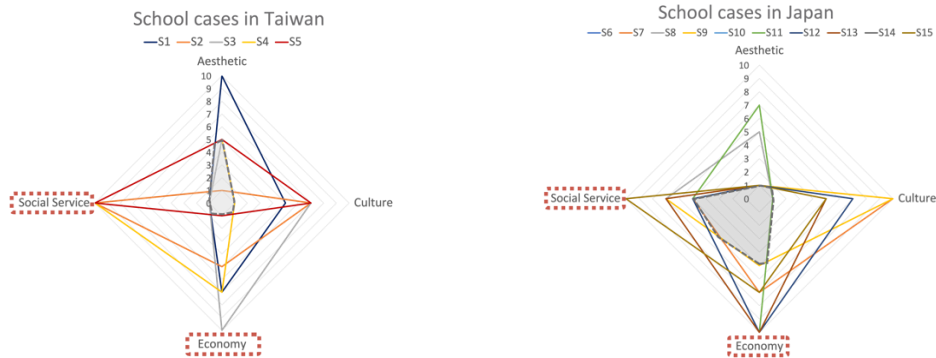
Figure 5-7 The minimum design satisfaction in Taiwan and Japan.

By contrast, other cases in Japan have been emphasize on creating the benefit in economy facto more than the case in Taiwan. Cases in Japan are focusing more on the economy because the program function can be use as the commercial use which makes a lot of different to the case in Taiwan. Thus, the perception satisfaction neither the aesthetic factor nor culture factor to a school renovation become less consideration strategy as a school regeneration project. Even though, school cases in Japan, the school architecture itself or the regional characteristic may have others advantage already. For instance, the nature environment advantage or the citizen has engaged to the community for very long time which is very support to build up a nice living environment with having a self-responsibility duty. s

In this point of view, interdisciplinary cooperation and diversity participants are chances to rebuild the connection in a local environment. Co-creation is a new design opportunity to collect the public message from different professions, backgrounds, and generations. All cases have offered a complete redesign space program, but the interdisciplinary cooperation still not as diverse as expect it. Most of the co-creators participate the project after the space was reconstructed, which is a bit late to understand the spatial arrangement of the space design. Even though the co-creator doesn't join the space arrangement significantly, but the local activity interchange arrangement has been improved. Not only is educational knowledge absorbed but also culture advertising to the public. Regardless, a new renovate place still attract the public's eye to participate the event more than an old space without an appropriate space management and operation. Thus, the balance between the space design, program creation, and manage the activity are three crucial considerations when all participants take part in the regeneration process.

5.3 Finding of the Organization Condition in a School's Public Area

If a public building, in the case of a school building, is a so-called private domain, then in this study, the corridor can be considered a public domain. Giving equal importance to classrooms and corridors means not only treating the corridor as a virtual space outside the classroom but as a basic supplementary element, carefully organized spatially, so that the corridor can serve more purposes than just the moving line. If the corridor is seen as a link to the building, it is basically a composite expression composed of private units, so the sequence of streets and squares potentially constitutes a space in which the classroom and the user can have a dialogue. Corridors are meant to be spaces for action and communication. Therefore, to think about the public domain or the open space to use in a school building, the shared space is also an essential analysis subject during the school regeneration design process.
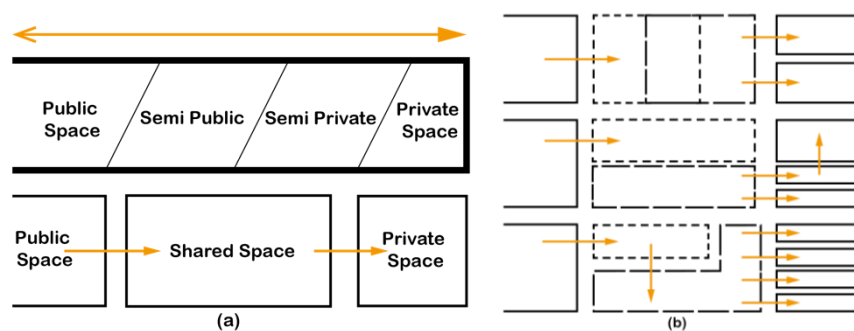
Figure 5-8 (a) Characteristic of Territory Quality Analysis. (**b**) Space Transformation Relationship between Public Space to Private Space.

Even if the school architecture had been closed and was transformed into a new architectural program, the school architecture as one of the public buildings should be regarded as the cradle of public life around the neighboring society. According to the territorial quality analysis (Fig. 5-8. (a)), the research discusses strongly on the community's dialogue and exchange of public affairs through a particular territory analysis level among the public, shared, and private spaces, especially during the progress of sharing spaces that also separated into semi-public and semi-private parts not only to understand the user behavior relationship but also to evaluate the property of the space (Fig. 5-8. (b)).

5.3.1 Private Claims on Public Space

The perception between the two is the key to eliminating the sharp division between spaces with different domain requirements. The point, therefore, is to create a transitional space that is either private or public in terms of management, but at the same time accessible from both sides, that is, users from both parties. As long as appropriate spatial treatment methods are incorporated into the regenerative design, users in the private territory will also be indirectly influenced to extend their experience space to the public area (Ramlee, Omar, Yunus, & Samadi, 2015). The finding of the use's perception needs in different territory zone is showing in Table 5-8.

Designers should use different design elements to encourage users to speak and influence the scope of personal influence in terms of the design concept that is encouraged, so the quality and quantity

of public space will also increase more attention. However, through the intervention of the users themselves into the space, and the place they have made to recreate the place, and properly combine with each other, it can be naturally transformed into a public space. Discuss the use of corridor space, such as classroom space into excessive corridor space for residential use, private office use, etc., and how it is discussed here. During the field survey of all 15 cases, the findings are interesting to know that even though the school is a public facility, but the regeneration program has shown in Table 5-7 that for the private use on a public space such as a school building, it may relate to some issues as a user, how does a user to leave out the boundary. The user behavior perception needs can also reflect to the user space experience in each territory zoning. By the user experience and their emotional feeling feedback, the result is shown in Table 5-8 that for the user who is using the space in a private claim on public space, people do feel the space as safety and comfortable to stay, even though it may have the limitation by some space's owner with the permission.

Table 5-8 Private claims on public space in all school cases

School		User behavior perception needs with territory zoning quantity						
		User behavior in a private claim on public space					Territory zoning number	
		Physiological needs	Safety needs	Belongingness needs	Esteem needs	Self-actualization	FSS	PBS
Taiwan	S1	×	△	○	×	×	1	4
	S2	△	○	○	△	○	3	5
	S3	△	△	○	○	○	5	2
	S4	△	○	○	△	×	1	1
	S5	×	○	○	×	×	6	0
Kyushu, Japan	S6	△	○	○	△	×	3	1
	S7	×	×	△	△	×	2	1
	S8	○	△	○	○	○	3	1
	S9	△	○	○	○	○	5	3
	S10	×	○	△	×	×	6	4
Japan, (Beside Kyushu area)	S11	×	○	○	○	△	1	0
	S12	×	○	○	○	○	1	1
	S13	△	○	○	○	△	2	4
	S14	×	○	○	×	×	3	0
	S15	△	○	○	○	△	5	1
	* Scale of the score: ×= Some, △= Marginal, ○= Good							

5.3.2 Public Accessibility of Private Space

The public accessibility of private spaces has fewer results in the regenerative design approach, and its impact is also deeply affected by the stereotypical thinking logic of its own users. The internal plan configuration of school buildings, in the past, school buildings were usually designed with the number of classroom space requirements and corridor circulation as the benchmark design for space

configuration. Taiwan's school buildings are based on geographical environment and climate considerations, basically the design of corridors are semi-outdoor space characteristics, with a divided classroom space, on the contrary, Japanese school buildings basically corridor space is also contained in indoor space, and with the entrance will have indoor and outdoor shoes replacement space as an intermediary space to enter the main interior.

Therefore, such spatial sensation will feel both internal and external spatial perception. The interconnectedness of interior and exterior is so strong that users will feel chaotic when transformed into a regenerative space that is not able to tell whether they are in a public space or a private space. Both in terms of spatial significance and the principle of accessibility for users, the regenerated school space acquires a reversal of internal and external characteristics. Because the strategy of regenerative design techniques or the way materials are used, they can represent the principles of a new system of accessibility, according to which the boundary between public and private is transformed and to some extent may be eliminated to the extent that part of private prestige is more accessible to the public.

In Table 5-9, it shows all the public accessibility at each school 's situation which shows that most of all cases have the territory claims on the permission require before entering the space which need to be pay attention about the boundary of public and private. When people are accidently walk into a place looks like a private zone in a public facility, it is always having a difficult time to think if this action will cause the problem or not, especially in a school building that the layout is almost the same if the redesign doesn't change much and stay as the original school layout. In Table 6-8, some cases are having this vague space boundary droning the filed survey. Also, people who have the authorization show the boundary may not be so clear for the outsider to understand the spatial condition, under this situation, the conflict and the emotional expression will show it when the conflict has been happened. On the other hand, this means that the accessibility between the private zone should take more seriously thought during the space design and territory zone differentiation.

Table 5-9 Public accessibility of private space's condition in all school cases

School		Name of building	User behavior perception needs with territory zoning quantity						
			User behavior of public accessibility of private space					Territory zoning number	
			Physiological needs	Safety needs	Belongingness needs	Esteem needs	Self-actualization	PLS	LSS
Taiwan	S1	Taiping Exhibition Center	×	○	△	×	×	3	4
	S2	Home for Care and Love (Kung Ma Ma: EXSIT FOR LOVE)	○	△	○	△	×	4	4
	S3	Pingtung AI Agri Hub	△	○	△	○	△	1	2
	S4	Pingtung Education Innovation Unit	×	○	○	△	×	3	2

	ID	Name							
	S5	Long-term Care Center	△	○	○	×	×	2	3
Kyushu, Japan	S6	Nordisk Village Campground & TAOFLAT KITCHEN	△	○	△	○	△	3	10
	S7	Kasamatsu Hirotomo Memorial Hall	△	△	○	○	×	1	2
	S8	Fukuoka Growth Next	△	○	○	○	○	2	6
	S9	iika Palette	△	○	○	○	△	2	7
	S10	Kahoalpe Hotel (K-WALL center)	△	○	○	△	×	3	3
Japan, (Beside Kyushu area)	S11	Tokyo Toy Museum	△	○	○	○	△	0	3
	S12	3331 Art Chiyoda	×	○	○	○	○	2	5
	S13	Roadside Station Hota Elementary School	△	○	○	○	△	6	10
	S14	Nanaura Clinic	×	△	○	△	△	3	6
	S15	Gym and local event place	△	○	○	△	×	2	8
	* Scale of the score: ×= Some, △= Marginal, ○= Good								

Regenerative design programs with the characteristics of private rights use will be designed with personalized facades and private entrances, no matter what form is used, when the number of such personalized and independent entrances increases, the cohesion of the indoor space is smaller, and the opposition between public and private space is stronger. The reuse of school space, based on previous research, we know that the quality of corridor space and the relationship between classroom space is a challenge that influences the regenerative design process. Users will want to not only complement each other in a spatial sense, but also serve as conditions for each other's formation. Especially in the organization of existing fixed flat spaces, spatial forms and moving spaces will provide each other with maximum accessibility of their respective boundaries, that is, the boundaries between interior and exterior become less clear, and the division between the private and public spheres will become more flexible. For example, the door of the classroom will be transformed into not a single barrier through the technique of regenerative design but may be extended and form a series of phased spatial sequences, and the positioning of the door may no longer be absolute inside, nor absolute public.

The relativity of interior and exterior concepts is first of all a matter of spatial organization, and whether the space tends to be lively or open-like or more inclined to the quiet atmosphere of the internal space, depending on the characteristics of the space. And beyond that, people feel that the form inside

the space, the exterior, or in between, depends to a large extent on the scale, form, and choice of material. The outdoor space organization and building materials are applied indoors, making the indoor space look less intimate. On the contrary, the indoor space organization is applied outdoors, making the outdoor space more intimate. Therefore, the overall synthesis and ambiguity of indoor and outdoor reinforces both the feeling of accessibility of the space and the feeling of intimacy in the perception of space. A phased expression space sequence created by architectural techniques guides users to gradually enter and exit the human space. The production of this overall spatial experience depends on the entire complex experience produced by architectural means, such as height, width, illuminance, natural and artificial, materials, ground elevation, landscape expression, etc.

5.3.3 The Strength of Placemaking and Articulation

In-Between Spatial Differentiation. The in-between is a spatial characteristic with duality, it can be a lap between two different spaces inside and outside, or it can be divided into more than two different spatial characteristics. Such a spatial characteristic, which people simply call a public space, will have a certain social function as a meeting place for people with common interests. Unfortunately, users often overlook the social function and representation of such a space. The social function is to socialize in a place, not only for material basic needs, but also to enjoy the happiness of the built environment. In this research, the public space is not just what we think of the exterior space, but also the public space who can offer the user to having a social engagement in different level of user behavior and activity.

Take an example of case in Taiwan, in Pingtung AI Agri Hub, this school building shows that the territory functions and space order had completely exchanged towards the more private claims on public domain consideration after the regenerated design. Not only open the room for particular limited service such as the retail store on the first floor, but also several private spaces on the second floor. Likewise, there are more functional service spaces for serving training, learning, and assisting spaces for everyone who needs knowledge of agriculture and business development. Despite the building's space design on public usage, the only public space for everyone to enter without any restriction is the green area at the right-side corner on the first floor. Additionally, the analysis results show the Pingtung AI Agri Hub is more emphasizing the territorial differentiation both in semi-public and semi-private functions. The architecture plan demonstrated usage flexibility from the past and present and showed that the limitation service space is exchanged for functional service on both floor plans, which allowed people to utilize the space longer without any space authority management and restriction. On the second floor, the plan layout is almost the same besides the fact that personal space has been split into two functions in one same space. The new servant property had provided not only toilet but also shower functions, for people who stay in the limitation service space (for example, the personal studio room at the right side of the main stair. Hence, this new design thinking outcome has established a different duty for users while they are using the built environment space.

A comprehensive redesign value of the overall school campus is also improving the entirely landscape scenery of the school building. Generally speaking, the campus is always restricted by regulation. The public is not allowed to enter the campus beside a special permission, people who is the

staff and students from the school can be allow to enter it which is a basic design requirement in Taiwan. This boundary is always designed an obstacle such as a fence to drawn a clear line on the site, but the research results show the regeneration design changes the performance of the campus. On the other hand, both cases indicate a deep-rooted idea of relating the public space to the first floor of the building as well as its exterior landscape area. First of all, the landscape elements are redesign with different use functions, shapes, and variety of plants, these design changes the user's behavior experience and provide a nature environment to enjoy with the scenery between landscape and individuals (Fig.5-9).
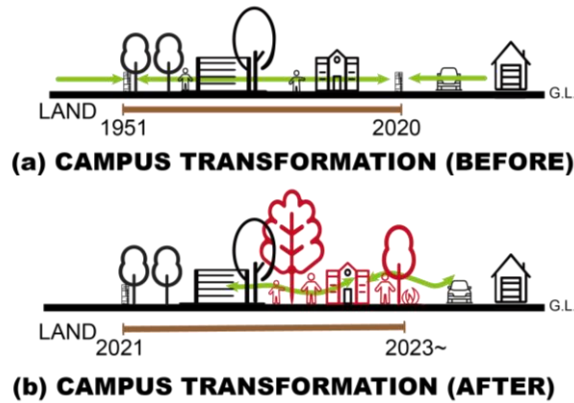
Figure 5-9 Campus Transformation of Pingtung Education Innovation Unit

Secondly, because the boundary on the site is open and extend to connect the surrounding , the campus converts to a place with a fridenly environment. Especially, in Pingtung AI Agri Hub, it not only cancels the barrier but also designs a symbolic art work to represent the image of the new transformation. Conversely, in Pingtung Education Innovation Unit, the land extend only a small part of the campus to connect to the community, the activity is more focus on the interior than exterior. Even though, the building is redesign a exterior pathway to connect to the community, the interaction benefit is still lower than the Pingtung AI Agri Hub. This appearance clearly shows in the Pingtung AI Agri Hub (Fig.5-10 (a)) than the Pingtung Education Innovation Unit (Fig.5-10 (b)).
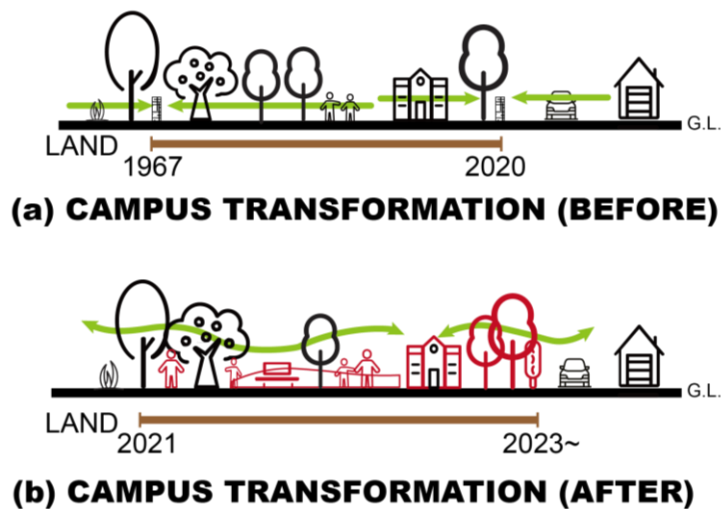
Figure 5-10 Campus Transformation of Pingtung AI Agri Hub.

Finally, the landscape space has changed to a many diverse sacles, Not only the user can

manipulate the activiey in variety of performance but also the visual experience is more penetrating on the spatial sensation. However, due to the redesign requirement in both cases are different approach, the green arrow shows the visual experience is also in different experience levels. As the results shows the the Pingtng Education Innovation Unit is only reuse one of the building on campus, the space sensation reflect the vision is more about the architecture itself than the landscpae. In the Pingtung AI Agri Hub, the redesign skill is focuing on open perception and widly view, the landscape space trasformation has given the neighboring a fresh impression). Since the land transformed into different level of physical and mently experiences for the user, the space has reestablish the social connection among the user, the neighborhood and the land. Furthmore, the overall renovated facility is present a new image of the local region.

The redesign architectural space gives the public, even the inhabitants to rethink the identity of the facility in the neighboring. Moreover, the sense of the space and place consciousness can be reconstructed through the user behavior, and social interaction. In Pingtung AI Agri Hub, many technical or functional service space has been provided without appropriate popularizing to the everyone. When people think the name AI agriculture, which sounds a very technical name and stop them to use the interior space. So, the building's name is attracting to a group of people who are interesting in a specific subject. Likewise, the Pingtung Education Innovation Unit, the word of education too. Also, the new program services the instruction training for the community in the countryside remain many unsure questions for the local neighborhood. Even though both cases conduct the event are inviting the neighborhood to plan the activity, but the identity of space consciousness still has a long way to establish in the local region.

Conversely, the limited-service space in these cases indicates a specific service for the new programming such as require a certain time condition of space management. In the Pingtung AI Agri Hub increased the limited-service space more than before after the redesign process. The results show different opinions on the interaction exchange behavior in the Pingtung AI Agri Hub, and the importance of the special subject such as the cultural elongation reinforces the significant local industrial development is the first consideration during the redesign purpose. Therefore, the space design property can offer more possibilities for a user to have their own space in anytime for their own needs. As the transformation of territory functions show the numbers of the space between limited and functional services have been designed for more spaces to interact on the first and second floor in both cases. On the contrary, public space has been decreased to put more emphasis on proving individual space. The overall territorial differentiation has been clearly to define and design on the first floor of school building. this is also meaning that the school environment may have more social interaction to connect the interior and exterior of the school building.

5.4 Discussion and Summary

In this chapter, the structure of the place includes two subjects to discuss which are territorial claims and user behavior with space perceptional experience. In the transformation process of such a spatial sequence, it will provide users with different experiences and feelings, and will also evoke

different associations with the space, each association is based on the user's own experience, from the previous experience process to the current space dejavu basis, so the so-called urban or outdoor spatial attributes can be distinguished. Moreover, in this sense, can also echo the use of the camp space. The responsibility of space use, as well as the user's concern for the withdrawal of space, are often related to the field claim and management, but architectural design can also be guided by the clear space image, form and materials, etc., which can stimulate the user's use of a certain space. Public and private will only be a matter of management, and how to make the private sphere no longer as vigilant as a castle through appropriate architectural techniques, but can be characterized by guided accessibility, and when a public space becomes directly related to it, users should be more concerned with the promotion of their personal responsibility and fully express the value assigned to the space in which they live.

In the traditional architectural conversion, designers usually will redo the interior element first. Facing the structural or law problem will try not to change with it. To propose a new program will start with the needs of the community. Social practice has been participating and a big challenge for regenerate the building; thus, applicants start to notice create a connection, the methodology as below. Then, it is important to improve the public realm based on school buildings as a starting point, so as to better cultivate and reflect the interaction in social relations, and whether it is also possible to improve the role of people's relationships through such spaces. Can the school building once again represent the public space where the neighborhood meets and improve the existing resources to enhance the communication relationship between the community and the neighborhood? Can such a space also allow the traditional way of life, which is gradually disappearing, to appear again in the future environmental space, to continue the original function of the original public space, and to adapt to the current public activities, and achieve the development of a sustainable environment.

However, the revival and reuse of public facilities, like the street revitalization of urban spaces, the restriction of public accessibility stems from the fear and fear of trespassing, and users tend to retreat into spaces they can control while feeling safe and protected. For schools, which belong to the state of social facilities and public facilities, the balance between openness and closure is the characteristic of our current diversified and more open social response. Therefore, a space relationship with a different territory claim should be considered more during the regenerative design progress.

CHAPTER 6

Construction of School Regenerative Design

Evaluation Process for User's Participant

6.1 Introduction

Nowadays, as many results from the government statement, we know many neighborhood schools were closing either in the city or in the rural area from every country, especially in Japan and Taiwan. Since the social population structure by age and sex is changing because the fertility rate is declining which is changing the entire social structure of the enrollment to the school. Due to this reason, some of schools have been forced to consolidate and close at their community, even the school building still in a decent and usable condition. Conversely, school facilities usually will be replaced to transformed into other functions. Other reasons for closure can include lack of money for needed repairs and pressures to build now, rather than renovate, old facilities, as well as a lack of public support for preserving existing school buildings.

6.2 Analysis of School Regenerative Design Process

In previous analysis outcome, chapter 4 explores the hierarchy of the space including 3 different types of plan design, while chapter 5 examines the relationship in 4 different territorial zones. Having just discussed that the school regenerated progression has several impact factors that effects the space reconfigure process and building renovation from the result of 15 cases filed survey. In addressing the question of space design limitation with placemaking's connection, the abandoned school regeneration program and their usage function have a deeply association with the surrounding neighborhood.

Therefore, begin to design the regenerative school space, the overall planning ideas can be classified into 5 types of the recreating missions to approach the regenerative task. As the hypothesis of this study, the abandoned school architecture can become the intermedium place to accommodate variety of architecture functions, which is also accomplishing a duty to the built environment both in making the environmental space better and establishing the social engagement in people's daily living (Fig.6.1).
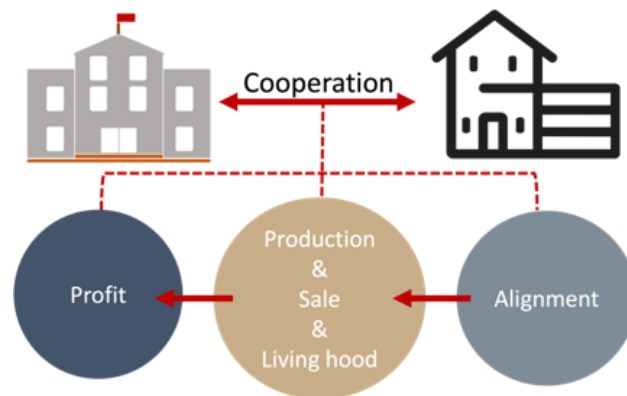
Figure 6-1 Concept of the correlation between school facility and local community

However, the correlation between school facility and local community need to share a linkage to each other, let the new school facility is part of the local community and let people involved the school space. Either the industry production or citizen welfare caring, school facility is a place to lead the connection for the present society. In this research, basing on the previous findings that can

organize 5 types of the redevelopment themes to assist the regenerative design process organization. All these five types are problem-solving, culture inherited, educational promotion, economic development, and disaster prevention. Each theme will be divided into three phases of evaluation criterion, which assume the regenerative design condition to start to find out the situation between the territorial zoning and space function planning.

6.2.1 Analysis of Space Regenerative Evaluation Criteria of the School Building

Whether the new utilization of school space is constructed by the professional team, amateur or craftsman, each space component is rarely thought through to show the hierarchy of the space. The experience of user behavior in the territorial differentiation is losing the genius loci sometime in fortuitously. In other words, the prevailing character or atmosphere of the place on overall campus has lack of the linkage with the local society and the public. Thus, in Table 6-1, the study has given a score to each level of the space order and territorial zoning. The total score is one, but it uses the fraction to show the grade from the beginning of the level A = 1/1 by degree in the space order and so on. Equally, the public space = 1/1 which is meaning fully open to the public, the rest three zones are gradually decrement the score from functional service space = 1/2, limited service space = 1/3, and the personal space = 1/4. The analysis is telling that the smaller score, the more inconvenient to access the space. The reason is either the space is less important like a servant space or is designed intention to be inconvenient to approach.

Table 6-1 Specific level for the shared space

	Score	Territorial zoning			
		PLS=1/4	LSS=1/3	FSS=1/2	PBS=1/1
	A=1/1	1/4	1/3	1/2	1/1
	B=1/2	1/8	1/6	1/4	1/2
	C=1/3	1/12	1/9	1/6	1/3
	D=1/4	1/16	1/12	1/8	1/4
	E=1/5	1/20	1/15	1/10	1/5
Depth of the space order level	F=1/6	1/24	1/18	1/12	1/6
	G=1/7	1/27	1/21	1/14	1/7
	H=1/8	1/32	1/24	1/16	1/8
	I=1/9	1/36	1/27	1/18	1/9
	J=1/10	1/40	1/30	1/20	1/10
	K=1/11	1/44	1/33	1/22	1/11
	L=1/12	1/48	1/36	1/24	1/12
	M=1/13	1/52	1/39	1/26	1/13

The inconvenient meaning at this stage of describing the space is neither good nor bad; however, another finding from this table shows that the score of 1/12 has shown in all four territorial zoning which gives the research discussion about that the 1/12 is a separation point or level to adjust the space order when thinking the design, the space component in every territorial zoning. The score of 1/12 is showing that the space level before 1/12 is completely to free access without any restriction, not only the access is convenient but also the space order's level is liberally to design. To be mentioned, the score in the public space is going to discuss less than others due to the score has been singed as one for the total grading that is meaning the space is always open to the public without any space order. After the cross section analyze that the score of 1/24 is the next separation point to divide the property of the space order, which is access to more private, hidden or inconvenient space.

But the score in between 1/12 to 1/24 in functional service space, limited service space and personal space has major different of the space level in each zoning. According to the matrix analysis, the result shows all the level in between this two score is the space order to giving a diverse potential to design the hierarchy of space in different territory. Obviously, the personal service space has less grade to adjust the space, only 3 transit options to arrange the space component, from level C to level F. Likewise, the space between the score 1/12 to 1/24 in functional service space and limited service space has more transit options to utilize during a design process and thinking. Functional service space has 6 transit options to adjust from the level F to level L, limited service space has 4 transit options to use from level D to level H. Both territorial zones show the intermediate space has given the user to create more spatial experience possibility and various characteristic of the design component among these levels in a building. Also, the difference between these two service spaces is restricted by several aspects, such as the role of people, staff, a visitor, and an authorizer. The space function like the performance and its management, is another aspect that affects the decision to arrange the territory zoning.

Therefore, in Table 6-2, the analysis of the requirement of territorial differentiation related to the program development planning shows the prerequisite needs in 5 different types of programs function with 4 different territorial zonings during the regeneration process. Because the space regenerative mechanism of the school building is used or designed by people, in other words, this project's customer. This significant characteristic relates to the user perception that this research will also use one of the methods to analyze the target during the regenerative design process. To maintain "rapid iteration and satisfying change," MoSCoW is a convenient and fast way, especially when discussing with customers (customers usually want everything) to let customers distinguish what they "need" and what they "want. Thus, the table shows the result of every architecture program essentially required by the grading of must-have, should-have, could-have, and will not have in these five distinctive program plan classifications. However, this prerequisite calculation is often used to give the main user an idea by this MoSCoW method, one of the discussion or product evaluation methods in the user interface (UI) design field. The MoSCoW method prioritizes product backlog and gets the most valued functionality faster during a program or product communication.

Table 6-2 Prerequisite score of territorial differentiation relate to the program development planning

Classification		Territorial zoning			
		PLS ■	LSS ⊠	FSS ⊡	PBS •
Program plan of space function elaboration	Fusion activity	W=2	C=5	S=7	M=10
	Industry activity	C=5	S=7	M=10	W=2
	Exhibition activity	W=2	S=7	M=10	C=5
	Learning activity	S=7	M=10	C=5	W=2
	Diversity activity	W=2	S=7	M=10	C=5
*PLS=personal space, LSS=limited service space, FSS=functional service space, and PBS=public space **M=Must have / Essential needs, S=Should have / Important but not essential C=Could have / Nice to have, W=Will not have / Not necessarily needed now					

As the analysis result from Table 6-2, the result comes out the must have grade which is meaning the essential needs of the program plan's concept are fusion usage with public space, industry usage with functional service space, exhibition usage with functional service space too. The learning usage with limited service space and the last is the diversity usage with functional service space. Regarding to the classification can go forward to the next analysis phase that is to evaluate different regeneration design typology in this research study's hypotheses. However, under this prerequisite analysis result, it can be certainly sure that the must have group become the basic standard to evaluate any further program plan developing that is the must have standard will stay the first status without change. Also, if we are giving a score form 0-10 in this 4 level's rank, the total score 10 divided by 4 that comes out the number of 2.5, 5, 7.5, and 10 for each rank, but since the decimal point is too complicate to calculate it, all the decimal point will discard unconditionally. So, the score become must have =10, should have =7, could have = 5, and will not have = 2. Along the same lines, to evaluate the proposal of regeneration design typology from Table 7-3 to 7- 7 are having more detail discussion to describe each typology's content relate to the territory claim and program planning relationship. Thus, they are five typologies which are problem solving, culture inherited, educational promotion, economic development, and disaster prevention and the detail are the following.

Based on the analysis outcome in Table 6-2, the first typology of problem-solving in the evaluation score shown in Table 6-3 that comes out with the highest score of the criterion is 44 to use the functional service space with the highest score of 29 in the diversity usage function. The essential features of problem-solving can be too broad to express the requirement in any condition, but the most important target is solving the problem in the region. Therefore, all participants redesigning or reusing the school space should discuss a list of specific goals and objectives to deal with the problem. The strength of the diversity program is the

specific functional purpose of arranging the quality of the issue and using the opportunity of design creation to offer a suitable space in the overall built environment to the surroundings. From the opinion of hardware condition, space requires more intermediate space to support the diversity use purposes in different conditions.

The software condition has focused more on the performance arrangement such as establishing the activity, managing the event, and gathering the technical people and skill knowledge. This also addresses the result from Table 6-3 that the classifications of other program plan also have a similar score such as exhibition is 27, and both industry and learning are 24. In short, the problem-solving concept may require more multipurpose than a single purpose. The boundary between each territorial zoning should be thought through and related to the problem that must be solved. The idea of a problem-solving plan should also organize the problem from the community, the physical problem of the school building, and the tasks of the local government. Sometimes, the problem is hiding in the living environment if people are unable to talk or are afraid to say anything, So, this process is also a potential process to create social engagement between the public, users, and community. This is also the idea of the school's regenerative design process and its achievement in providing a platform to integrate into people's daily lives. To create a new place for people who are just moving to the community or are just visiting the school building for certain purposes, through this user behavior interaction and integration, people start to care about their living environment, the school space, and how do the school architecture can be presented in their neighborhood. There are many potential possibilities to think relate to the specific problem that can be solved directly or indirectly. But regenerative design process has given the chance to review the space of the school again.

Table 6-3 Score of regeneration design typology 1: Problem solving

Development concept of regeneration design standard	Typology 1: Problem Solving	Criterion	Territorial zoning				
			PLS	LSS	FSS	PBS	Total score
		Fusion	2	2	7	**10**	21
		Industry	5	7	**10**	2	24
		Exhibition	5	7	**10**	5	27
		Learning	2	**10**	7	5	24
		Diversity	7	5	**10**	7	29
		Total score	21	31	44	29	-
		Summary: 1st: FSS vs Diversity. 2nd: LSS vs Exhibition					
	*M=10, Must have / Essential needs, S=7, Should have / Important but not essential, C=5, Could have / Nice to have, W=2, Will not have / Not needed right now						

Table 6-4 shows the inherited culture has the highest territorial zoning score of 44, which is direct to public functional service space. The classification of the program planning is the learning usage function,

which has a score of 27. Culture has become a typical consideration in many aspects of the field, especially during the architectural regeneration theme, it is a critical opinion to think of what kind of thing or object can represent the word culture. Culture can refer to the cumulative knowledge, experience, religion, values, notion of times, spatial relations, roles, and possessions tangible and intangible acquired by a group of people through individual and group striving in generations. So, the culture inherited requires a sense of social engagement, which also shows the public space has the second highest score, and exhibition becomes the space function to demonstrate the form of the culture to present the built environment.

Table 6-4 Score of regeneration design typology 2: Culture inherited

Development concept of regeneration design standard	Typology 2: Culture Inherited	Criterion	Territorial zoning				
			PLS	LSS	FSS	PBS	Total score
		Fusion	2	2	7	**10**	21
		Industry	5	5	**10**	5	25
		Learning	5	7	**10**	5	27
		Exhibition	2	**10**	7	2	21
		Diversity	2	2	**10**	7	21
		Total score	16	26	44	29	-
		Summary: 1st: FSS vs Learning. 2nd: PBS vs Industry					
	*M=10, Must have / Essential needs, S=7, Should have / Important but not essential, C=5, Could have / Nice to have, W=2, Will not have / Not needed right now						

Typology 3 shows in table 6-5 is the educational promotion which is a common but impotent classification for a city to growth with a fundamental development program. However, the weakness of what it calls educational promotion may have a conflict relevant to the existing educational system. People always know that one is never too old to learn which is giving an opportunity to reuse the school as the essential meaning of school. In this typology, the score shows the territorial zoning is requiring the functional service space as usual and public space as the second choice to have the activity such as display the achievement of the educational learning from different various subjects. Also, the regeneration development program can also plan to have the project to cooperate with the existing school class in different level of school system. The regular school system not only can have a new fresh stimulation to the students but also the school can have the potential to create a link for the students to engaged to the reality industry. Moreover, this linkage can bring further connection to embrace variety of generation, theme, and communication. Therefore, educational promotion can also carry the advantage to revitalize the region through the placemaking process. In term of policy implication, the regenerated development concept is always relying on the economic expansion in any kind of city development. Usually, there is a contradiction among the economy benefit decision and other criterion.

Table 6-5 Score of regeneration design typology 3: Educational promotion

Development concept of regeneration design standard	Typology 3. Educational Promotion	Criterion	Territorial zoning				Total score
			PLS	LSS	FSS	PBS	
		Fusion	2	2	7	**10**	21
		Industry	2	7	**10**	5	24
		Learning	7	7	**10**	5	29
		Exhibition	5	**10**	5	7	27
		Diversity	5	2	**10**	7	24
		Total score	21	28	42	34	-
		Summary: 1st: FSS vs Learning. 2nd: PBS vs Exhibition					
	*M=10, Must have / Essential needs, S=7, Should have / Important but not essential, C=5, Could have / Nice to have, W=2, Will not have / Not needed right now						

In table 6-6 shows that the economic development become the regenerated development concept, the most essential needs of the program classification is the fusion utilization function, the score is 29 at the highest. Fusion means to eliminate the boundary between school site and the neighborhood. This demands an innovative marketing survey to understand which theme can produce the better economic profit to the place. Likewise, the highest score 44 shows in territorial zoning are functional service space. But the second territorial zoning to think of is the limited service space which is meaning to improve the economy enlargement, the program may need more professional or specific scheme to assist the economy growth. By extension, this development concept and its progress need to aware of the commercialization effect to the area.

Table 6-6 Score of regeneration design typology 4: Economic development

Development concept of regeneration design standard	Typology 4: Economic Development	Criterion	Territorial zoning				Total score
			PLS	LSS	FSS	PBS	
		Fusion	5	7	7	**10**	29
		Industry	2	7	**10**	5	24
		Learning	2	2	**10**	7	21
		Exhibition	2	**10**	7	2	21
		Diversity	5	7	**10**	5	27
		Total score	16	33	44	29	-
		Summary: 1st: FSS vs Fusion. 2nd: LSS vs Diversity					
	**M=10, Must have / Essential needs, S=7, Should have / Important but not essential, C=5, Could have / Nice to have, W=2, Will not have / Not needed right now						

Table 6-7 shows the typology 5 that is the concept of disaster prevention. The score comes with a very interesting result: functional service space versus the diversity program plan scores is the highest, showing 42 and 29. The overall grade of the disaster prevention also shows that limited service space with a fusion program plan idea is another theme to present the progress of the school's regenerated design concept. In this typology, the disaster category is hard to predict but what people can do is mitigate to reduce the consequences from the disaster. For instance, to use the school space as a storage to preserve the basic belongings or use the space as a shelter to provide a secure place for the emergency. Prevention is better than treatment, disaster mitigation is an issue to think of during the present time in this living environment. The school has many potential advantages such as the school space layout is usually in a module scale which is easy, simple, and fast to arrange the space layout. Also, the physical condition of the building already exists in the school building. Last, the structural safety factor's consideration was established while the school building was built; the safety factor has the fundamental standard to obey the architectural design regulation.

Table 6-7 Score of regeneration design typology 5: Disaster prevention

Development concept of regeneration design standard	Typology 5: Disaster Prevention	Criterion	Territorial zoning				
			PLS	LSS	FSS	PBS	Total score
		Fusion	5	7	5	**10**	27
		Industry	5	7	**10**	2	24
		Learning	2	7	**10**	5	24
		Exhibition	2	**10**	7	5	24
		Diversity	7	7	**10**	5	29
		Total score	21	38	42	27	-
		Summary: 1st: FSS vs Diversity. 2nd: LSS vs Fusion					
	*M=10, Must have / Essential needs, S=7, Should have / Important but not essential, C=5, Could have / Nice to have, W=2, Will not have / Not needed right now						

In short, to use this typology as the development concept of the regenerated design, we should consider the mitigation mission in advance and add the idea of the prevention function during the renovation of the school space. This typology is a debating decision about which disaster is not always happening in people's daily lives, but when the disaster is happening, it has many circumstances that the citizens cannot imagine and predict. Even in Taiwan, disasters such as a landslide caused by heavy rain, typhoons, or the water infrastructure facility system, it is hard to know the need for this emergency situation. Therefore, a school building usually has the function of becoming a refuge place after these disasters, but if the space layout of the school does not think about this idea before, the space of the school building can be hard to arrange if the redesign process doesn't consider this idea. The design strategy influences the space function

planning for designing a service function with a flexible space arrangement or needs to think more through each human basic needs in both physical and mental requirements. Thus, the school building in this situation is presented as a home meaning for the people, therefore, the base need of the inhabitant is essentially thinking of how the space can play a residential function for the citizens.

In Table 6-8, the assessment score can give a head of the suggestion for redesigning the school space, the criterion includes both territorial space and the concept of program planning. The highest score in the classification of territorial space is the functional service space of all 5 types of regeneration design development. This means that the space in the school should offer more public service zones for the user. Another assessment factor that should be considered is the appropriate concept of program planning in these 5 types of regeneration design development. As all findings of the criterion in the concept of program planning, the exhibition criterion has been shown up more than the others in the overall 5 types of regeneration design development theme.

Table 6-8 The assessment factor of the regeneration design development theme

Criterion		Typology of regeneration design development				
		Type 1 Problem Solving	Type 2 Culture Inherited	Type 3 Educational Promotion	Type 4 Economic Development	Type 5 Disaster Prevention
Territorial space	PLS	21	16	21	16	21
	LSS	31	26	28	33	38
	FSS	44	44	42	44	42
	PBS	29	29	34	29	27
Concept of Program planning	Fusion	21	21	21	29	27
	Industry	24	25	24	24	24
	Exhibition	27	27	29	21	24
	Learning	24	21	27	21	24
	Diversity	29	21	24	27	29
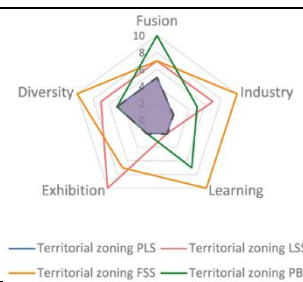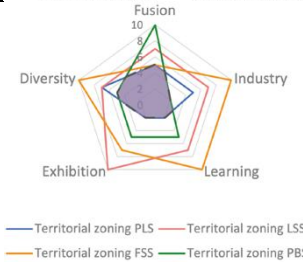
This result has led to the assumption that having an exhibition function can create a lot of advantages for the school's regenerative process development. But for each typology of the regeneration design development theme, the result as T1: problem-solving with diversity concept, T2: culture inherited with exhibition concept, T3: educational promotion with exhibition concept, T4: economic development with fusion concept, and T5: disaster prevention with diversity concept. These conclusions are the minimum prediction to each typology to suggest as the assessment factor while the users are trying to give the scheme to organize the idea of how to reuse the school space again, which is also a good advantage to the local community. The overall result can give an idea while a participant thinks about the territory zoning differentiation and the concept of the space functional activity. Therefore, different purposes of the regeneration design in a school building can show the school architecture's role in the community. The

overall result can give an idea while a participant thinks about the territory zoning differentiation and the concept of the space functional activity. Therefore, different purposes of the regeneration design in a school building can show the school architecture's role in the community. All five typologies can refer to the factor of territory zoning and space functional planning as two important criteria (Table 6-9).

As a comprehensive analysis result to discuss more detail of the regenerated development concept of each typology, this study process is combining the findings from Table 6-3 to 6-7, each individual typology has its own principle to assessment the priority while the participant is choosing the development goal and objectives, for instance, the best territorial zoning category is the yellow line represents the temporary free access and service which cover the most classification of the development program plan idea. Furthermore, the study is overlapping each territorial zoning result in each typology which is very interesting to find out the result of the minimum regeneration design criterion for each typology. All the results are illustrating as the purple color area which is shown in table 6-9.

Table 6-9 Comprehensive analysis of five typologies suggestion

	Typology	Illustration of the overlapping result	Suggestion of the minimum development plan function
Development concept of regeneration design standard	Typology 1 Problem Solving		From the findings, the purple area is showing the least require function of the building, the last three of functional classification are fusion, exhibition, industry. So, the space function can design toward to the diversity as second and the first is related to learning as the primary purposes.
	Typology 2 Culture Inherited		The minimum require function of the building can presented the order as fusion, diversity, and exhibition usage of the spatial function and form design. Both utilization purposes of industry and learning are two important statuses to create the architecture program.
	Typology 3 Educational Promotion		The minimum require function of the building can presented the order as fusion, diversity, and industry usage of the spatial function. Most important agenda to create the architecture programs are exhibition and learning usage in this typology.

204

Typology 4 Economic Development		The bottom require function of the building shows the order as learning, exhibition, and industry usage of the space function. The utilization of fusion and diversity function can create the best minimum performance of economic development typology.	
Typology 5 Disaster Prevention		The minimum requires function of the building in typology 5 shows more combination function of fusion, diversity, exhibition, and industry. The space function is more complex consideration to approach the disaster prevention.	

To take few cases in point to show the connection between the territory and program can rediscover the genius loci of the school space such as the public space and the functional service space. Since, to start with renovating the exterior space, landscape is one of an important design thinking by redesign the landscape element. First, the landscape elements are redesigned with different use functions, shapes, and variety of plants, so that these designs change the user's behavior experience and provide a nature environment to enjoy with the scenery between landscape and individuals. Secondly, since the boundary on the site is open and extend to connect the surrounding, the campus converts to a place with a friendly environment. Table 7-8 and table 5-9 are two assessment perspectives to give the suggestion for the future user that can provide some concepts either a single use purpose or multiple use purposes for a school building. even though in Table 6-2 has a prerequisite score of territorial differentiation relate to the program development can be as the basis reference to start the thinking of the regeneration design process, but to give a deeper thought of a specific theme of the regenerative design development which can consider the evaluation factor and analysis process from Table 6-8 and 6-9.

As an example, in the case of Pingtung AI Agri Hub and Taiping Exhibition Center in Taiwan, they cancel the barrier and design a symbolic artwork to represent the image of the new transformation. Conversely, in the Pingtung Education Innovation Unit, the land extends only a small part of the campus to connect to the community, the activity is more focused on the interior than the exterior. Even though the building is redesigned to function as an exterior pathway to connect to the community, the interaction benefit is still lower than the Pingtung AI Agri Hub and Taiping Exhibition Center. This appearance clearly shows in the Pingtung AI Agri Hub than the other cases in Pingtung Education Innovation Unit, Home for Care and Love (Kung Ma Ma: EXSIT FOR LOVE), and the long-term care center in Taiwan's field survey.

Finally, the landscape space has changed to a many diverse scales. Not only can the user manipulate the activity in variety of performance, but also the visual experience is more penetrating on the spatial sensation. However, since the redesign requirements in both cases are different, the green arrow shows that the visual experience is also different. As the results shows some schools that they only reused building on

campus, the space sensation reflects the vision is more about the architecture itself than the landscape. In the Pingtung AI Agri Hub and Taiping Exhibition Center, the redesign skill is focusing on open perception and widely view, the landscape space transformation has given the neighboring a fresh impression. Since the land transformed into different level of physical and mentally experiences for the user, the space has reestablished social connections among users, the neighborhood, and the land. Furthermore, the overall renovated facility presents a new image of the local region with a strong articulation to the neighborhood which is going to describe on the next section.

6.2.2 Regeneration Scheme of Design Thinking Criterion

At the beginning of the school regenerative design, this study discussed the space regenerative mechanism in section 6.2.1, including the space order score to determine the territorial differentiation related to the program development. Moreover, the analysis result can show another overall satisfaction with space perception and program planning. The analysis process is shown in Table 6-9. The cross-analysis results from Table 6-9 show that the inquiry criterion score for thinking the building function category, the priority develops a plan can be shown that the territorial zoning should have more functional services including the industry use and diversity utilization, the space property is having more various idea of the planning to the public.

Secondly, the limited service space can offer a territory property with temporary authority over the space usage. This means the user's behavior can be narrowed down to more personal caring of the program idea. Therefore, this section analyzes survey results with three objectives: Territory, Function, and Users' needs. Three objectives refer to the beginning idea of architectural placemaking in Design, performance, and goals. The abbreviation for easy to read in this research analysis shows the T as territory, F as function, and U as users' needs, which will be read in the following paragraph as well (Fig.7-2).
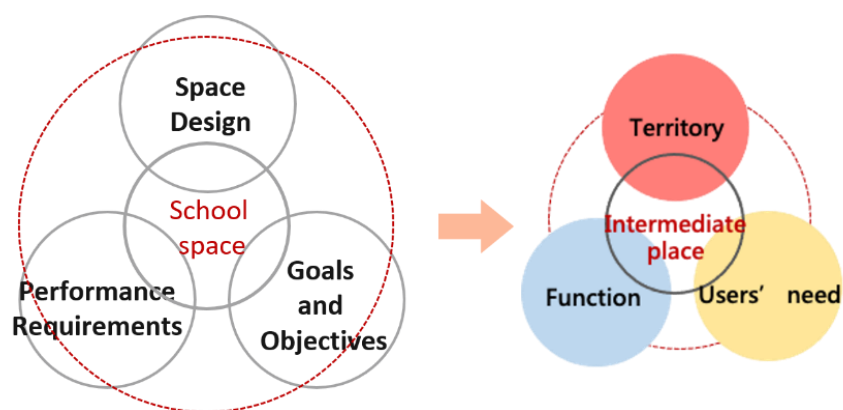
Figure 6-2 Three objective factors of the school regeneration design process

Currently, an architectural project's design process has several ways to be approached. Traditional architecture design can be too isolated during the design and client discussion. Placemaking can be one of the friendly design systems for a project in the relative community. Whether placemaking occurs in an interior space or outdoor public space, the essential design method is trying to create a relationship between

206

space and people. Placemaking is also an excellent strategy to educate the participators who haven't been trained in a professional field; the design process can be simple, practical, and direct into the design project; moreover, to enjoy the transformation process with each other. In other words, the social interaction with the placemaking progress can establish the connection between place and placemaker. Especially the social infrastructure such as a school building (Fig.6-3).
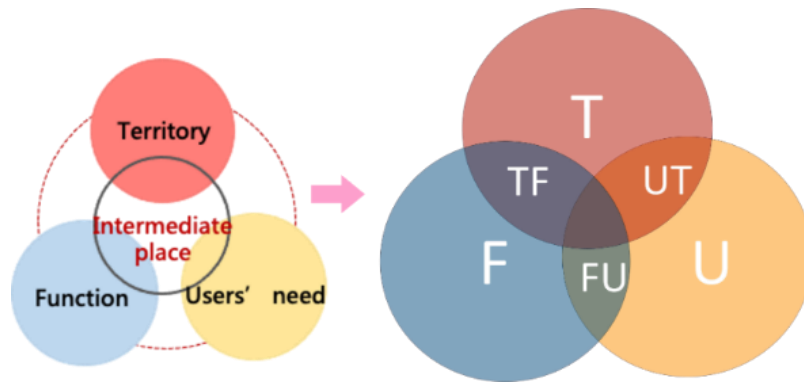
Figure 6-3 Scope of the regeneration process of TF, FN, and UT aspects

The idea of three objectives factors of the school regeneration design process is trying to improve the design thinking process to instruct the participant's mind and require about the space regeneration, it is an analysis process to find the relationship between TF, FN, and UT criteria which means this evaluation form concept is focusing on the white area of all TF, FN, and UT's result (Fig.6-4). Moreover, this concept of the school regenerative design evaluation form making is trying to give a suggestion while the participant is joining the school regenerative design project.
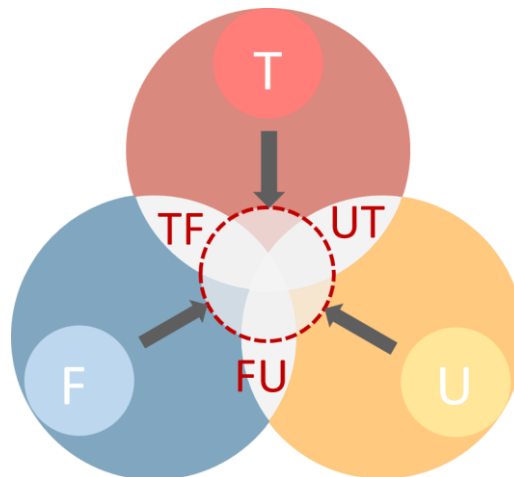
Figure 6-4 Concept of the school regenerative design evaluation target

Thus, in Table 6-10, the analysis continues the score results in contents from Table 7-9 and cross-section again to analyze the inquiry score of architectural programs related to the overall three architectural placemaking reviews of the redevelopment themes to assist the regenerative design process organization. The cross-section analysis survey result of the three objectives score relationship can be seen in Table 7-10: analysis result of territory zoning related to the space function, Table 7-11: analysis result of the space

function about users' needs, and Table 7-12: analysis result of users' needs regarding territory zoning. All scores are given by the concept of multiplication and using the MoSCoW method to provide each category score. The abbreviations for each analysis result table are TF score, FU Score, and UT score to present the meaning of territory, function, and users' need during the regenerative design process. Analysis result of all three objectives criterion categories: MoSCoW method of TF, FN, and UT scores. There are 4 different scores represent the meaning of must have equal to 10 score, should have equal to 7, nice to have equal to 5, and not need right now equal to 2.
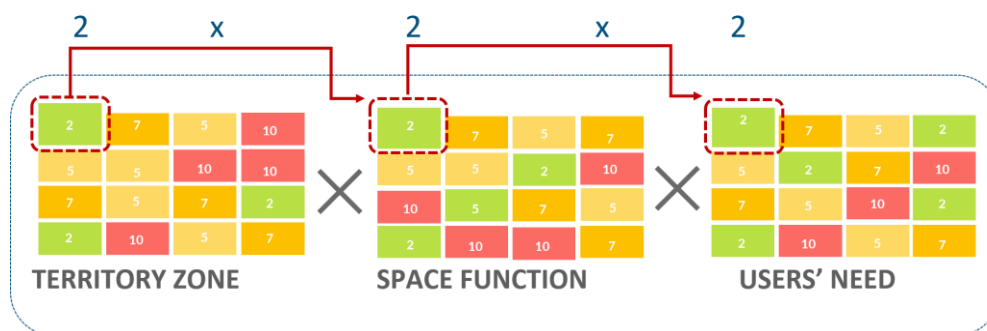
Figure 6-5 Explanation grading process of three emulation aspects.

Table 6-10, the grading of territory zoning with space function criterion's result shows that the essential needs criterion of territory zoning needs to be focused on the territory is designed as a functional service space property as the first and the limited service space as second space design consideration. Especially the space function has a clear function to reach.

Table 6-10 The inquiry score of the territory related to the space function (TF score)

Criterion F \ Criterion T		T: Territory zoning			
		T1: Personal space	T2: Limited service space	T3: Functional service space	T4: Public space
F=Space function	F1: Civic engagement function	2	2	2	10
	F2: Industrial cooperation function	5	7	10	2
	F3: Knowledge learning function	7	10	5	2
	F4: Diversity interaction function	2	7	10	5
	*M=10, Must have / Essential needs, S=7, Should have / Important but not essential, C=5, Could have / Nice to have, W=2, Will not have / Not needed right now				

The public space has the highest score relate to a space with operating a civic engagement function that is meaning when a territory zone is meant to be designed as a social interaction purpose. When the territory zone is designed as a personal space property, which is establishing a comfortable phenomenon of

the space to support a person both physical and mental needs at the time. In other words, the personal space is a space including the space characteristics of individual, private, and secure.

The score result in Table 6-11 shows the space function criteria of four various usages under different users' needs criterion advocate the priority to think of using the space again with an idea to cooperate with a local industry instead only using the space without any planning. Not only the space function has designed into a purpose but also the architecture program should think about the management strategy while reusing the school building in a region. Everyone's interaction is only the function to reuse the school, but the social benefit of the built environment and public's interests are an important concept to improve the value of the school building. Furthermore, to avoid the consequence of an abandoned school will influence the surrounding neighborhood such as the bad landscape phenomenon of the built environment and the lack of the connection between the school, community, and visitors. The existing school building represents a center spirit of the local community whether the city scale is big or small, the school is a memory place for the local residence, there are many stories can be discovered and transformed into a new place to continue the mission as a new role of school architecture in the local community.

Table 6-11 The inquiry score of the space function related to users' needs (FU score)

Criterion U \ Criterion F		F = Space function			
		F1: Civic engagement function	F2: Industrial cooperation function	F3: Knowledge learning function	F4: Diversity interaction function
U= Users' needs	U1: Style of the space	2	7	10	7
	U2: Theme of the school building	7	7	10	2
	U3: Potential of economic benefit	2	10	2	7
	U4: Co-creative service of the place	10	5	7	10
*M=10, Must have / Essential needs, S=7, Should have / Important but not essential, C=5, Could have / Nice to have, W=2, Will not have / Not needed right now					

The inquire score of users' needs shows in Table 6-12. Table 6-12 shows the thinking on users' needs with 4 different criterion's that can be affected by 4 different territorial zones. Users' needs are always an important principle when a building is been established. To seek for the user's best interest while designing a place, this is also one part of the placemaking idea. A place is always about the people with the built environment elements such as physical, cultural, social, economic, and environment context.

So, the closest and most basic influence impact is how the users think about the territorial zoning differentiation in a school building. During the placemaking process in a school regenerated design, users can be instructed to think of the inquire wish after the school is regenerated, a styling

design of the space, an overall major theme of the school building, the social infrastructure as a school can bring the potential in an economy way and having a co-creative service to service the neighborhood. Thus, the territory arrangement is focusing on more public property than personal property to achieve the different users' needs in each criterion. Aesthetic idea of the space becomes the attractive factor, especially the public territory. With a clear purpose of other three users need criterion, the territory will focus on the functional service and limited service space, which require more attention during the regeneration design process of a school building.

Table 6-12 The inquiry score of users' needs relating to territory zoning (UT score)

Criterion U / Criterion T		U= Users' needs			
		U1: Style of the space	U2: Theme of school building	U3: Potential of economic benefit	U4: Co-creative service of the place
T=Territorial zoning	T1: PLS	2	5	7	2
	T2: LSS	2	10	10	5
	T3: FSS	10	7	2	5
	T4: PBS	10	2	5	7
	*PLS=personal space, LSS=limited service space, FSS=functional service space, and PBS=public space **M=10, Must have / Essential needs, S=7, Should have / Important but not essential, C=5, Could have / Nice to have, W=2, Will not have / Not needed right now				

The total multiplication score of TF, FN, and UT objectives is shown in Figure 6-5; after the multiplication of TF, FN, and UT (TF x FU x UN), the color illustrates the score panel, the red panel is the meaning of the highest score which is 1000. Orange color is the second high score, which is 700. The third score is 490, the fourth is 350 with two numbers. The fifth score is 200 and the sixth score has three numbers of 140. The numbers of 70 and 20 have 4 and 2 for each number. Final score is 8 which is the only one in the overall. The total multiplication score of each objective is shown in Table6-13.

8	70	140	140
70	490	1000	20
140	700	20	70
200	70	350	350

Figure 6-6 The color panel of the total criterion category grading

According to the analysis result in Table 7-13, the number of scores has been classified to nine as the original color scale by each score. But, to give a straightforward arrangement of the score result, this step is deciding to narrow down to 5 groups of the score to make it more compact to understand the color scale. Thus, the arrangement number for each group. Group number 1 is1000, group number 2 is 700, group number 3 is 490 and 350, group number 4 is 200 and 140, group number 5 is 70,20, and 8. The analysis result shows that the multiplication score of TF, FN, and UT objectives that represent the territory, function, and users' needs can be classified into five different regenerative design options to review and think of the overall redesign achievement using the school building.

This finding refers to Figure 6-5 that after the multiplication by each criterion category property group, this category property can be seen in Table 6-10, Table 6-11, and Table 6-12. Based on the comparison between these three tables and the color panel of Figure 6-5, the corresponding table and each panel characteristics can be found and read to use during the regenerative design review and thinking.

Table 6-13 Total multiplication sore of TF, FN, and UT objectives

	Analysis results of the score				Number of scores	Group of score	New Group
	1000				1	1	
	700				2	2	1
	490				3		2
	350	350			4	3	3
	200				5		4
	140	140	140		6	4	5
	70	70	70	70	7		
	20	20			8	5	
	8				9		

Number of score classification

6.2.3 Progress Developing of Regenerative Design Assessment

Based on the analysis of survey results, the regenerative design process has been classified into five different property groups. The multiplication score has defined all groups. The score panel in each group is a reference to refer back to the three placemaking impacts, which are the overall regenerative design objectives. The detailed discussion is shown in the paragraphs below.

Group 1, the refer panel (Fig.6-6) in each TF, FU, and UT can be directed to Table 6-14. It shows the panel properties are indicating T3F2 (Functional service space with industry cooperation function), F3U2 (knowledge learning function with a theme of the school building), and U3T2 (Potential of economic benefit with limited service space). In summary of group 1, the territory zoning chooses the functional service space with knowledge learning function combined with notice the potential of economic benefit, which gives a program related to a knowledge training of the school building and also brings up the potential economic benefit of the school building space to meet the users' needs.

Score panel of Group 1			
8	70	140	140
70	490	1000	20
140	700	20	70
200	70	350	350

Figure 6-7 Color panel of Group 1

Moreover, Group 1 indicated that the regenerative design process has carefully considered territory zoning and space function. The users' needs may also be carried together simultaneously because the space function and the space design have been defined clearly to understand which school space is doing the assignment that has been thought through to ready to use every school space.

Table 6-14 Refer to panel characteristic of three placemaking impacts in Group 1

F \ T	T: Territory zone				U \ F	F: Space function				T \ U	U: Users' needs			
	T1	T2	T3	T4		F1	F2	F3	F4		U1	U2	U3	U4
F1	2	5	7	10	U1	2	7	10	7	T1	2	5	7	2
F2	5	7	10	2	U2	7	7	10	2	T2	2	10	10	5
F3	7	10	5	2	U3	2	10	2	7	T3	10	7	2	5
F4	2	7	10	5	U4	10	5	7	10	T4	10	2	5	7

Group 2, the refer panel (Fig.6-8) in each TF, FU, and UT can be directed to Table 6-15. It shows the panel properties are indicating T2F2 (LSS with Industry cooperation function), T3F1 (FSS with Civic engagement function), F2U3 (Industry cooperation function with a potential of economic benefit), T3F4 (FSS with Diversity interaction function), F2U2 (Industry cooperation function with a theme of the school building), F3U1 (Knowledge earning function with Style of the space), F3U4 (Knowledge earning function with Co-creative service of the place), U2T2 (Theme of the school building with limited service space), U3T1 (Potential of economic benefit with personal space), and U3T4 (Potential of economic benefit with public space). In summary of group 2, the territory zoning chooses the functional service space with a knowledge learning function, and it can slightly relate to the industrial cooperation function to have a theme of the school building and to bring up the potential economic benefit of the school building space.

Score panel of Group 2			
8	70	140	140
70	490	1000	20
140	700	20	70
200	70	350	350

Figure 6-8 Color panel of Group 2

Table 6-15 Refer to panel characteristics of three placemaking impacts in Group 2

F \ T	T: Territory zone				U \ F	F: Space function				T \ U	U: Users' needs			
	T1	T2	T3	T4		F1	F2	F3	F4		U1	U2	U3	U4
F1	2	5	7	10	U1	2	7	10	7	T1	2	5	7	2
F2	5	7	10	2	U2	7	7	10	2	T2	2	10	10	5
F3	7	10	5	2	U3	2	10	2	7	T3	10	7	2	5
F4	2	7	10	5	U4	10	5	7	10	T4	10	2	5	7

Group 3, the refer panel (Fig.6-9) in each TF, FU, and UT can be directed to Table 6-16. It shows the panel properties are indicating T2F2 (Limited service space with industrial cooperation function), T3F4 (Functional service space with diversity interaction function),T4F4 (Functional service space with diversity interaction function), F2U2 (Industrial cooperation function with a theme of the school building), F3U4 (Knowledge learning function with Co-creative service of the place), F4U4 (Diversity interaction function with Co-creative service of the place), U2T2 (Theme of the school building with functional service space), U3T4 (Potential of economic benefit with public space), and U4T4 (Co-creative service of the place with public space). In summary of group 3, the territory zoning chooses the functional service space with industrial cooperation to have a theme of the school building space is the major consideration in group 3. This is the prioritize options while starting the regenerative design process in group 3.

Score panel of Group 3			
8	70	140	140
70	490	1000	20
140	700	20	70
200	70	350	350

Figure 6-9 Color panel of Group 3

Table 6-16 Refer to panel characteristics of three placemaking impacts in Group 3

F \ T	T: Territory zone				U \ F	F: Space function				T \ U	U: Users' needs			
	T1	T2	T3	T4		F1	F2	F3	F4		U1	U2	U3	U4
F1	2	5	7	10	U1	2	7	10	7	T1	2	5	7	2
F2	5	7	10	2	U2	7	7	10	2	T2	2	10	10	5
F3	7	10	5	2	U3	2	10	2	7	T3	10	7	2	5
F4	2	7	10	5	U4	10	5	7	10	T4	10	2	5	7

Group 4, the refer panel (Fig.6-10) in each TF, FU, and UT can be directed to Table 6-17. It shows the panel properties are indicating T1F3 (Personal space with industrial cooperation function) and T1F4 (Personal space with diversity interaction function), T3F1(Functional service space with a civic engagement function), T4F1(Public space with civic engagement function). F1U3(Civic engagement function with a potential of economic benefit), F1U4 (Civic engagement function with co-creative service of the space's function), F3U1 (Knowledge learning function with a style of the space), F4U1 (Diversity interaction function with a style of the space). U1T3 (Style of the space with functional service space) and U1T4 (Style of the space with a public space), U3T1 (Potential of economic benefit with a limited service space), and U4T1(Co-creative service of the place with personal space).

Score panel of Group 4			
8	70	140	140
70	490	1000	20
140	700	20	70
200	70	350	350

Figure 6-10 Color panel of Group 4

Table 6-17 Refer to panel characteristics of three placemaking impacts in Group 4

F \ T	T: Territory zone				U \ F	F: Space function				T \ U	U: Users' needs			
	T1	T2	T3	T4		F1	F2	F3	F4		U1	U2	U3	U4
F1	2	5	7	10	U1	2	7	10	7	T1	2	5	7	2
F2	5	7	10	2	U2	7	7	10	2	T2	2	10	10	5
F3	7	10	5	2	U3	2	10	2	7	T3	10	7	2	5
F4	2	7	10	5	U4	10	5	7	10	T4	10	2	5	7

In summary of group 4, the territory zoning is focusing on personal space with a knowledge learning function and diversity interaction function, it can also have both public and functional service space to serve a civic engagement function of the school building. With knowledge learning and diversity interaction function can meet the users' needs in a style of school space. Users' needs in this group emphasizes on the style of the school space in both functional service space and public space, which is meaning that the open space to the public require more space design element to show the space characteristic. Potential of economic benefit and co-creative service needs require the personal space to have a better phenomenon of the space to offer a personal to focus on their needs which is meaning the personal space should also have a clear purpose or space function to use the school space. It will be very nice to have during the overall regenerative design process of the school building space

in the built environment, but in the group 4, almost every impact has been selected a little by the score. Thus, under this situation, the highest score of the panel still is the first choice and consideration to make the regeneration design planning. In this case, the score of 200 is the major panel to take the suggestion in each placemaking impact of territory zoning, space function, and users' needs.

Group 5, the refer panel (Fig.6-11) in each TF, FU, and UT can be directed to Table 7-18. It shows the panel properties are indicating to every sub criterion of TF, FU, and UT. In group 4, it also has the similar result situation of the grading. So, the decision option is focusing on the highest score panel that is renter to score of 70. In this case, the referral panels are indicating to T1F2 (Personal space with industrial cooperation function), T2F1 (Limited service space with civic engagement function), T2F4(Limited service space with diversity interaction function), T4F3 (Public space with knowledge learning function). F1U2 (Civic engagement function with a theme of the school building), F2U1 (Industrial cooperation function with a style of the school building), F2U4 (Industrial cooperation function with co-creative service needs), F4U3 (Diversity interaction function with a potential of economic benefit). U1T2 (Style of the space with limited service space), U2T1 (Theme of the school building with personal space), U2T3(Theme of the school building with functional service space), and U4T2 (Co-creative service needs of the place with limited service space).

Score panel of Group 5			
8	70	140	140
70	490	1000	20
140	700	20	70
200	70	350	350

Figure 6-11 Color panel of Group 5

Table 6-18 Refer to panel characteristics of three placemaking impacts in Group 5

F \ T	T: Territory zone				F \ U	F: Space function				U \ T	U: Users' needs			
	T1	T2	T3	T4		F1	F2	F3	F4		U1	U2	U3	U4
F1	2	5	7	10	U1	2	7	10	7	T1	2	5	7	2
F2	5	7	10	2	U2	7	7	10	2	T2	2	10	10	5
F3	7	10	5	2	U3	2	10	2	7	T3	10	7	2	5
F4	2	7	10	5	U4	10	5	7	10	T4	10	2	5	7

In summary of group 5, the territory zoning is choosing the shared space, both limited service space and public space with an industrial cooperation and diversity interaction function, to have a co-creative service with a theme of the school building. Moreover, in group 5, every criterion category of the three placemaking impacts shows they all have the color panel for each criterion category. These may not help to instruct while starting the regenerative design process of the school building space. Under this situation,

the criterion will suggest it is nice to have or at least need to have the shared space with civic engagement and diversity interaction activity to create a same subject.

6.3 The Influence Factor of Social Infrastructure as Constructed Environment

6.3.1 Scope of Regeneration Design Development

In previous section, the analysis of research result describes the regenerative design assessment developing progress is classify into five groups by using the MoSCoW method evaluation. According to the total multiplication score of all three placemaking impacts, the five groups can be divided depending on the total multiplication score. The group one is the score that match the 1000 score, which is presenting each placemaking impact is score 10 x 10 x 10 = 1000. Second group of the score is 500 < score <1000. Third group is 300 < score <500. Fourth group is 100 < score <300. Final, the group five is the score less than 100. Table 6-19 can see the classification of all five groups.

Table 6-19 Classification of five groups' score

Group no.	Score range	Score category	Number of score category
1	1000	1000	1
2	500 < score < 1000	700	1
3	300 < score < 500	490,350	3
4	100 < score < 300	200,140	4
5	Score < 100	70,20,8	7

In this analysis of survey results, to complete a satisfying school regeneration project as a social infrastructure in a neighborhood, the placemaking action is one of the actions can gather various backgrounds of people to do the placemaking action. The education training of placemaking thinking include several aspects such as physical, cultural, social. Economic, and environmental context, all aspects relate to bring the equity, safety health, economic vitality, environmental sustainability, and local resource reproduction to improve the community development value. On the other hand, the school regenerative project by using the educational concept of placemaking, which is to bring a place to life, especially the social infrastructure like the school architecture. Moreover, during the regeneration design process, the right culture and attitudes are essential design thinking to comprehensive a place revitalization in a community.

The scope of the overall five groups detail context can be described as the following paragraphs. To category all five groups, the decision making depends on the resource of the existing built environment around the school and the intervener of the school regeneration project. The physical condition of the school building will be investigated at the earliest stage before the school has decided to regenerate the space. Therefore, all five groups can be categorized into the description as below (Table 6-20). Each of group has its own characterizes which is giving the overall school regenerative design process to have an instruction to seek the best option for the school regeneration project.

Table 6-20 Characteristics of five types of groups

Group no.	Type of group	Characterizes of group
1 (1000)	Technical learning based	- Provide various technical knowledge study and training lesson. - Gather the professional educator to educate the participant. - Course training provides appropriate economic benefits and wealth.
2 (500 < score < 1000)	Industrial theme based	- Cooperate with the industrial company. - Expand opportunities for vendors to show the special of their industry. - Measure the existing market's value to implement the production and consumption.
3 (300 < score < 500)	Start-up creation based	- Scale up operations and social infrastructure resource connection. - Served a module on how to support local entrepreneurs and stakeholder. - Provide innovative tools, techniques, and alignment opportunities.
4 (100 < score < 300)	Civic engagement based	- Engage the local community and citizens. - Creating clusters of activities and events. - Present the sense of place and local style identification.
5 (Score < 100)	Regional reinvent based	- Discover the potential resources of the local built environment. - Support the emergency condition such as disaster prevention or mitigation. - Community service in a long-term management and programming.

In group number one: Technical learning based. This type has a clear subject to indicate the regenerative design is focusing on the educational developing in various files. All technical learning relating to a particular subject, art or craft or its techniques can be called as a technical learning. In this group, the provider or the resource can use the signific traditional custom to inherit the local culture or finding the inquire technical subject from the citizens. Thus, it is a double win situation that the regenerative process is not only provide the various technical knowledge study and training lesson for the users but also offer the chance for the professional educator to teach their professional educational knowledge to the public. All these technical training services can also respond the outcome of the economic benefits and wealth between the user and the skill knowledge. On the other hand, the educational profit reflects the social benefit income. In the spatial design aspect, the space needs to have a certain time schedule to use for the users, and the spatial authorize need to be cleared to establish the rule of the territory differentiation.

In group number two: Industrial theme based. This group is giving the private enterprises some chances to expand their own business into an area, which is to expand the opportunity or potential to express their own business advantage and enterprise's characteristic. A thematic phenomenon of the school building also emphasizes the industrial character and present to the public. It is expanding chances for other vendors

to cooperate with the industry enterprises to improve the business development. Also, the present market's trend can become one of the stimulating powers to assist the local community too, the measurement of the existing market's value to implement the production and consumption is another chance to improve the local living quality and working positions. Therefore, either the local industrial enterprises or outside enterprises can deliver a new phenomenon to the social infrastructure such as the school building in a neighborhood. The territorial differentiation in group two should thinking more about the amount of the space relate to the industrial theme development. The space should provide not only for the public but also the staff of the enterprises.

In group number three: Start-up creation based. This group is providing a place for those start-up group when they start to build their own interest in this combative society. Co-creation is a new trend to begin a business, an interdisciplinary network can be linked together and shared to each other for every start-up. The regenerative design process of the school building, it can scale up operations and social infrastructure resource connection through rearrange the regeneration architecture program and offer the appropriate spatial arrangement. Also, through the redesign of the space, the place can provide the fundamental innovative tools, equipment, techniques, and alignment opportunities, to share the common experience and knowledge is major mission to serve a module on how to support the start-up, entrepreneurs, and stakeholders together to develop an interdisciplinary network system. The school building can also become the hub to serve the network between market, cities, and enterprises. In the territorial differentiation, the space design should be more focused on designing the functional service space and limited service space. Thus, people can use this space to exchange while they need to communicate and have a diversity interaction.

In group number four: Civic engagement based. This group is closer to civic engagement to the local community and citizens. A style space require may become the basic design strategy to attract the local citizen to use the school space. The definition of a style can thinks of the direction of creating a sense of place and local lifestyle identification. The lifestyle can belong to the existing regional history or traditional culture and customs. These can be the phenomenon to reestablish in the school building, according to these resources to create clusters of activities and events. All these connection assist to shape inclusive spaces focusing on the community as an export within in the public realm. Therefore, people-centricity is the main thought during the regenerative design process in the school building. Also, place with purposes achieving social impact to the community and citizens can aligning a different vision to the overall built environment.

In group number five: Regional reinvent based. This group is a group that has a tiny score in each criterion of three placemaking impacts. In another way, the result shows the regenerative design direction is in a vague condition. The location of the school may have nonspecial resources or characteristics. Even more, there is no organization interested to invest the school with its surrounding. Because of the lack of resources or attractions in this school's location environment, the regenerative design process should try to discover the potential resources of the local built environment and create a program plan to inject the new

resources into the school's environment. Besides, this group can become a place to support the emergency condition such as disaster prevention or mitigation (Tsai, Lee, Tsai, & Li 4). But other than that, this group needs to consider at least the community service require and their needs to reinvent the school functional for the local neighborhood.

6.3.2 Guideline of Regenerative Design Evaluation

During the regenerative design process, this guideline assists the project's participants understand the purpose and requirements before starting the regenerative design construction. According to the American Institute of Architects (AIA), an architectural design project begins with schematic design, design development, construction documents, bidding, and construction administration. However, during the school regenerative design project, this research suggests a different insight when participating in a school regenerative design project. Add a pre-design phase before the schematic design phase also presents the idea of a placemaking strategy. Thus, this research finding gives a guideline to instruct the project's participants while they are involved in designing the school's regenerative space. This pre-design step in the architectural design phase is for problem-seeking. It asks all participants to inquire to gain an idea of their problems, wants, and needs. During this time, everyone participating in the process also determines the scope of the school's regenerative programming and objective to be designed. Also, the actual design is not yet designed in this phase. Citizens, private entrepreneurs, designers, and organizations interested in designing the school regeneration project should participate in the pre-design stage; regardless of whether there will be a programming consultant, all users must experience this design phase. Moreover, the most important in this pre-design phase is to ensure that the school's regenerative design meets everyone's needs and they also understand their living, environmental resource to preserve the value of the neighborhood. The regenerative design phase content can be seen in Figure 6-12.
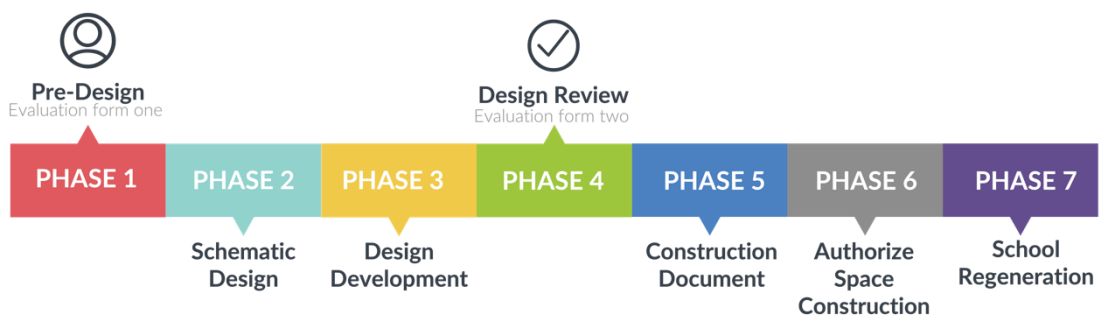
Figure 6-12 Regenerative design phase in placemaking strategy

Also, in this guideline, two evaluation forms must be filled during the regenerative design process in a pre-design stage before the schematic design. Another evaluation form is after the schematic design has been proposed, it is also a significant time to review the message between space design and users' expectation. The first evaluation form is discovering the priority category of school regeneration program

and objective through the criterion of territorial zoning, space function, and users' needs. On the other hand, the score of TF, FN, and UT objectives (Table 6-21), the complete evaluation form context is on the appendix 3. The second evaluation from is discovering the hierarchy of the space, which is focusing on a review of the new space design according to the first evaluation outcome (Table 7-22) and appendix 4. During the evaluation form two, it is a phase of reviewing the process from schematic design (phase 2) to design development (phase 3). This phase is on the process of number 4 in the overall regenerative design process.

Table 6-21 The evaluation form of TF, FN, and UT objectives (Evaluation One)

Criterion		Score of Territory, Function, and Users' needs			
1	**TERRITORIAL ZONING**	T1: Personal space	T2: Limited service space	T3: Functional service space	T4: Public space
F=Space function	F1: Civic engagement function				
	F2: Industrial cooperation function				
	F3: Knowledge learning function				
	F4: Diversity interaction function				
2	**SPACE FUNCTION**	F1: Civic engagement function	F2: Industrial cooperation function	F3: Knowledge learning function	F4: Diversity interaction function
U= Users' needs	U1: Style of the space				
	U2: Theme of the school building				
	U3: Potential of economic benefit				
	U4: Co-creative service of the place				
3	**USERS' NEEDS**	U1: Style of the space	U2: Theme of school building	U3: Potential of economic benefit	U4: Co-creative service of the place
T=Territorial zoning	T1: Personal Space				
	T2: Limited Service Space				
	T3: Functional Service Space				
	T4: Public Space				

In phase 4 of the school regenerative design process, Table 6-22 is an evaluation review of the design development's condition, according to phase one of the pre-design evaluation. During this phase, this evaluation form helps the project's participants to understand how the space is designed either by a professional designer or an expert with whole experience. According to this form, the process can provide not only the hierarchy of the space but also the brief quantitative requirements.

Table 6-22 The evaluation form of space relationship (Evaluation Two)

Y=Level	Depth of the space order level with score												
	A	B	C	D	E	F	G	H	I	J	K	L	M
	1	2	3	4	5	6	7	8	9	10	11	12	13
Score	1/1	1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13
	Please color the space below												
Color													
	Please count the spatial number from each level												
Number													
Space character description													
1. 2.													

6.3.3 Different Regenerated Management Schemes between Taiwan and Japan

The strength of architectural placemaking is creating a self-sustaining place; placemaking is an excellent strategy to start with the project, especially for people aiming to achieve a sustainable city in the future. Subsequently, when visited, these cases show that architectural placemaking has a solid attraction for people to utilize the space; the placemaking process can be flexible to use whatever resources they have on the site. Basically, the architectural façade remains the same as the original, besides maintaining the surface of the exterior. However, the interior plan layout will follow the new function to design the space. Additionally, all cases show one interesting strategy is using social media as a tool to share what's happening at the school can be one of the attraction factors to express the school again. Even after the regeneration, the cognitive emotion can be recall connecting the community and place; meantime, social media is also helping the business propaganda faster to grow without any doubt. Furthermore, the regenerated management system is another factor to influence a regenerated design project (Sánchez-Zamora, Gallardo-Cobos, & Ceña-Delgado, 2014). Public agency and private developer should be related more as closer as possible, public school as a public facility for the society, if there has a group of teams to keep in touch and track the situation about the school, it may also give the school an image that school can be a place for the public to communicate to the local government (Tang, Mason, & Wang, 2015). Creating a dialogue platform as an intermedium can also help the public to aware and understand about the role of

the new school facility can be represented it. Community organization is also giving a chance to join the progression of the social infrastructure transaction. To use the public facility more can also keep the architecture building a live and improve the living environment, especially to achieve a sustainable community for the society (Fig.6-13).
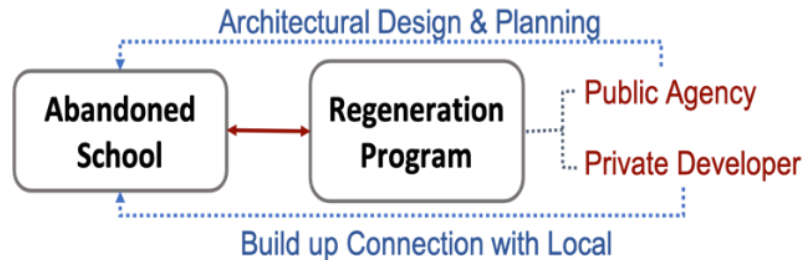
Figure 6-13 Participants of school building and program's connection

According to the figure 6-12, the regenerative design process can be seen to add extra two phases, one is during the space reconfiguration and the operation after the regeneration process. As the findings show in Table 6-23, the school regeneration case that has been support by the public agency such as getting the subsidy from the government are many, but the condition of the space can be remodel, which needs to see the subsidy from the government. This situation can affect the spatial renovation condition as well. However, the amateur and craftsman can also offer another space design characteristic with more practical way. On the other hand, the amateur and craftsman can also create a surprise space phenomenon to the complete school facility.

Table 6-23 Overall cases analysis of regenerative management scheme

School		Building regenerative management and operation condition						
		Name of school building	Spatial design team			Government involve	Private enterprise	Community organization
			P	A	C			
Taiwan	S1	Taiping Exhibition Center	√	x	x	√	√	√
	S2	Home for Care and Love (Kung Ma Ma: EXSIT FOR LOVE)	x	√	x	None	√	None
	S3	Pingtung AI Agri Hub	√	x	x	√	√	None
	S4	Pingtung Education Innovation Unit	√	x	x	√	√	None
	S5	Long-term Care Center	x	x	√	None	√	None
Japan	S6	Nordisk Village Campground & TAOFLAT KITCHEN	√	x	x	None	√	None
	S7	Kasamatsu	√	x	√	None	√	√

222

		P	A	C			
	Hirotomo Memorial Hall						
S8	Fukuoka Growth Next	√	x	x	√	√	√
S9	Iika Palette	x	√	x	None	√	None
S10	Kahoalpe Hotel (K-WALL center)	√	x	x	√	None	None
S11	Tokyo Toy Museum	√	x	x	None	√	√
S12	3331 Art Chiyoda	√	√	x	None	√	√
S13	Roadside Station Hota Elementary School	√	x	x	None	√	√
S14	Nanaura Clinic	√	x	x	None	√	None
S15	Gym and local event place	√	√	x	√	√	√
	*P=professional, A=amateur, C=craftsman						

6.4 Discussion and Summary

In recent discussion of abandoned school reutilize, a controversial aspect has been the architecture quality remind in a society environment. On the one hand, some argue that an empty space cause not only environmental pollution but also the social crime will happen. Neither of these arguments, however, considers the alternative view that school architecture is an architecture that include the fundamental function, the most substantial structure, and the most flexibility of space arrangement. In order to achieve the economic, recycle, sustainable architecture and society empathy, these findings have more important implication for the broader domain of architectural placemaking design in a regeneration process to an abandoned school architecture.

In summary of the placemaking impact while doing the school regeneration design project, the analysis of research result shows that the evaluation process of territory zoning, space function, and users' needs, all three criterions will help the participants during the process of design thinking, understand more about the relationship between the territorial differentiation, space function with its design program, and the users' needs. What is different than the traditional architectural design process is adding two extra phases during the school regenerative design process. Before the schematic design, the pre-design phase of regenerative design is for problem-seeking, which gathers all the relevant people to determine the scope of the school's regenerative project. People will use the evaluation form number one to establish the types of spaces, functions, and users' needs. Moreover, the goals and objectives in various of subject, for instance, the organizational goals, the function goals, the economic goals, the time goals, and the management goals. On the other hand, the form and image of the school architecture impact the users and surrounding environment can be represented in the school building. The main and side uses of the school building, which

223

will become the restrictions or improvement that will influence the school regenerative design process.

To gather relevant information, create a workshop or communication occasion to gain a clear understanding of each space in the school building and the users' want and needs. The more dialogue has been created, the more accurate the pre-design phase will be. In this period of the time, the dialogue or the discussion should be both quantitative and qualitative but leave the accurate qualitative number to the phase of the design development. Evaluation form number one is to nail down what the school 's regeneration will become in the future. In addition, to use the evaluation form number one to identify the space reused strategies. Continue to get the user's input to assist the schematic design and design development phase, space diagram and territorial zoning to show the those reused spaces match together or not, the most important is do the redesign layout meet the user's needs or like. On the phase 4, the design review is using the evaluation form two to review the determination of both quantitative and qualitative features. At this point of the design phase, there is another discussion impact that is the total cost of the regenerative design project, the design is based on the beginning of the phase one until now, the cost can be not just the construction, it is also including the design fees, contingency, furniture and equipment, investigation, and any other costs. Sometime, the cost will determine the design's strategy, especially to use the public school building. The last step is to summarize the overall result of both evaluation forms to provide for the construction document phase. The purpose of the pre-design process diagram can be seen in Figure 6-14.

Develop
Establish goals and objectives

Identify
Evaluate the territory, function, and users' needs

Summarize the outcome
Both evaluation form one and two

Analyze
Gather relevant information

Advertise
Determine the quantitative requirements
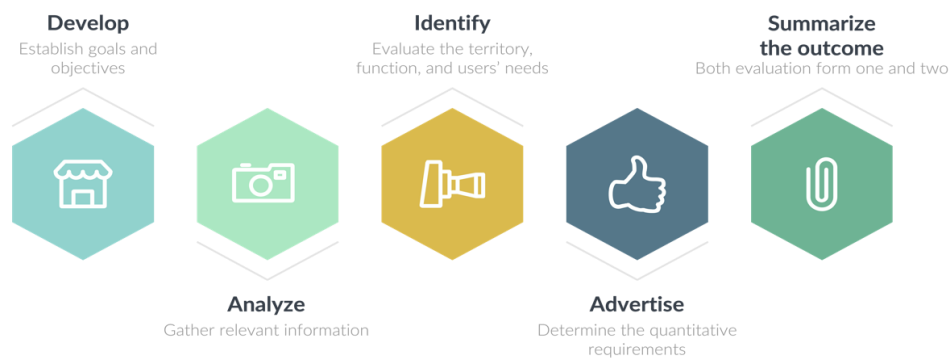
Figure 6-14 Purpose of the pre-design process

The five types of the regenerative design guideline can instruct the regenerative design project's participants to seek the prioritizing circumstance and requirement to find the outcome. But there are few things to consider while during the evaluation process of the regenerative design project. First, if some scenario has become a workaround situation during the evaluation process, the situation should have stop to think about what is the must have, it is the decision can be move to the option of should have or could have. Secondly, anything is less critical that need to insist in a must score, the must decision should try to switch to should have or could have. The evaluation score can be changed in different built environment situation and personal condition, so, the decision of evaluating each criterion should do as prioritizes quickly as possible. Evaluation process and the time should set a boundary like an hour to a couple of hours should be enough. There is no need to evaluate all criterion over a day or more. Thirdly, this evaluation

form is a guideline to assist the project's participants or future users to understand more about the regeneration of the school building around their daily life, especially the local community and the citizens. It is a design thinking process that the evaluation result can assist the next regenerative design phase, for example, the evaluation result can give the final designer team to have a clue and design direction to match the evaluation result according to the evaluator. Thus, prioritization is not the destination of the school regenerative design process, this can be always under review again and again to throughout the overall regenerative project of the school design. To ensure every time of the evaluation score is still valid and meet the regenerative design project. Regardless of everyone's prioritize, this is to communicate with targets and review is there any misunderstand or mistakes during the placemaking process of the school regenerative design project.

CHAPTER 7

Discussion of the Effects on Reusing School Building and the Regenerative Progression

7.1 Exploring the Influence on School Regeneration Development in A City

7.1.1 School Environmental District Affects by the Abandon School Circumstance

       Under the normal school district system, the central education regulations stipulate the division of school districts, so local governments are authorized to handle it on their own. However, in recent years, regardless of whether experimental schools, university district systems, schools with ample space, or gifted resource education enroll. Students have been involved in the issue of students choosing to study across school districts. Under the central education regulations, some popular star schools are crowding out due to an explosion of registrations, and some have ample space. But have more teaching staff than students, which affects the fairness of educational resource allocation and indirectly damages the rights and interests of teachers and students. This research findings give a hypothesis to explore the economic, cultural, and social exchanges between regions affected by the changes brought about by the abolition of schools that affect cross-school attendance programs or the current situation of spatial regeneration (Fig.7-1).
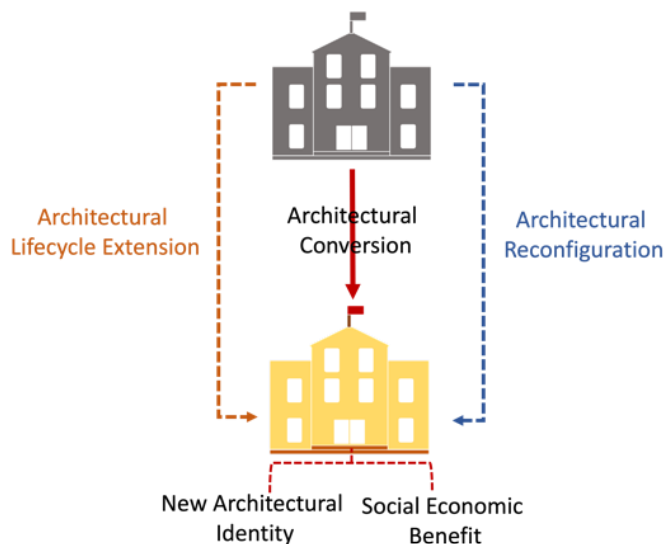
Figure 7-1 Conversion benefit of school architectural in a region

       The district system originated from the state constitution passed by Massachusetts in 1789, which stipulated that the residents of the school district should set up "school committees", this school committees are independent of the local government, responsible for educational affairs, and they have the right to give authority to the middle school in the school district. Also, school committees have various decision making such as primary education administrative power, levying education tax, deciding budget, reviewing school retention, curriculum content, educational personnel and administrative supervision are the organizational prototypes of American educational administration. School districts usually contain several primary, junior high and high schools. Students can choose a school in the school district to study, which is the concept of a university district. At the time of 1990 period in the United States of America, President Bill Clinton advocated "school choice" for parents, which made cross-district schooling common, forming a

phenomenon in local school districts and large school districts (Chen Baoyu, 2003; Mendez & Knoff, 2003). The university district system was finally closed due to the bureaucratization of academic institutions, the efficiency was not as good as expected, and there was a phenomenon of "emphasizing universities and neglecting primary, junior high, and high schools". Therefore, the university district is under the Ministry of Education, a unit that takes the university as the educational administrative agency and is parallel to the provincial education department. It is an educational administrative system that integrates academics and administration, the university president is the highest education administrator of the school district in this system.

In recent years, in response to the problems of declining numbers of children, school financial difficulties, or insufficient student resources, the school committee is taking care into account the rights and interests of stakeholders such as supervisory units and schools, teachers, and students. They have launched cross-school schooling programs with the concept of university districts. Many counties and cities in Taiwan, they apply for exempted household registration to attend a school that is not in the school district to the residence. However, the university district system has not been formally incorporated into the central regulations, nor is it the official school administration of Taiwan's educational institutions. After the adoption of the three experimental methods, factors such as promoting the educational experimental plan and making full use of educational resources should be considered.

Every county and city adopt the registration method to announce the study across districts system, it should calculate the standard total number of students in each school based on the existing area of each school, in order to different purposes of making full use of educational resources, the joint experimental education school, and the school with the same attributes combined with the proximity of the school models, the system will not be restricted by the original designated school district, all education programs such as exempting household registration from moving are collectively referred to as university districts. Some cases such as school in Checheng township, Pingtung County, Taiwan. The Checheng township comprises 11 villages, is located on the Hengchun Peninsula, dominated by low hilly terrain, with four streams and Baoli streams flowing through the countryside which makes this place become a popular hot spring spot (Fig.7-2).

The location of the school is in the southern part of Taiwan with 49.85 squares kilometers. The climate is tropical monsoon, with strong falling winds blowing from October to February of the following year due to the influence of the terrain. The industrial structure of is dominated by primary industries such as agriculture and fisheries, of which the agricultural population accounts for 31% of the total population of the township, another popular local culture will be the Tudugong temple custom. As for industry and commerce, development is extremely difficult due to its remote location and lack of resources. The overall population is 8181 people based on the date in 2021. The local industry is focusing on the fishery and agriculture. Lately, the tourist attraction is getting more popular because the sichongxi hot spring. The

region has the hot spring is located at the Sichongxi riverbank, the architecture style was designed with Japanese architecture, the hot spring is alkaline type and rich in sodium carbonate. Also, the architecture style was built with Northern China Royal temple style. It is the largest Tudigong temple at southern part of Taiwan that is delicated to the god of Tudigong. Moreover, the overall environment scenert of wen cyuan community is fully of nature and traditional cultural story that create the region becomes unique too.

Figure 7-2 Sichongxi hot spring park., checcheng fuan temple.and the environment scenery of wen cyuan community

Another school case to discuss is the Funamawari elementary school in Narushima, Goto Island. Narushima is part of Goto islands, it's located above the Fukue main island (Fig.7-3). The transportation will be taken the ferry to connect to the Fukuoka terminal and Nagasaki port. The overall environment is well known by the sanctuary for the Hidden Christians fleeing Tokugawa persecution. Also, this island is homegrown to Egami Church and its surroundings such as the Shirotake Observatory and several churches. The history of Naru Island can be traced back to 15th century in Ming dynasty, China. Naru Island was a port of call Japanese vessels on missions between China and Japan at the time. Till 1566, Christianity was introduced to the Goto Islands and started the lifestyle.
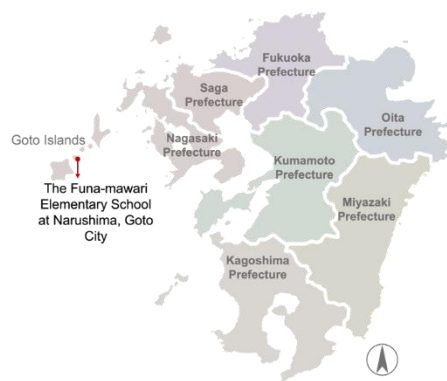
Figure 7-3 Map of the Funa-mawari Elementary School, Narushima, Goto City, Nagasaki Prefecture, Japan.

In 1612, the Japanese government announced to prohibition the Catholics religious for the entire society, many worship and events were arranged secretly until early 17th century, the Japanese Catholics are preserved and suggested the religious mission extended from Nagasaki to Fukue Island, Naru and

Hisaka. The Naru Island's environment resource is defined by its fishery, tourist and geographical of Naru Island (Fig.7-4). Also, the history of the Christianity churches resources. First, the church was first constructed in 1918 after the ban on Christianity was lifted. It's a wooden with roman catholic architecture style. Second, the Church was built in 1926, but through the time, it was damaged by the typhoon and rebuilt in 1961. The church stands out from one of the hills from the downtown main street. Moreover, the island is the back is called KOJIMA, and it is made of hard rock with solidified magma. Natural movement cause the geographic rock becomes an incredible terrace view.

Figure 7-4 Egami church, naru church, and shutogashmi wave-cut platform

In this research, the findings of field surveys showing the CheCheng Elementary School WenCyuan Branch, Taiwan and the Funa-mawari Elementary School, Narushima, Japan have led the architecture design to propose a new utilize of the abounded school building. Although most redesign projects attribute design reconfiguration to a professional design team, the finding's result of the Funa-mawari Elementary School leads to the possibility that reconfigure the architectural space can be also designed by a group of amateurs. As long as the regeneration design process has been well communicated and discussed through the entire project, design experts and amateurs work together before the construction stage on site. Thus, the investigation of results is also rediscovering the scope for design process which shows the concept from inspiration, ideation, implementation, and revitalization (Fig.7-5). In order to operate the architectural placemaking by both professional designer and amateurs together, previous design detail and strategy should be more careful and discussion often
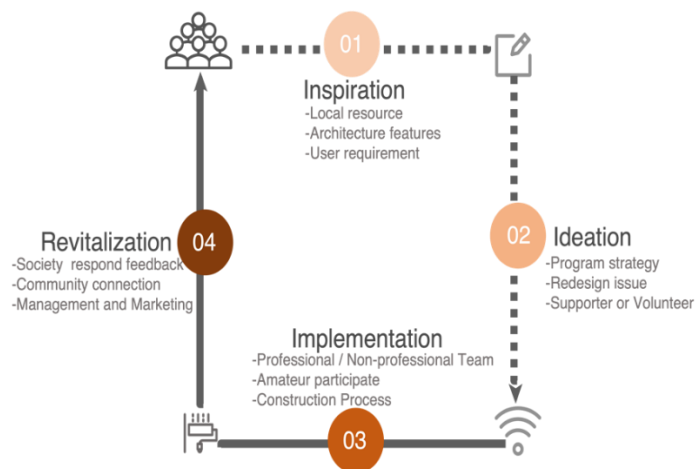
Figure 7-5 Resources discover and collection to use in a school regeneration process

7.1.2 School Regeneration Affects the Local Citizen and Built Environment

The discussion of the school regeneration in both cases shows that the school regeneration can affect the local environment. The CheCheng Elementary School WenCyuan Branch in Pingtung Prefecture has been purposed to a new regeneration project by the City Government of Pingtung. The government's consideration of this project is trying to improve the quality of rural education and the local industrial business in CheCheng township. Due to the decrease of student enrollment, one of the school buildings will convert to the new program, and another school building will continue the original function as a school to maintain the elementary education system for the WenCyuan community. The new architecture program has been proposed as a youth educational creativity base to educate, train, and connect to the surrounding neighborhood (Fig.). The reconstruction building is located on the east side of the campus, the redesign task also has completed by a local architecture company, SanPen Architecture Company from Pingtung city.

Figure 7-6 Aerial view of campus environment. Yellow area is the reconfigure building and school building before construction.

The Funa-mawari Elementary School is about 20 minutes driving from Naru Port Terminal. This school started in 1875 to 2007. Over 132 years of history, the school was also the place for the Naru citizens to host the event, a center gathering and life sharing facility. After the school closed, the Nagasaki government noticed a precious artist, Kasamatsu Hirotomo from Narushima, he presented many serious of panting which was influenced and inspired from his lovely home island. In order to collect all his artwork, a NPO organization proposed the plan to the city, they suggested the school converted into a memorial hall to preserve the artist work. Not only promo the local culture art resource but also restart the school itself. In Fig 7-7, the Entry still remained the original from the past and the trees are welling organized and treat nicely. And The school is surrounding by the forest and small villages which is close to a port that has a pathway for the tourist. Also, the Entry still remained the original from the past and the trees are welling organized and treat nicely. However, the gym is one of the school buildings that is closed without any utilize. And the façade showed the buildings went through the time from its glory. Back side of the Funa-mawari Elementarty School. The school contains a big grass field ground which is also the place to host the community event and school

activities in the past time. The interior of the school preserves 82 large-scale artwork and various small paintings which was donated by Mr. Kasamatsu Hirotomo's daughter. The memorial hallway now is organiz and managed by NPO DONDON, a group of people is also from the local area (Fig.7-8).

Figure 7-7 Aerial view of campus environment and the Funa-mawari Elementarty School.
Narushima, Goto City, Nagasaki Prefecture, Japan.

Figure 7-8 The original building and the view from the backside of the school building

In addressing the quality of the reconfigure design process from the field survey, this research uses the Fitch's "determining the gradient of intervention according to the degree of damage to the building" as a reference to measure the building reconfiguration design process. The discussion is to think how the reconfigure of architecture features can affect the local and built environment during the school regeneration design process. Transformation of architecture space in both cases are found several similarities. Classrooms are combined to several use with few light structures will change. Because both schools exist for a long time, the mechanical system is the main issue while redesign the function, school furniture are often reserve to reuse again. Architecture façade and landscape can be modified depend on the budgets and construction time before the management begins. The architecture façade is renovated. The second floor's fence changed from concert to steel material. All exterior windows and frame are changed too. The roof and specific features are painted during the school regeneration process. In the original classroom, the teaching and learning room is combined a staff room and storage space. In this space, the floor is adding extra interior level that is increasing the hierarchy of the space. The space design change to meet the inquire of the space function to separate the amin space and entry. Moreover, the detail of the space characteristic is also showing to renovate the ceiling and lighting equipment during the regeneration

process. It is often to see in the communication and information room doing the space design characteristic to express a new sense of the school place. For instance, the open ceiling and wooden craft furniture that is not as same as before (Fig.7-9).

Figure 7-9 Overall space reconfiguration in checcheng elementary school, Pintung, Taiwan

On the other hand, the school regeneration case in Narushima, the new architecture program is to use as a memory hall from a local artist. In order to express the art work and relevant painting practice, the space reconfiguration is showing to use as a painting recover work space and use original school's cabinet to store the tools and lighting system. Also, the classroom in one of the school layouts is changed to preserve all painting from this artist. The room is adding air condition to control the temperature at the preservation room and divide the space into different scale of racks to classify the paintings. The biggest space reconfiguration in the school building is the art gallery. Art gallery is using the all-left side spaces on the second floor of the school plan. The renovation of the space has changed into different characteristic that is hard to see form the outside of the school. Therefore, people need to visit the school then realize the school is no longer a school anymore, it is a memory hall to celebrate the local artist (Fig.7-10).
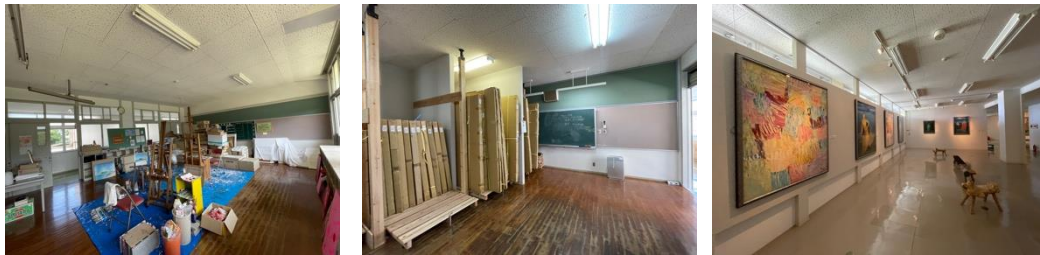
Figure 7-10 Overall space reconfiguration in funamawari elementary school, Narushima, Goto city

Even though the aesthetic may as be nice as the professional team and construction, the gathering action to do one same thing with a group of people who are enjoy making a change to the school space is also represent another meaningful gold to the local community. Also, after the school has been renovated the space, the physical condition has been improving but also the software condition need to continue to maintain the school space. As the study find out that the management and operation phase, the government usually will not involve too much that the government will require a private developer to run the school. Undeniably, the budget shows the influence of regenerate limitation, volunteers or handyman represent the resource to maintain the operation of the school building. Nevertheless, to maintain the business develop in appropriate condition, ideal of education, profit of economy, and sustainable ecology system should be

the three principles to be followed during the phase of the rebirth of school architecture.

In summary, a complete regenerate program relate to the city future's masterplan is also an important vision when a developer is writing a proposal to reuse the abandoned school architecture. Likewise, this research study shows during the preservation and conversation phase, architecture characteristic can be less important than before to become the priority consideration element, but it still reminds to be one of the evaluation subject to think of for the overall project to a city development. When a building reminds to being abandoned at a surrounding, as its condition to be preserved or demolished, the decision will depend on this building's architectural characteristic. Either the building designs in a specific architectural style or an important person. In other words, abandoned school's regeneration not only can rediscover the identity of architectural characteristic itself through the existing time but also it might be creating the advantage of the economic value for the present time (Fig.7-11).
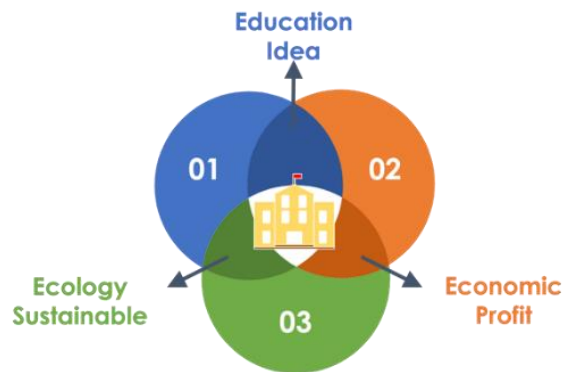
Figure 7-11 Three Principles of reusing the school architecture.

7.1.3 Influence of School Regeneration Expansion on City Development

The situation of abolishing and merging schools due to the declining birth rate has broken the school district system established by the original administrative district. For this reason, exchanges between local areas and neighbors in many counties and cities have occurred. Gradually, due to the opportunities after the rebirth of the abandoned school, resource exchange and mass interaction between regions have been obtained. Therefore, in the face of the consequences and social impacts brought about by the regeneration of existing abandoned schools, the implementation of either the original school district system or the university district system can be regarded as a solution for local governments to face the abolition of schools. A way to confront socio-economic problems and solutions for the regeneration of environmental spaces, especially abandoned school regeneration (Liu Y. , 2022). At the same time, it is given the public opinion and problems facing the society, not only the pressure to solve these problems but also the balance between the rectification of the educational space and social and policy issues. Not only it gives parents the right to freely choose schools for their children, but it also improves the issue of unused space caused by the abolition of schools.

Meanwhile, school before is more independent in one of the administration regions (Fig.7-12). Due to the social structure has been changed rapidly by many different influences and school architecture becomes one of the problems in the area if the school is facing the abandoned or consolidation situation. As the last few paragraphs is describing that the transformation process of the school and its space been redesign and used again (Fig.7-13). The boundary relate to each region can be broken the administrative line and assisted to develop the local region. It is also a hypothesis method in this study which is purpose this method can be improved the local economy and combine local resources together to reuse the abandoned school. Moreover, the regeneration of the school can assist the local place to represent the genius loci as well. This is an innovative idea in this research to rethink the school architecture position. (Fig.7-14). The overall city development by thinking regenerated the school building as one of the planning developments is a sustainable strategy to improve a local environmental phenomenon.
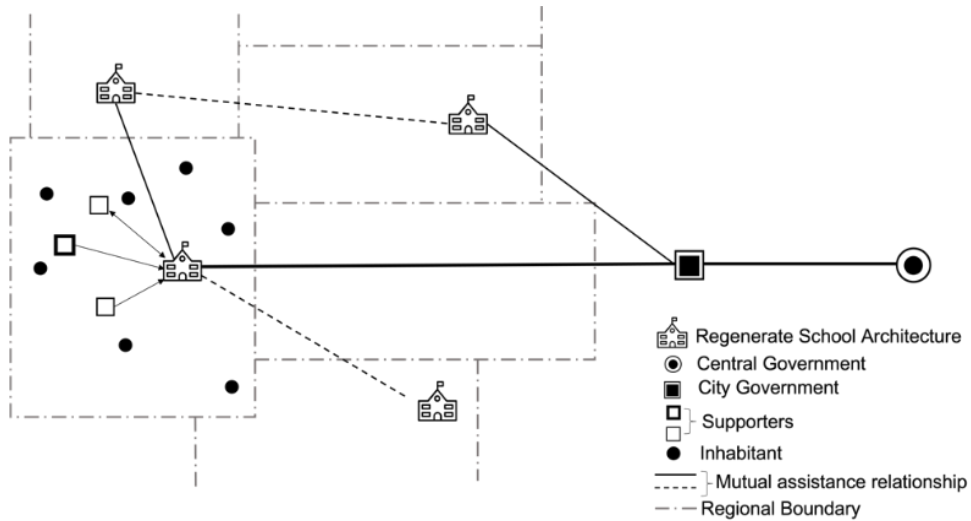
Figure 7-12 Abandoned or consolidation school architecture with closed administrative areas
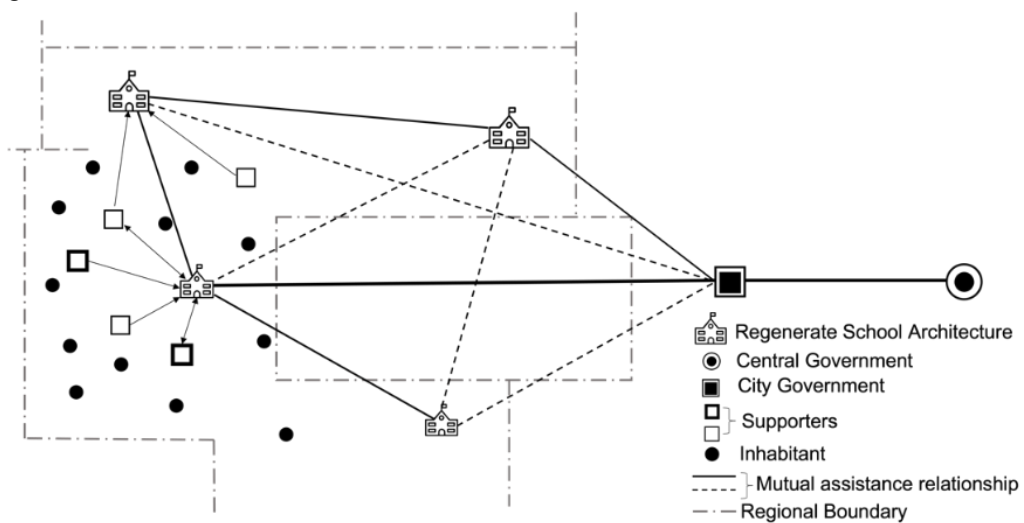
Figure 7-13 Expand on mutual assistance and cooperation relationship of schools
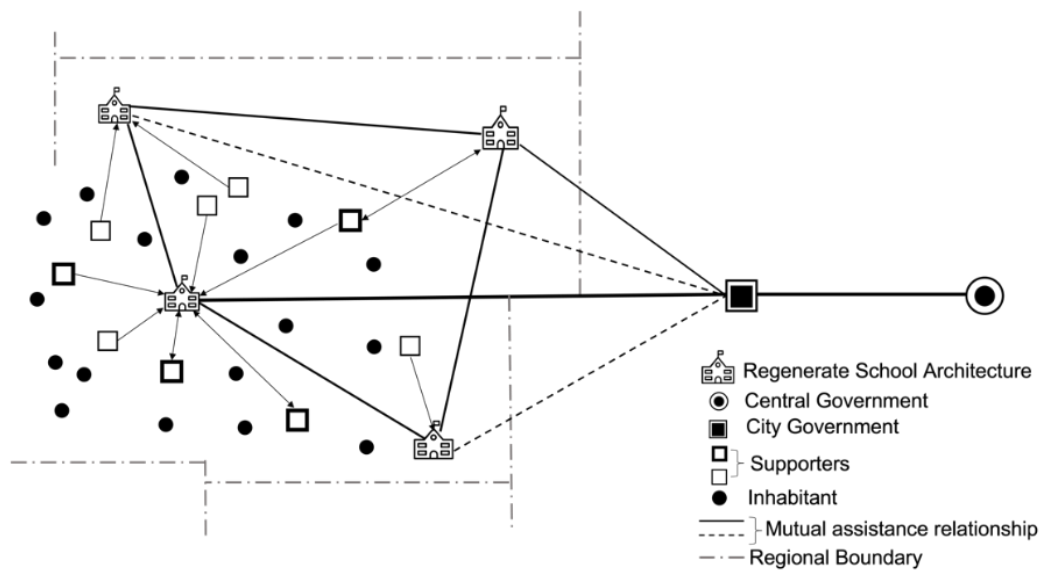
Figure 7-14 School regeneration and regional connection shared system

Studying across school districts is the freedom of parents' educational choice, and the university district system is a feasible model that breaks through the restrictions imposed by regulations on school districts. However, the definition and implementation of university district policies in various local governments are different. Some are stipulated by local self-government laws, while others are stipulated by administrative orders. The name and content are also flexible and more than standardized, but they may form a multi-horse cart. Nearly half of the various forms of university district enrollment are not restricted by existing school district enrollment, that is, the demand for university districts is gradually greater than supply. Therefore, data collections have found that it believes that since the university district has been officially entered into the law, it shows its importance at the present time. Based on the increasing demand for the better educational district in many counties and cities year by year in Taiwan's education environment. An example from Kaohsiung City Government, the Kaohsiung City Government formulated the "Implementation Points for the Principles of Kaohsiung Primary, Junior High, and High School District Division", it classified the school districts into three categories: "basic school districts", "free school districts" and "university districts". Among them, the university area refers to the school district where the total number of students in the general class is less than 80 (excluding branch schools and classes) approved by the Kaohsiung City Education Bureau. Students studying in this kind of school in the university area are not restricted by the original school district. According to the statistics of the Education Bureau of Kaohsiung City Government on June 24, 2020, there are 32 schools in the university area in the 2019 academic year, which there are 26 schools in the former Kaohsiung County, accounting for 81%. Schools with fewer than 100 students are 23 schools that is accounting for 72%. All of them are located in the former Kaohsiung County. It can be seen that the schools in the university district are characterized by a small number of students and sufficient spare space and are mainly distributed in the suburbs or old residential areas after urban renewal (K.C.G, 2022). According to the data collection, there

are five factors for parents to consider the crossing school district option:

1. To satisfy the personal requirement for the children.
2. Expectation of better professional education quality.
3. An embrace, friendly, and sustainable school environment.
4. Open communication and discussion with the school committee and resources.
5. Shared decision making.

However, it can be seen that the University District provides the opportunity for parents to exercise their right to choose education. Among many schools in the University District, the school can meet the learning needs of students (including teachers, resources, environment, and school brand recognition, etc.) is the main concern for all parents. Others consideration such as the transportation, school size, learning adaptation, school manpower and management system are less important to be considered by all parents. Although each school has developed its own community attributes such as its own characteristics and urban-rural differences. However, most parents who choose to let their children participate in the university district are satisfied with the planning of the university district system and the learning performance of the students, but most parents think that the number of schools to choose from in the university district is still insufficient.

7.2 Analysis of Overall School Building Regeneration Process

7.2.1 Impact of School Building Renovation Application Process

In order to realize the target of school building regeneration to meet the new social environment, it is necessary to reconsider the value of the school building and overcome the problems between the needs and space design. Rethink the role of school facilities in the post-corona time, as people experience the spread of the new coronavirus infection, schools once again play a role in guaranteeing learning opportunities and academic ability, but also provide a safe and secure place for students to belong. The public reaffirmed the role and way of being in schools, which has existed as a matter of course, such as the welfare function and social function of nurturing the sociality and humanity of students. In addition, while recognizing the effectiveness of remote and online education, experiments, and practical training. Everyone recognized the importance of face-to-face instruction in situations where people learn from each other, and when co-creation is necessary to create solutions and new ideas while cooperating as a team to solve unknown problems. From this perspective, after the pandemic, it is necessary to reconsider the value of school spaces such as the public-school facilities where everyone can gather, learn, play, and live together. Thus, before the school is closing, the school committee should report the school condition to the local government before the school is officially announced the abandoned decision.

There are five steps to follow during the overall renovation process of school building (Fig. 7-15). All applicants can give the proposal between step 2 and step 3 to gather all the school information, local

resources, and business operation proposal to the authority groups to review both disadvantages and advantages of overall school regeneration progression. The most important thing is don't leave the unused school building behind too long, the school revitalization time point should start at the same time as the school was closed in order to continue the school architecture's physical condition and maintain the building lifecycle as well.
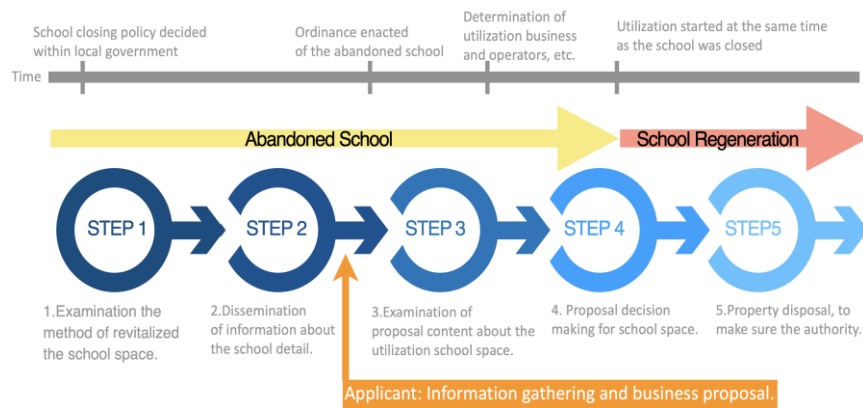
Figure 7-15 Process of the abandoned school transformation requirement

Regarding the topic of unused space on campus, Governments in Taiwan have consulted professional teams, experts, and scholars to arrange a working group to formulate the complete direction and strategic content (Fig.7-16). The overall tasks are related to operation planning, assist in reviewing, supervising, and promoting related work with organizes the unused space on each campus.
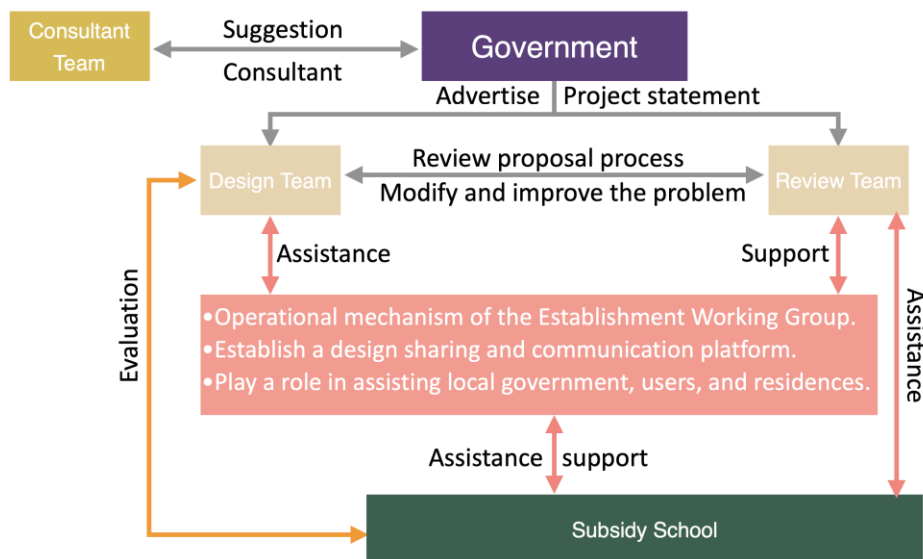
Figure 7-16 Preparation team and working progress

During the implementation of the plan, in addition to providing various guidance, support and necessary assistance to local government education bureaus (departments) and schools. It also facilitates the plan through regular work meetings, briefing sessions, results announcements, and on-site visits. The organization and operation of the working group is shown in Figure 7-6 below shows, to promote and

achieve the predetermined goals as scheduled. In revitalization, utilization and management of unused space in abandoned schools, during the process there are special regulation needs to understand and obey to complete the redesign project in every county and city. In order to fully revitalize and utilize the land and buildings left unused due to abandoned or merged schools.

7.2.2 School Revitalization and Counseling Operation Suggestion Process

In response to the trend of declining birthrates and changes in urban and rural population structures, counties and cities have implemented measures such as consolidation of schools, campuses, branch schools, and classes in rural areas where the number of students is decreasing. It would be a pity if the unused school building space is becoming a lost space, and it may also develop a dead corner of community security. In order to effectively implement the reuse of abandoned school buildings that is urgently wanting to carry out the multiple uses of "the second chance of the campus". Government have successively proposed "revitalizing the campus Space Master Planning Plan" revitalizes the unused campus space and expands the efficiency of space usage. In previous section has written there are seven principles to begin the redesign school space. Under the seven principles, there are several potential architecture programs to revitalize the unused space and reuse to other functions. To sum up, the various architecture programs are also the opportunities to maximize the benefits of public assets from different direction during the redesign school project (Fig.7-17).

In order to expedite the processing of the school revitalization, in addition to the fund's consideration. The revitalization process required not only professional manpower but also professional reuse management to operate the school after it has been renovated. The description is as follows.

1、Professional Human Resources.

Making good use of school space at all levels for reinforcement, dismantling and rebuilding occasional campus foundations, as site design in multiple directions such as functional reuse of architectural space requires sufficient professional manpower and business experience. If local governments and schools are short of manpower and change frequently, it will easily affect the promotion of the overall reuse of space. In addition, school administrators generally lack engineering professional knowledge and need to be reviewed by experts and scholars to ensure the quality of the project. Therefore, it is still necessary to appoint a special project team to assist local governments and schools in handling this business for the overall architectural space design and other engineering parts. So as to cooperate with the review work, handle project contracting and budget control related matters, it is important to improve the effectiveness of the overall plan implementation and engineering quality.

2、Professional Information Resources Management.

In terms of information management professional resources, the "School Building Information Network" commissioned by the central and local governments has collected and established basic data and related information on school buildings of elementary and junior high schools across the country. In addition to controlling the status and implementation progress of each school building in elementary and

junior high schools across the country, it can also collect relevant data in a timely manner as a reference for decision-making. At the same time, it can be used as administrative support services such as data collection, progress control, and result data collection when local governments implement plans, reducing the administrative work of the control mechanism.
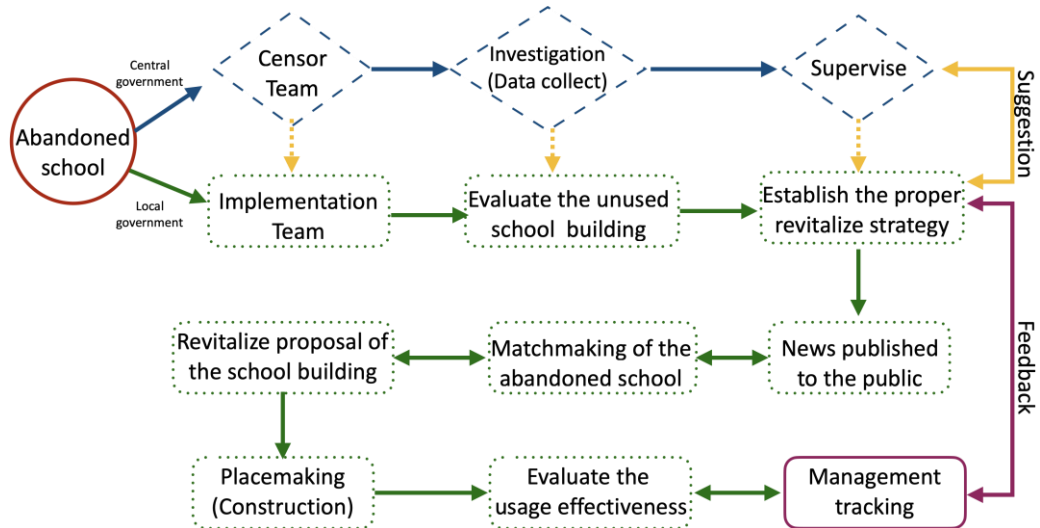
Figure 7-17 School revitalization and reuse mechanism and operation process

In this section, the research is trying to discussion a solution to revitalize and reuse the school space according to the concept of counseling project by the government's policy. This research find out there will have some expected effect and impact as follow which can separate into three perspectives.

1.Direct benefit

One reuse task was to be creating a friendly child-rearing space" subsidizes 50 schools to build 200 classes (485 classrooms) of new kindergartens. According to the "Expanding the Publicization of Early Childhood Education and Protection Plan", the goal of adding 1,000 classes of public kindergartens from 2016 to 2020 is achieved that is increasing schooling opportunities for 30,000 children. Another space improvement function was "activating campus space and expanding community services". In addition to expanding 275 classrooms, providing various community services and adding more classes to existing kindergartens, the school space can also be used to set up community multi-learning centers, community information stations, it is estimated that about 1,790 bases will be set up for various community services such as sports and leisure stations and school community shared reading stations.

2.Social benefits.

According to the information submitted by local governments to assess the needs of the community, architectural program planning is carried out to handle the use of reuse space that residents in the neighborhood of the school can participate in. It is obvious that the government attaches great importance to the campus as a part of the community, which can enhance the positive feelings of the people.

3.Indirect benefit.

Creating a friendly school space is expected to increase women's labor force participation rate. The

revitalization of campus space and the expansion of community services provide various community services, which can be used by the community and establish habits such as studying together or exercising, which are intangible assets of the society.

7.2.3 Analysis of School Regenerative Use Purpose

A supplementary standard area addition system was established for multi-purpose spaces to realize a highly flexible learning space that corresponds to the diversification of educational methods. Presently, in the school building development guidelines that indicate points to consider when planning and designing school buildings, it is important to have an area that allows for the placement of desks, furniture, etc. that can accommodate a variety of learning styles. The same is shown to school establishers. But many of these school buildings have not been qualitatively improved, such as thermal insulation of walls and windows, energy-saving lighting, etc., these are making the school space has the difficult to secure a good thermal environment control on campus. In 1984, as one of the efforts to shift from quantitative development to qualitative development, the national treasury subsidy system for multi-purpose spaces was established. Classrooms have been developed on the premise that all classes face the blackboards at the same time. In this learning styles continue to diversify in the future, people will promote the development of school buildings, including the classrooms toward the realization of new learning, while accumulating and disseminating know-how and ideas for effective use of spaces. The average area of regular classrooms in public elementary and junior high schools is 64 square meters, and about 70% of the classrooms are less than 65 square meters. Also, regular classrooms are equipped with daily living functions such as lockers for storing children's belongings, cleaning utensils, and serving tables. Regarding to the research finding, it shows about 30% of all public elementary and junior high schools have multi-purpose spaces that can accommodate various learning contents and styles in 2019. While there are effects such as flexible operation corresponding to a variety of studying behaviors and increased flexibility in multipurpose usage, all spaces need to have considerations for the acoustic environment and thermal environment, which is a good way while reusing the school building into a new space function.

Additionally, by using one terminal per person, it is possible to asynchronously access and learn various learning resources according to the characteristics of people, beyond space and time. Styles are expanding, and the possibilities are also expanding for scenes that go back and forth with the conventional style of learning that is "synchronized and gathered". It is hoped that the realization of environments and spaces that enable such diverse learning will lead to the realization of diverse well-being for every child. So, there is an increasing possibility that schools will become a place of learning for teachers and other staff members, such as taking online training at schools. What is more, the learning sources can be anyone who are willing to share their knowledge to the public, which means the school space no longer use only by the child but can be everyone to learn from variety knowledges. Thus, it is necessary to reconsider school facilities while imagining the possibilities of users and their learning behavior in a school space.

The servant area of the school is also the fundamental inspection requirement such as the conditions of air conditioning equipment and toilets. The air conditioning installation rate in public elementary and junior high school regular classrooms has advanced to 92.8%, while the air conditioning installation rate in special classrooms is 55.5%, and the air conditioning installation rate in gymnasiums, and so on in 2020. It remains at 5.3%, and there is a problem from the viewpoint of securing an educational environment that can respond to recent unexceptional weather conditions. In addition, many of the existing gymnasiums do not have sufficient insulation, the cooling and heating efficiency is also a problem. When installing air-conditioning equipment, it is also necessary to consider insulation and ventilation equipment for school buildings and gymnasiums during the renovation process. The percentage of western toilets in public elementary and junior high schools is 57.0% in 2020, which is significantly lower than the diffusion rate of western toilets in homes (89.6%, surveyed by the Ministry of Internal Affairs and Communications (2008)). However, there are issues in terms of divergence from living culture and sanitary environment.

The renovation space layout in the school building construction of an inclusive education system should add the idea of barrier free situation. The built environment is necessary to promote barrier free society by removing physical and psychological barriers, to develop an inclusive social environment, and to aim for the concept of universal design. For this reason, it is necessary to promote barrier free spaces as an environmental improvement that forms the basis for school building as an inclusive education system and reasonable accommodation.

Hence, the standards of spatial movement in the public elementary and junior high schools, etc. are newly positioned as special specified buildings subject to the obligation to comply with the standards, and existing buildings are also required to make efforts to obey with the same standards. Moreover, the barrier free status of architecture such as public elementary and junior high schools is 65.2% for barrier free toilets and 27.1% for elevators (both school buildings), including existing facilities. Consideration based on the increasing trend of support the special cares of the children is necessary. Especially, elder generation or children who need medical care such as sucking sputum and tube feeding on a daily basis, designers should also think the spatial design layout as barrier free space when the school building is been require utilizing as a social welfare architecture program. Furthermore, the 5 types of school regeneration can be one of the guidelines to help the school's program to meet the purpose for the users. Even though there are still have a lot of things need to consider in the regeneration process.

7.3 Overall Analysis of School Regeneration Beneficial Result

7.3.1 Analysis of New Use Function to Improve the Civic Engagement

From the analysis of this research discussion, there are many different levels of community activity, it is all relate to the regeneration architectural program as a single use or mixed use (Table.7-

1). A significant program such as redesign into a hotel at Kahoalpe Elementary School, the interaction between school and community remains a certain distance. Ikawa Elementary school has been just reused and open in a short period, the relationship is just started to build the connection with the surrounding. On the other hand, school program design for Iikane Jingo Elementary School has been very successful to create a variety of activities to attract people to come from different cities; also, the school start the concept of music education and new living lifestyle. Daimyo Elementary School is located in downtown Tenjin city which has many commercial, office and recreational facilities area; therefore, the school offers several categories of co-working space. The most important of daimyo elementary school is the program also known as a startup base for people who have the enthusiastic to start the business in Fukuoka city, especially, the startup program is particular to assistant the foreigner to begin the business. Another word, category of program use, regeneration time, operating and management strategy, propaganda news, location of the school with its surrounding.it will all effect the regeneration and region revitalization's connection and the school architecture's destiny.

Table 7-1 School reuse program reflects to the social activity

Space Reconfiguration verse Community Interaction			
No	Image of the Space	Reconfigure Space	Community Activity
1		■ Landscape area: Original brick wall has been partial preserved to tell the story about the school.	- Historical story telling of old daimyo elementary school. - Campus spaces open to the city street.
2		■ Public Discussion area: A classroom is converted to an open discussion area and use the original plan layout.	- Several classrooms open to the public without paying any fee to use all the equipments.
3		■ Lobby: Not only the lobby for the guest but also the public gathering space for the local citizen.	- A hotel lobby and local information exchanging and gathering space.
4		■ Public study space: A lecture hall changed to a public study area with different types of furniture to use.	- Multifunctional space for gathering, exchanging, reading, and studying function.
5		■ Landscape space: An original playground but adding a different type of equipments to creat different behavior.	- Landscape area becomes a variety of sport activity, bbq, local festival, and concert place.
6		■ Cafeteria space: Before was a school kitchen, it keeps the kitchen stool and now it changes to a restaurant.	- A cafeteria space which offers the traditional local meal and food material.

Transformation of school architecture in all cases are found several similarities. There are four basic space functions relate to education, special require, sharing, and activity which most of the regeneration requirement from the public community (Fig.7-18). Also, the architecture design style turns into many unexpected surprises because of each participator has different experience of using the space. Commonly, classrooms are combined became bigger spaces to use for the multi-purpose; on the other hand, exterior became the outdoor event for the community gathering. The revitalization of the surrounding turns into a new scenery, not only the school architectural space has been rebirthed but also the community are willing to participate the action at the new place but in an old architecture school building.

Figure 7-18 Reused school space to improve the community value

7.3.2 Perspective of Reusing School Value for the Community

Rethinking the value of school space with future thinking. Creating the entire school facility as a place of learning. Schools for the future is a space creating the new spatial experience for people and a place to bring variety life by different users. In the age of Society 5.0 which is called by Japanese government, the very nature of society itself, including the industrial structure and social systems, is undergoing major changes. Under this society phenomena, it is important for school education space to value each child, respect each other, deepen exploration while working together, and develop the qualities and abilities to solve problems that is always a big issue when the school remain the original purpose. But what is happening about the school in the current is the school building has nearly lost the essential role in the society. The report compiled by the Central Council for Education in January 2021 indicated the direction of reforms aimed at school building as the new idea has presented "Japanese-style school education in Reiwa", drawing out the potential of all children, and integrally enhancing individual optimal learning and create the collaborative relationship between students, users, and community. So as to freely develop various educational methods and learning activities, a major change is required in the school facility environment whether the school is consolidation, transformation, and renovation.

Looking back at school facilities, during the period of post-war school reconstruction and the rapid increase in the number of students, since 1970s, the school's standardized construction of a one-corridor

and one-character style was promoted. A multi-purpose space has been set up to accommodate various educational methods, and distinctive school facilities have been developed. Besides, the public have entered the new era of Reiwa, the GIGA school concept has progressed with the expansion of the GIGA school concept, one terminal per person, and the expansion of the school network. Against the backdrop of the need for a new normal school atmosphere in anticipation, it is necessary to clarify and realize the school facilities that are suitable for the school architectural environment in the new era. The key concept that represents the vision of the school facility is rethinking the value of the school space. Focus on a flexible and creative learning space that realizes the environmental education from the school in the daily social order. On the other hand, the new role of school space shows how a rich place for living and co-creation stands on the foundation of safety and environment.

Thus, to understand an education that leaves no one behind, it is primary to develop and reuse the public facilities that leave no school behind. The Japanese government is proposed that the school establishers should also take the duty of improvement in the educational environment. Therefore, to new era of the school space can become should have four mission statements which are life, co-creation, safety, and environment (Fig.7-19). To realize the learning behavior and dealings against aging in an integrated manner, including securing basic building performance such as safety against natural disasters and thermal environments through renovations to extend the life of existing school architectures. At the national level, the central government review and enhancement of the financial support system. Not only the enrichment of technical support for the development of school facilities but also the revision of the guidelines for the redevelopment of school facilities.
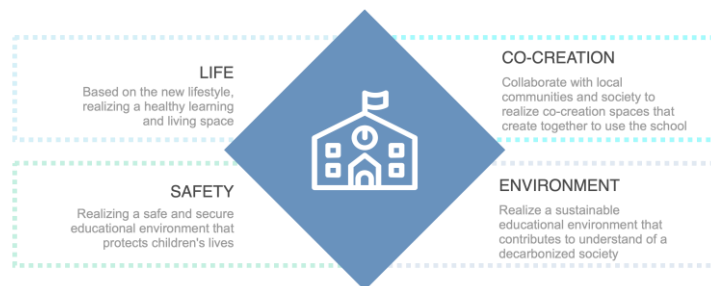
Figure 7-19 Goal of the new school space utilization

7.3.3 Articulation between Architecture Design Idea and Existing Situation

To understand the regeneration process that the replan process combined with many aspects like social practice could help the regeneration process become efficient, this research starts to understand the successful cases from several countries, which utilizes many strategies and group of ambitious people to change the abandoned school into a new function. Also, the city government has set up a policy platform to support the developer that will sure help the regeneration program to go on. This research also suggests a social media should involve in the early phase that can connect to the local community; meantime, manager the business to uploaded and shared it to public to view will also help the business propaganda.

The participatory placemaking strategy in the architectural design system brings more virtually and challenge. In several cases, the participatory placemaking design has been slow to affect the surrounding neighborhood.

From the local perspective, how does the local community think about the foreigner? Therefore, for all participants from the community or designers, they should be aware of starting to have the duty to manage the strategy of the connection first. Of course, social media is one of the elements to present to the community due to the influence of society today. People understand the school building's identity such as culture, local story, and business quickly. While it is true that social marketing and content marketing are inextricably linked, community marketing also spread content with a fresher, more professional way to package content, to maximize the benefits of content marketing (Fig.7-20). It does not necessarily follow that urban creativity and placemaking can solve the social issue or political aspects.
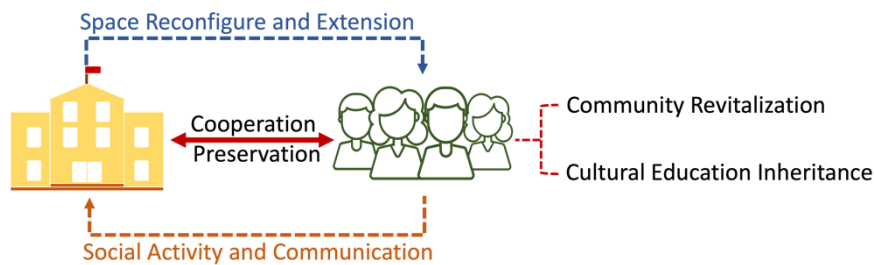
Figure 7-20 Influence of placemaking in a school regeneration process

Generally speaking, after a school is closed or abandoned, the education units of the Central Government will assess whether the school premises need to be reallocated for school or other educational purposes, depending on their scale, location and condition of the school premises. If it is not suitable for cooperative education, or if the Bureau does not anticipate the need to reallocate the unused school premises for educational purposes (the Bureau intends to retain part of the abandoned school buildings to meet unexpected changes and future educational needs), the vacant school buildings will be handed over to the Planning Department, which will then play a central allocation function to use the unused school buildings for other suitable residential or other purposes to meet the policy needs of local governments (Wood, 2020).

At present, there are many contradictions between the situation in regeneration of abandoned schools in Taiwan and the government's land use (such as the difficulty of increasing land supply). Therefore, there is also a heated discussion in Taiwanese society on how to convert unused land (e.g., factory buildings transformed into historical relics, "low-utilization or unused land in post-industrial society due to industrial transformation", unused school buildings, etc.) into houses or transformation for other development. In the case of abandoned school buildings, it refers specifically to school premises that have ceased to function due to closure, replacement and merger. The reuse of abandoned school premises shall be subject to compatibility with the land use of the same district and the needs of the district, and the conversion of the vacant land to other long-term uses (Jones & Heley, 2016).

Public opinion held that the first opposition to the conversion of vacant land into residential or village

housing does not meet the expectations of the city or local region. Secondly, the group responded that the application for the use of abandoned school buildings is complicated and the reasons for the rejection are not transparent, and it is suggested that the application threshold for land use should be lowered, and the land should be shared with the community. Third, when the school building is handed over to the group for operation, whether the nature of its business can attract people or meet the needs of the region, or who should bear the cost of renovation. All need to be clarified to the public. Last, the policies of various government departments in managing school buildings are not perfect in communication, and the discussion mechanism should be added.

7.4 Discussion and Summary

To summarize, from the above survey of overall research analysis and finding, abandoned circumstance and its regeneration process, it is found that the similarities and differences between Taiwan and Japan practices during the overall society. When the government face the problem of revitalization of unused campus space caused by the demographic transition, and the handling situation is not satisfactory by the public, even there are many supports to encourage the participant to give a proposal of the redesign school project. Also, the revitalization in Taiwan is the control and responsibility by the education unit, it should be suggested to various stage treatment of the education unit and the Planning Department. Finally, the expectations of groups in the community for the revitalization of unused school space are quite high, therefore, it needs to have an appropriate people, professional, and discussion through the regeneration process.

During the process of architecture space reconfiguration or renovation. The design style is always the various consideration of architecture design thinking. But when a redesign project such as school architecture regeneration, sometimes it is difficult to think about only the style because of the existing school building situation, most of the consideration will come such as the safety issue of the building structure, mechanical system, environmental control system, heating and cooling system, etc. These architecture components are invisible but important to hold on the architecture building to stand up and operate normal in every single day.

After all the inspection of architecture itself, then comes the major performance goal and numerous style arrangement of architecture placemaking in the complete school architecture redesign process. Space design idea and methods are always related to two aspects: 1. The utilization purpose of the architecture space. 2. The induction of user behavior. Both two aspects are allied to each other and create the balance in the design thinking process, especially the outcome need well display the advantage of the surrounding community. Architecture design is the possibility of extending the designed space elements to meet the needs of the current environment, so that they are more suitable for the purpose of the original design concept, and even have more functions.

Therefore, architectural design should be in response to changing environmental conditions, through the design concept to obtain the most adaptable form and space design techniques. Spatial design is focusing

to increase the potential for adaptation and enable the space to be more acceptable to the public through design techniques under different social conditions such as environmental factors and users of different ethnic groups. Such architectural design, in fact, through the basic elements of the most basic architectural design language. For instance, different thinking modes, shapes and sizes of objects are used to stimulate people's sensory and behavior. Moreover, the space design is to inspire user's spatial cognition during using the space and experience the environmental places. Hence, the idea of thinking about the details of space division and the pattern of user behavior is to create a truly friendly and suitable architectural space.

CHAPTER 8

Research Conclusion and Recommendation

8.1 Overall Conclusion

The main elements of this overall research study are as follows:

Chapter 1 introduces the background of this research-selected topic, which also defines the scope of this research study. It also establishes the foundation for the research topic to be discovered by finding out the specific issues and the related thesis of the architectural environment design composition of the abandoned school and the condition of the school's regeneration design process of each case in Taiwan. The overview of the school conditions between Japan and Taiwan to understand the situation of the educational environment from the past to the present. The static findings show that abandoned schools are getting more severe because of the social demographic status and other social issues. All results also analyzed the transformation condition of an abandoned school in two countries, which shows the advantages, disadvantages, potential, and weaknesses of the school's regeneration process. For example, the abandoned school's information can be easily to find from the Japan's government website, the website not only includes all abandoned schools' database but also the regenerative school cases in Japan. The school information collections are very complete that is also showing the entire process of applying to reuse the school building. Moreover, every year, the government is managing the announcement to encourage the public to participate the school regenerative design project in every city. They will invite the successful case's owner to share the regenerative design process experience. On the other hand, the database about the abandoned school information is hardly to receive and there is no website that is gathering the school's information from the ministry of education in Taiwan. The database system is not arranging directly, a lot of information about school, neither the abandoned condition nor regeneration situation is hardly to see to the public, to get the detail information of abandoned school, it is taking a long time to gather all data.

Chapter 2, as a social infrastructure such as a school in an area, the school's role in this significant society's environmental situation affects the school's position in a region, reflecting several urban planning and design theories. Also, because of the urban expansion and social and economic sources, the uneven resource distribution between urban and rural areas causes the environment to lose an area's characteristics without any notice that an abandoned school's existence can also change the phenomenon of a site if the abandoned school is given a chance to be reused again. Moreover, reusing the school space can improve and create a new linkage to the local community as long as the regeneration design process has been appropriate to present to the local built environment. Thus, the regenerative design process of built environment enhancement needs to comprehensively consider users' behavior and needs from the essential human requirement, space reconfiguration, and territory access definition. All the combinations above explore a regenerative process of a school building by the theory of proxemics to give this current research a direction to analyze the territory status as part of this research study.

Chapter 3, according to the above essential data collection, this research uses the literature reviews' theories and methods to establish the research method. The space reconfiguration process to understand each space symbol's position relates to the space property in the present regeneration school cases by using

the essential concept of space syntax; this analysis method creates a simple understanding by using three imageability symbols to present node, room, and device room of solid to void space property. Furthermore, after recognizing the space property, the space layout and function can also influence user behavior. That is the characteristic accessibility of each territory zoning related to various activities in each school building. From the field survey of 15 cases (5 cases in Taiwan and 10 cases in Japan), gather the school's background history and existing transformation process through different approaches such as site visiting, personal observation, and interviews with the user or staff at the school building. Also, the architectural drawings construct the analysis method to review the space hierarchy and the territorial differentiation of the school building's regenerative design progress.

Chapter 4, based on the space syntax method, this chapter investigates the current situation of the school regeneration project and the hierarchy of the new design of reusing the school space. This analysis directly explains the depth of each regenerative design strategy related to the original school building layout. Also, using this space analysis method allows the user to clarify the spatial order and each space element's boundary at each school building level. Moreover, the overall regenerative design of the school space can be seen in the restricted capacity of the design strategy in a regenerative design school project, which is the revision of reusing the school building as a regenerative design project, the result of the design, including the space element, spatial arrangement, physical environment, structure safety, building durability, infrastructure, environmentally friendly and regional characteristic apply to a deeper design thinking while the participants are trying to reuse the school space as social infrastructure in a built environment.

Chapter 5, based on the proxemic theory by Edward T. Hall, that the social space is under 3.6 meters and the personal space is under 1.2 meters. The public space is above 7 meters, and less than 0.45 meters is intimate. So, the structure analysis is used to construct a place through different territorial transformations related to user engagement behavior. The territory claims in different situations, such as public accessibility of the private space or private claims on public space, become obscure mystery spaces in a school building. However, the territory's characteristics or boundaries relate to the users' engagement with various space functions. At the same time, the user and territory establish the place phenomenon, which is the genius loci that has been created. The form, users' engagement, and the campus's environment constructed the spirit of the place to present the image of the community.

Chapter 6 the overall evaluation results are analyzed by combining the research findings of Chapter 4 and Chapter 5 to construct a school regeneration design standard suggestion for the user interested in participating in the school regeneration project. The regeneration design process evaluation strategy uses territory, function, and users' needs as three objectives to review the school regenerative design project. However, the impact factor score of the regenerative design's gold in three criteria classifies the regenerative design condition. This is the guideline for the participant designer without having professional architecture knowledge; therefore, they can use this handbook as a review instruction to analyze the regenerative design project in space design thinking, image the space function, and understand the users'

needs. There are five types of the school regenerative designs including technical learning based, industrial theme based, start-up creation based, civic engagement based, and regional reinvent based. According to the MoSCoW method to evaluate the three criterions in territorial zoning, space function, and users' need, the research study has designed a new design thinking process, which are including two evaluation forms. The traditional architectural design process combined with schematic design, design development, and construction document; these are the basic service of the architectural design process. Sometime, the bidding phase is also including at the end of the architectural design that is an additional service. In this chapter, the research has revised the design think process of architectural project design, two supplemental services are adding at the beginning and before start to doing the construction document phase. A pre-design phase and design review phases are implemented into the school regenerative design process. This is also part of the placemaking concept, placemaking is a process not a product and it is always going on. However, placemaking is community-based process of visiting, experimentation, and care to change the way people use and experienced a public space, in this case is the regenerative school in the public's neighborhood. Therefore, this research is giving a guideline to improve the school regenerative design process by using two evaluation forms, to provide a clear thought about the mission statement of the school regeneration goal.

Chapter 7, in this chapter, summarizes the full text and proposes several suggestions and recommendations for future research. The research results description can be shown in the list below.

1. Before the redesign discussion.

1) Architecture feature inspection should be carefully recording the original drawing document.

2) Surrounding landscape drawing documents on campus to preserve the eco-environment.

3) Neighborhood or city resource survey and record.

2. During the design process.

1) Renovate material and method consideration of sustainability.

2) Program development should be considered carefully for the overall community industry business development.

3) Detail design, such as color, mixed material, and renovated elements, must be evaluated carefully.

4) Space requirements should be adaptive to the user's behavior in the future.

5) Environmental control system.

6) Design flexibility to modify any situation on site, such as hardware and software device rearrangement, neighborhood's reaction, and all participator's attitudes.

3. Project construction.

1) Construction technician's knowledge.

2) Construction environment organization.

3) Construction management and time. Further Research Suggestion

1. Before school is going to be abandoned.

1)   The historical or memorial event on campus and in the community should be recorded as a reference for future design.

1.   Event of the regenerate space

1)   School architecture becomes a place for the public to interact, exchange local information, and share life daily.

3. Management

1)   Regenerate program management and operation of the school architecture.

2)   The building maintenance task.

3)   Open job opportunities to the local community and industry.

8.2 Research Limitations

The studies indicate that the first redesign priority is restricted to understanding the possibilities of space in the architectural placemaking process. Also, the design methods used in this analysis can be a tool to revise the school redesign and architectural programming. First of all, the original school environment has set a limit to redesigning the space, which also points to the difficulty in creating a sense of ordinariness in the local neighborhood. It is difficult for local dwellers to use the space through different levels of environmental behaviors and human needs. Also, the architecture's original form and layout limit the space redesign plan, which leads to a highly unified space design without fluid characteristics. In this research, the cost factor is not in the discussion, the project's budget is always playing an essential influence during any design development, all cases in this research have different problems that needs to deal with the source of the budget, the applicant qualification to seek for the subsidy from various source in different stakeholders and governments.

Secondly, a new position of the redesigned school institution should be created in the neighborhood. Since Taiwan's birth rate has decreased over the year in many regions, the abandoned school is confronted with the latest district crisis and its development. Whether the school building is rebuilt or renovated, the new architecture program must increase utilization and improve environmental quality. People often perceive school as an institution that provides educational service for students only and ignore its presence as a common property for the whole community. Another common saying is that when the school space is reformed through the new program, it demands much more time to discuss and educate the surrounding neighborhood to treat the school building as a public facility again. Therefore, determining how to explore core values before redesigning the school space should be the principle of the regenerating process. Moreover, finding the effective way to reinvite the local people and attract outsiders to visit the readjusted school facility should be the main objective of the project.

Thirdly, a school in a community plays a crucial role in collecting the dialogue among its owners and users, which in turn, involves a duty to interpret the sense of contemporary of the area. Thus, the redesigning program should be based on physiological and social needs. On the other hand, the school owner should also look for an effective way to enhance the presence of the reformed school within the local

community. Cooperated with professionals, practitioners, and educators, the agenda anticipates enlightenment of school environment /regenerative design awareness on this regional revitalization process.

Finally, the advantage of reusing the school environment is that one can extend local resources and provide a sustainable environment for future region revitalization. Still, it is also a limitation during the regenerative design process. The United Nations addressed the agenda for sustainable development in 17 sustainable development goals (SDGs). According to goal 11, sustainable cities and communities can establish an environmentally friendly, safe, resilient city for human settlements. Therefore, reusing the school facility and reserving the service is the direct approach to exemplify the goal of SDGs in a region. However, the redesign program and strategy should be case by case due to the different scales of the area. Additionally, each region's characteristics show another phenomenon in its diverse culture. Also, every characteristic of the local resource has its unique element to propagate the typical subject and perform the idea to the public.

Furthermore, during redesigning school project, the school redesign projects can provide several key insights in sustainability, such as reusing the school space in different design ways, linking the industrial knowledge with local resource's reproduction, and reestablishing the sense of the local identity. Overall, by rediscovering local value, both decision makers and local residents can further improve the regional development. Therefore, the different viewpoints and processes can stimulate the public's mind to rethink what is a better space quality in the community and living environment, especially with regards to redesigning space in an abandoned school.

8.3 Research Recommendations and Further Areas of Research

The habitable space between school and region, this research suggests that a placemaking strategy can help the region to revitalize again. Placemaking with social media tool is becoming the trend of present society environment. In the 1960s, Bernard Hunt architect noted that "We have theories, specialisms, regulations, exhortations, demonstration projects. We have planners. We have highway engineers. We have mixed-use, mixed tenure, architecture, community architecture, urban design, neighborhood strategy. But what seems to have happened is that we have simply lost the art of placemaking; or, put another way, we have lost the simple art of placemaking. We are good at putting up buildings, but we are bad at making places." Placemaking is one of the design approaches that often uses in a public area with basic society collaboration.

The traditional architectural design may have a site to visit, an invisible client in a design project, but never have the opportunity to deal with the real problems and build it. Sometime, the complete design is also hard to really meet the requirement or suitable for the local neighborhood. The design has no connection to the local environment; thus, understanding the real world's circumstance for these young generation, this research advocates that placemaking is a good strategy to educate the people who are interesting to participate the regeneration project. In my opinion, placemaking is matter because the design

is about fixing problems as everyone knows as PBL in pedagogy. Problem-based learning is facing the problems; then, participant or placemaker will propose creativity but specific solutions; these findings challenge a designer and his decision abilities. Although social media may seem unrelated, it is crucial in today's concern over personal marketing. The architectural design process becomes different from before, an interesting subject to emphasize in the design process.
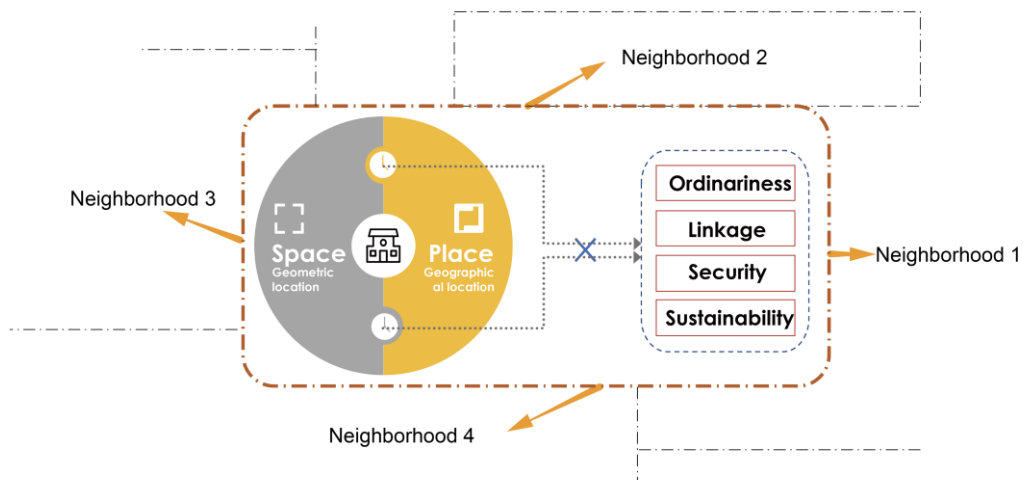
Figure 8-1 School regeneration constructs the integrity of the neighborhood environment.

1. Human-space interaction should be recognized and recommended as the basis for forming and continuing social organizations. Whether creating a secure environment for social interaction in business organizations, institutions, or neighborhoods can form a sense of community is always a topic worthy of attention. Although human interaction may seem trivial, it is in fact crucial in terms of today's concern over what architecture can represent in this social environment. Conversely, as a designer, one must ask what can be done for this small group of individuals and region to improve overall living quality.

2. In this research's discussion of space adaptability and flexibility, built environment and human behavior relationships are, in fact, addressing the more extensive matter of human interaction to create a value standing of the living cognition and spatial behavior in a social infrastructure around the neighborhood. The most basic reason recommended for the important purpose of the interaction is that interaction is necessary for the continuation of human relationships, which are fundamental to a sense of belonging and intimacy.

3. The school is a social foundation of architecture to contribution the region development. Since the social atmosphere changes rapidly, and environmental disasters are increasing in frequency more than before, physical protection and human emotional security are necessary with respect to consideration for the lives of in-habitants in a safe neighborhood. Moreover, infrastructure such a school building has already provided the basic structure system for user safety under the architecture design regulation (even more since the facility provides many spaces for states of emergency). Not only is it easy to establish the groundwork, but it is also easy to reinforce security conditions in advance. Thus, the risk of disaster prevention and

mitigation programs or requirements should be recommended and considered in the redesign space layout arrangement, which in turn can make the future school facility much more secure than before (and also no matter how the interior space or exterior environment are functioning with regards to the regular activity during normal daily life). When an unexceptional incident happens, the school facility after it is been redesigned is always in a good shape to offer safety in the near future. In sum, then, this research findings explanation shows the outcome of reusing the school space. Further work in this study may lead to the development of regenerate school architecture design detail and the effort, risk, cost, and value of the school architecture to the community development revitalization.

Appendix

Appendix 1: Cases in Taiwan

Table 4.1 Description of Redesign School Architecture.

No.	City, Country	Name of School	School Age	Regenerated Date	Campus Condition	Reuse Programming	Program Function	Management Type
1	Checheng Township, Pngtung County,	Chechen Elementary School Wencyuan Branch	1951-2020, 69	2022.09.25	School+Facility	Pintung Education Innovation Unit	Single	Separated Entry
2	Gaoshu Township, Pngtung County,	Nanhuan Elementary School	1967-2020, 53	2021.01.11	Facility	Pingtung AI Agri Hub	Multiple	Original Entry
3	Chaozhou Township, Pingtung County	Chao Tung Primary School, Lunchuan Branch	unidentified	2017.12	Facility	Lunchuan camping area	Single	Original Entry
4	Taiwu Township, Pingtung County	Taiwu Elementary School,Jiaxing Branch	Unknown-2004	2013 (Date unknown)	Facility	Native Taiwaness Culture Space	Single	Original Entry
					Continue to next page			
5	Gushan Dist., Kaohsiung City	Guyan Elementary School	2010	2021.06.07	School+Facility	Day care center	Single	Original Entry
6	Fengshan Dist., Kaohsiung City	Fongsi Junior High School	unidentified	2016	School+Facility	幸福分享中心-高雄市實物銀行	Single	New Entry
7	Fengshan Dist., Kaohsiung City	Zhongxiao Elementary School	unidentified	2018	School+Facility	高雄市鳳山區兒童早期療育發展中心	Single	Original Entry

8	Gushan Dist., Kaohsiung City	Geouru Elementary School	unidentified	2014.05	School+Facility	鼓山公共托嬰中心	Single	Original Entry
9	East Dist., Tainan City	Zhongxiao Junior High School	2013	2016.05	Facility	臺南大學榮譽教學校區	Single	Original Entry
10	Madou Dist., Tainan City	Tsung-Yeh Elementary School	2018	2016.05	Facility	總爺藝文中心	Multiple	Original Entry
11	Qigu Dist., Tainan City	HuaGoung Elementary School, DingShang Branch	1960.08.01-2008.08.01	2016	Facility	Black-Faced Spoonbill Conservation Association	Single	Original Entry
12	Alishan Township, Chiayi County	Xianglin Elementary School (Old campus)	1914.04.01-2005	2014.09.01	Facility	Alishan National Forest Recreation Area	Single	Original Entry

13	Yuchi Township, Nantou County	Gaungming Elementary School	1957-2008.06	2016.04	Facility	SUN MOON LAKE Study Center	Single	Original Entry
14	Zhongliao Township, Nantou County	Guangying Elementary School	1970-2015.08	2015	School	森優生態實驗教育學校	Single	Original Entry
15	Guanxi Township, Hsinchu County	Renhen Elementary School	unidentified	2014	Facility	Jing Kwang Cherng Cultural Museum	Single	Original Entry
16	Hengshan Township, Hsinchu County	Fengxisng Elementary School	1983	2004	Facility	大山背人文生態館	Single	Original Entry
17	Emei Township, Hsinchu County	獅山 Elementary School	1987	2001	Facility	獅山遊客中心	Single	Original Entry
18	Zhongshan Dist., Keelung City	TaiPing Elementary School	1968-2017.08.01	2021.10.23	Facility	Multiuse: exhibition, bookstore	Single	New Entry
19	Anle Dist., Keelung City	Wulun Elementary School	unidentified	2008	Facility	Community School	Single	Original Entry

20	Yuanshan Township, Yilan County	內城國小自強分校	unidentified	2013	Facility	行政院勞動部勞動力發展署北基宜花金馬分署-宜蘭職業訓練場	Single	Original Entry
21	Yuanshan Township, Yilan County	大湖國小雙連埤分校	unidentified	2014	Facility	雙連埤生態教室	Single	Original Entry
22	Guangfu Township, Hualien County	大進國小大全分校	unidentified	2012.06.25	Facility	花蓮縣光復鄉立幼兒園	Single	Original Entry
23	Shoufeng Township, Hualien County	光華國小鹽寮分校	1965	1995	Facility	洄瀾國際文教會館	Single	Original Entry
24	Shoufeng Township, Hualien County	月眉國小米棧分校	unidentified	2012	Facility	古道修復工班	Single	Original Entry
25	Shoufeng Township, Hualien County	平和國小吳全分校	unidentified	2012	Facility	行政院勞工委員會職業訓練局北區職業訓練中心	Single	Original Entry
26	Fenglin Township, Hualien County	南平國小	1997	2013	Facility	中途學校	Single	Original Entry
27	Fenglin Township, Hualien County	大榮國小山興分校	1992	2014	Facility	世界展望會認養管理	Single	Original Entry
28	Fenglin Township, Hualien County	大榮國小中興分校	1992	2015	Facility	社團法人臺灣古美術文物研究交流協會認養管理	Single	Original Entry
29	Ruisui Township, Hualien County	瑞穗國小瑞祥分校	1998	2014	Facility	行政院勞委會北區職訓局職業訓練專案	Single	Original Entry
30	Yuli Township, Hualien County	樂合國小安通分校	1988	2014	Facility	松年長青大學	Single	Original Entry

31	Fuli Township, Hualien County	東竹國小羅山分校	1996	2012.11	Facility	羅山露營區	Single	Original Entry
32	Fuli Township, Hualien County	永豐國小四維分校	1992	2015	Facility	吉拉米代農事體驗計畫	Single	Original Entry
33	Changbin Township, Taitung County	臺東縣忠勇國小	2013	2017.11.21	Facility	Day care center	Single	Original Entry
34	Beinan Township, Taitung County	溫泉國小樂山分班	1993.06	2018	Facility	樂山休閒農業發展協會	Single	Original Entry
35	Beinan Township, Taitung County	初鹿國小嘉豐分校	1993.07	2017	Facility	CAMPGROUND	Single	Original Entry

<div align="center">Continue to next page</div>

36	Luye Township, Taitung County	瑞源國小寶華分校	1993	2018	Facility	鹿野鄉公所	Single	Original Entry
37	Luye Township, Taitung County	永安國小永隆分班	2013.03.13	2018	Facility	熱氣球飛行訓練學校	Single	Original Entry
38	Jinfeng Township, Taitung County	賓茂國小歷坵分校	unidentified	2015	Facility	Community center	Single	Original Entry
39	Xiyu Township, Penghu County	澎湖縣西嶼鄉小門國民小學	unidentified	2018	Facility	澎湖西嶼社會福利館	Single	Original Entry
40	Wang'an Township, Penghu County	嶼坪國小	1998	2018	Facility	Tourist Center	Single	Original Entry

Appendix 2: Cases in UK, USA, and Japan

Table 4.2 Description of Redesign School Architecture.

No.	City, Country	Name of School	Redesign Year	Campus Condition	Features	Management Type
1	Fareham, Hampshire, UK	Whiteley Primary School	2000	School	Add several common spaces for student from 5-10 ages to share the space and interacted together.	Shared Entry
2	Redditc, Worcestershire, UK	Matchborough First School	2003	School + Café + Community office	Variety of learning process with organization's special curriculum. Eco friendly redesign the overall school spaces such as water recycling, nature light, and cross section ventilation.	Shared Entry
3	St. Paul Minnesota, USA	John A. Johnson Elementary School	2000	School + Kindergarten+ Day care + Community service (Gym & Pool)	YMCA as the organization to offer variety of recreation programs. Volunteers form parents or residents are providing the school culture to achieve learning, healthy, and welfare programs. Special design with the patio in the learning area. Community service remains on the ground floor to control the event, preschool service, 2nd floor provide early childhood family education service.	Separated Entry
4	Novi, Michigan, USA	Deerfield Elementary School	2000	School + Café + music and dance class + learning center+ green house	School surround by the nature environment and local house. Schools within a school is the theme program to redevelop several common spaces in this community. Space like café, tree house, music room create a friendly phenomenon to attract people to join the space in this school environment.	Shared Entry
5	Mckinney, Texas, USA	Roy Lee Walker Elementary School	2000	School + Café + Community gathering space + public library	Before restart the reuse school project, government invited teachers, designers, and residents joined the process until the project was built. The rebuilt process utilized the recycle material from the local, also encourage residents brought unused material to assist the material collection. This idea brought the benefit to this redesign project such as the cost management and environmental sustainability.	Shared Entry
6	North Aurora Illinois, USA	Harold G. Fearn	2001	School + Café + Media center +	Government cooperates with the school to develop a professional development school program to create the relationship between	Shared Entry

259

	Elementary School		Community gathering space	university and elementary school. This program also offers the chance not only the internship training but also learning support service to assist the school operation. Gym becomes multiple functions in different aesthetic and sport purposes. Library becomes the common center for student, teacher, and community to communicate and interaction.	
7	Park city, Utah, USA	Trailside Elementary School	2001	School + Façade	Open are such as gym to the neighborhood to use. A café area is a place for everyone to come and enjoy the activity which shared the common entry in campus.	Shared Entry
8	Wilsonvile, Oregon, USA	Boones Ferry Primary School	2001	School + Media center	An idea of village layout to create the schools within a school in this reuse school project. The nature environment resources create a vivid subject during the learning process. Media center opens to the public to use as computer learning and training. Volunteer to join the school management.	Shared Entry
9	Newport, California, USA	Newport Coast Elementary School	2001	School + Library + Parking area + Playground	School lesson material can be taught from the environment resources and elements. Besides every grade of classrooms, most of school service open to the public to use such as library, meeting room, and conference room.	Shared Entry
10	Statesville, North Carolina, USA	Third Creek Elementary School	2002	School + Gym + Café + Playground	School was honed by the LEED certificate in overall material use and recycle system. Due to the recreation space require from the local residents, school opens part of the space such as gym, baseball field, and a café store to the public.	Shared Entry
11	Hampshire, UK	Endeavour Primary School King Site	2011	School + Community center	Classrooms are flexible to change the shape of the space for different activity purpose. Beside tall he classrooms, the school spaces are open to the community to use as well. The security manages depend on the situation either during the school hour or community service.	Shared Entry
12	Buckinghampshire, UK	Cressex Community School	2011	School + Community center	A tall atrium as an intermedium space to connect the classrooms and other school spaces. All spaces besides classrooms can be pay to use it.	Shared Entry
13	Chelsea London, UK	Marlborough Primary	2017	School + Community center	School is in the center area of London that surround by different types of academy facility. A community from desk counter is located at the	Separated Entry

	School				entry area to arrange the space for rent or use.	
14	Washington State, USA	Wilburton Elementary School	2018	School + botanical Garden	School's environment is extended to the surrounding environment which create an open campus for student and public to communicate through the learning process and nature experience.	Separated Entry
15	Fukuoka, Japan	Hakata Elementary School	2001	School + library (2F) + Lunchroom (5F) + Music room (3F)	Because the school is in the center area of the city, it becomes the center for communication and gathering space. Different event such as traditional culture festival, community event and learning center to interact with the community area.	Separated Entry
16	Siidama, Japan	Shikisyo Elementary School	2003	School + Media center+ Library	Several spaces in the school are not only shared with the local community to host the traditional event, learning, and exhibition but also the school equipment can be used for everyone. Each area has its own management.	Shared Entry
17	Mie, Japan	Ishigule Elementary School	2003	School + Community center	School reorganized in 2003 after the area consolidation becomes a place for community to use as well. A group of local residence create a team to take care the school's environment and preserve the local culture to extend the traditional ishigule city's characteristics.	Separated Entry
18	Hokkaido, Japan	Hikashikawa Elementary School	2014	Culture and Art center	School becomes a local culture art center which includes multiple purposes such as environmental education, social training, and regional culture preservation programs. Also, the center offers the international language school for foreigner to understand the Japanese culture.	Separated Entry
19	Tokyo, Japan	Sirokanenooka Elementary School	2015	School + Community center	Local residence and retire people create an organotin to preserve the school space for the community. Also, the school and the community cooperate to host the activity and events.	Separated Entry
20	Iwate, Japan	Rikuzentakata Elementary School	2019	School + Community center	After the earthquake, the redesign ideas are included school learning, regional culture, and environmental protection. School and local residence together to preserve and promote the culture and life experience.	Shared Entry

Appendix 3: Evaluation Worksheet one

Evaluation Form One

TF, FN, and UT objectives score, Evaluation Date:

Please indicate how much you agree with the following statements by writing your response using the scale provided: 10=Must have, 7= Should have, 5= could have, and 2= will not have.

Agenda 1: Give a score to the Table 1

Criterion		Table 1: **TF, FN, and UT objectives score**			
1	**TERRITORIAL ZONING**	T1: Personal space	T2: Limited service space	T3: Functional service space	T4: Public space
F=Space function	F1: Civic engagement function	5			
	F2: Industrial cooperation function				
	F3: Knowledge learning function				
	F4: Diversity interaction function				
2	**SPACE FUNCTION**	F1:Civic engagement function	F2:Industrial cooperation function	F3:Knowledge learning function	F4:Diversity interaction function
U= Users' needs	U1: Style of the space	7			
	U2: Theme of the school building				
	U3: Potential of economic benefit				
	U4: Co-creative service of the place				
3	**USERS' NEEDS**	U1: Style of the space	U2: Theme of school building	U3: Potential of economic benefit	U4: Co-creative service of the place
T=Territorial zoning	T1:Personal Zone	2			
	T2:Limited Service Zone				
	T3:Functional Service Zione				
	T4: Public Zone				

Agenda 2: Multiplication of all scores in each table.

Notice: each column spot multiplies the same position. Example: 5x2x7=70

Score of all multiplication			
70			

Agenda 3: Classify the score result by the group provided below.

Group no.	Score range	Score category	Number of score category
1	1000		
2	500 < score < 1000		
3	300 < score < 500		
4	100 < score < 300		
5	Score < 100		

Agenda 4: Finding the regeneration objective type.

Group no.	Type of group	Characterizes of group
1 (1000)	Technical learning based	- Provide various technical knowledge study and training lesson. - Gather the professional educator to educate the participant. - Course training provides appropriate economic benefits and wealth.
2 (500 < score < 1000)	Industrial theme based	- Cooperate with the industrial company. - Expand opportunities for vendors to show the special of their industry. - Measure the existing market's value to implement the production and consumption.
3 (300 < score < 500)	Strat-up creation based	- Scale up operations and social infrastructure resource connection. - Served a module on how to support local entrepreneurs and stakeholders. - Provide innovative tools, techniques, and alignment opportunities
4 (100 < score < 300)	Civic engagement based	- Engage the local community and citizens. - Creating clusters of activities and events - Present the sense of place and local style identification
5 (Score < 100)	Regional reinvent based	- Discover the potential resources of the local built environment. - Support the emergency condition such as disaster prevention or mitigation. - Community service in a long-term management and programming.

Agenda 5: Please provide brief answers to the evaluation score from Agenda 4.

Regenerative Design Objectives *(copy objectives from agenda here)*

_____

1.

2.

3.

Additional comments

_____

Appendix 4: Evaluation Worksheet Two

Evaluation Form Two

Space Relationship in School Design Layout

Evaluation Date:

Agenda 1: Please fill in the information below:

1. City:

2. Name of School: 3. School's Address:

School Background		
Photo of the school	Site plan	Floor plan

Agenda 2: Regeneration design plan

Regeneration Design Floor Plan
Floor plan
Analysis the Space Symbol

Agenda 3: Graph of Spatial Order

X= Spatial Number, Y=Depth of the access *(symbol can reference the below)*

SOLID

NODE	SPACE	DEVICE SPACE
INTERIOR STAIR	ROOM	STORAGE
CORRIDOR NODE	TOILET	
	ADMINISTRATION OFFICE	

INTERMEDIATE SPACE

CORRIDOR	ATRIUM
TRANSATION POINT	INTERMEDIATE SAPCE
DOOR	

VOID

| PATHWAY NODE |
| PATHWAY |
| EXTERIOR STAIR |
| PLAYGROUND |

Graph of Spatial Order:

Y=DEPTH OF CONVENIWNCE

K
J
I
H
G
F
E
D
C
B
A
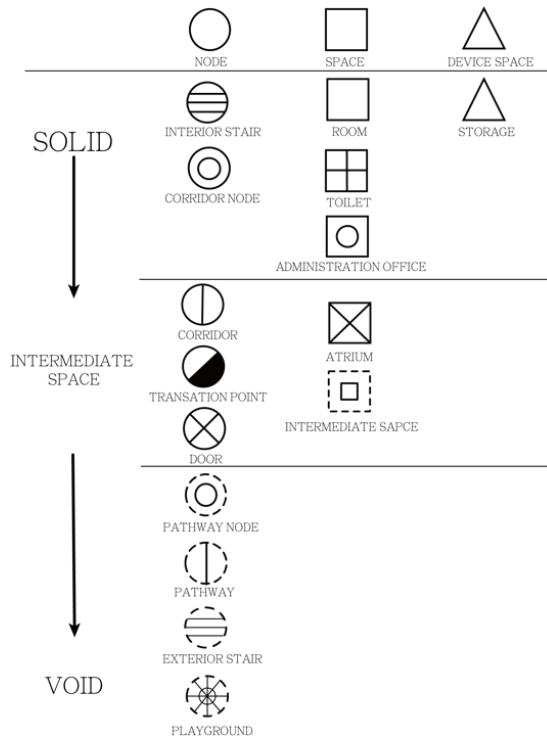
X=SPATIAL NUMBER
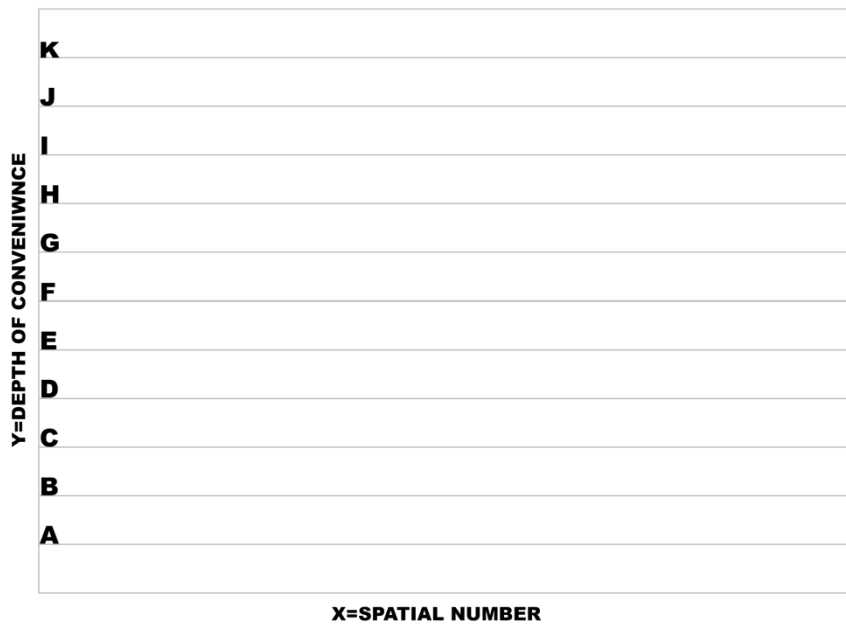
Agenda 4: Territory Differentiation

Note: Please draw each territory differentiation on the new design school floor plan according to the definition in Table 1 below:

Table 1: Definition of territorial frequency quality

Category	Abbreviation	Score	Definition of each territorial zoning
Personal space	PLS	1/4	Personal use space with a comfortable circumstance.
Limited service space	LSS	1/3	Specific objective with the permission to enter.
Functional service space	FSS	1/2	A period of time to allow to access the space. (Usually 6-8 hours per day)
Public space	PBS	1	24 hours access the space without the limitation.
*Score=1, fully open space to the public with free access.			

Territory differentiation:

Y=Level	Depth of the space order level with score												
	A	B	C	D	E	F	G	H	I	J	K	L	M
	1	2	3	4	5	6	7	8	9	10	11	12	13
Score	1/1	1/2	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13
Please color the space below													
Color													
Please count the spatial number from each level													
Number													
Space character description													
1. 2. 3.													

Agenda 5: Please provide brief comments to the territory differentiation from Agenda 4.

Please answer the following questions.

Additional comments…

References

Abdullaeva, M. (2020). Proxemics as a factor of national communicative behavior. *KANT*, 92-95. doi:10.24923/2222-243X.2020-35.18

Adegoriola, M., Yung, E., Lai, J., Chan, E., & Yevu, S. (2023). Understanding the influencing factors of heritage building maintenance management: findings from developed and developing regions. *Building Research & Information*, 1-20.

Akturk, A. (2016). *Regenerative Design and Development for a Sustainable Future: Definitions and Tool Evaluation.*

Altamirano, A., Gonzalez-Suhr, C., Marien, C., Catalán, G., Miranda, A., Prado, M., . . . Meli, P. (2020). Landscape Disturbance Gradients: The Importance of the Type of Scene When Evaluating Landscape Preferences and Perceptions. *Land*, 306. doi:10.3390/land9090306

Bafna, S. (2003). Space Syntax: A Brief Introduction to Its Logic and Analytical Techniques. *nvironment and Behavior*, 17-29. doi:10.1177/0013916502238863

Bard, J., Force, N., Gardener, C., & Wieland, R. (2005). RURAL SCHOOL CONSOLIDATION REPORT History Research Summary Conclusions and Recommendations.

Batty, M. (2004). A New Theory of Space Syntax.

Benito, A. (2003). The School in the City: School Architecture as Discourse and as Text. *Paedagogica Historica*, 53-64. doi:10.1080/00309230307462

Bergerot, B. (2022). The Citizen Science Paradox. *Land*, 1151. doi:10.3390/land11081151

Bibri, S., Krogstie, J., & Kärrholm, M. (2020). Compact city planning and development: Emerging practices and strategies for achieving the goals of sustainability. *Developments in the Built Environment*, 100021. doi:10.1016/j.dibe.2020.100021

Blanco, E., Pedersen Zari, M., Raskin, K., & Clergeau, P. (2021). Urban Ecosystem-Level Biomimicry and Regenerative Design: Linking Ecosystem Functioning and Urban Built Environments. *Sustainability*, 404. doi:10.3390/su13010404

Brown, N. (2001). Edward T. Hall: Proxemic Theory, 1966. 2007.

Burke, C., & Grosvenor, I. (2008). *SCHOOL.* London: Reaktion Books.

Busbea, L. (2020). *Proxemics and the architecture of social interaction.* New York, NY: Columbia Books on Architecture and the City.

Byrne, D., Fairclough, G., Harrison, R., Jameson, J., & Schofield, J. (2007). *The heritage reader.* Reno: Routledge.

Cai, G., Zou, B., Chi, X., He, X., Guo, Y., Jiang, W., . . . Zhou, Y. (2023). Neighborhood Spatio-Temporal Impacts of SDG 8.9: The Case of Urban and Rural Exhibition-Driven Tourism by Multiple Methods. *Land*, 368. doi:10.3390/land12020368

Camrass, K. (2022). Urban regenerative thinking and practice: a systematic literature review. *Building Research & Information*, 339-350. doi:10.1080/09613218.2021.1922266

Casey, E., Feld, S., & Basso, K. (1996). *Senses of Place.* School for Advanced Research Press.

Chen, N. (2016, 10). Governing rural culture: Agency, space and the re-production of ancestral temples in contemporary China. *Journal of Rural Studies*, 141-152. doi:10.1016/j.jrurstud.2016.07.029

Cleveland, B., & Fisher, K. (2014). The evaluation of physical learning environments: a critical review of the literature. *Learning Environments Research*, 1-28.

Coelho, C., Cordeiro, A., Alcoforado, L., & Moniz, G. (2022). Survey on Student School Spaces: An Inclusive Design Tool for a Better School. *Buildings*, 392. doi:10.3390/buildings12040392

Cole, R. (2012). Regenerative design and development: current theory and practice. *Building Research & Information*, 1-6. doi:10.1080/09613218.2012.617516

DATA.GOV.TW. (2021). *Datasets*. Retrieved from 政府資料開放平臺: https://data.gov.tw/

Dias, B. (2015). BEYOND SUSTAINABILITY – BIOPHILIC AND REGENERATIVE DESIGN IN ARCHITECTURE. *European Scientific Journal*, 147-158.

Ding, X., Zhao, W., Yan, T., & Wang, L. (2022, 11 13). Response of Ecosystem Service Value to Spatio-Temporal Pattern Evolution of Land Use in Typical Heavy Industry Cities: A Case Study of Taiyuan City, China. *Land*, 2035. doi:10.3390/land11112035

E., B., Jr., W., & E., M. K. (2012). *Principles of Research in Behavioral Science.* New York: Routledge. doi:https://doi.org/10.4324/9780203085219

Ekomadyo, A., Nurfadillah, A., Kartamihardja, A., & Cungwin, A. (2018). Becoming Heritage: A Place-Making Study of Old Neighbourhood Marketplace in Bandung. *IOP Conference Series: Earth and Environmental Science* (p. 012012). Institute of Physics Publishing. doi:10.1088/1755-1315/158/1/012012

Esparcia, J., Escribano, J., & Serrano, J. (2015). 10.1016/j.jrurstud.2015.09.005. *Journal of Rural Studies*, 29-42. doi:10.1016/j.jrurstud.2015.09.005

Gattupalli, A. (2022, 12 5). *What is Regenerative Architecture? Limits of Sustainable Design, System Thinking Approach and the Future.* Retrieved from ArchDaily: https://www.archdaily.com/993206/what-is-regenerative-architecture-limits-of-sustainable-design-system-thinking-approach-and-the-future/638d8b1e585a8e4f475333c0-what-is-regenerative-architecture-limits-of-sustainable-design-system-thinking-approach-and-th

Griffiths, S. (2012). The use of space syntax in historical research: current practice and future possibilities. *Eighth International Space Syntax Symposium* (pp. 1-26). Santiago de Chil: PUC.

Gu, C., Li, Y., & Han, S. (2015). Development and transition of small towns in rural China. *ELSEVIER*, 10.

Habraken, N., & Teicher, J. (2000). *The structure of the ordinary: form and control in the built*

environment. Cambridge, Mass.: MIT Press.

Hall, E., Bidwhistell, R., Bock, B., Bohannan, P., Diebold, ,., Durbin, M., . . . Vayda, A. (1968). Proxemics [and Comments and Replies]. *Current Anthropology*, 83-108. doi:10.1086/200975

Helfenberger, M., & Schreiber, C. (2019). BUILDING CITIZENS: SCHOOL ARCHITECTURE AND ITS SOCIETAL PROGRAMME - COMPARATIVE VISIONS FROM 19TH AND 20TH CENTURY SWITZERLAND AND LUXEMBOURG. *História da Educação*, e82303. doi:10.1590/2236-3459/82303

Hillier, B., Leaman, A., Stansall, P., & Bedford, M. (1976). Space syntax. *Environment and Planning B: Planning and design*, 147-185. doi:https://doi.org/10.1068/b030147

Hoggart, K., & Paniagua, A. (2001). The restructuring of rural Spain? *Journal of Rural Studies*, 63-80. doi:10.1016/S0743-0167(00)00037-1

Huitt, W. (2007). Maslow's hierarchy of needs. *Educational psychology interactive*, 23.

Ickinger, W., & Morris, S. (2001). *PSYCHOLOGICAL CHARACTERISTICS AND INTERPERSONAL DISTANCE.* Tulane University .

Jiang, G., Ma, W., Dingyang, Z., Qinglei, Z., & Ruijuan, Z. (2017). Agglomeration or dispersion? Industrial land-use pattern and its impacts in rural areas from China's township and village enterprises perspective. *Journal of Cleaner Production*, 207-219. doi:10.1016/j.jclepro.2017.04.152

Jones, R., & Heley, J. (2016). Post-pastoral? Rethinking religion and the reconstruction of rural space. *Journal of Rural Studies*, 15-23. doi:10.1016/j.jrurstud.2016.02.008

K.C.G. (2022). *Social welfare.* Retrieved from Soical Affairs Bureau of Kaohsiung City Goverment: https://socbu.kcg.gov.tw/index.php

Kremenić, T., Andlar, G., & Varotto, M. (2021). How Did Sheep Save the Day? The Role of Dry Stone Wall Heritage and Agropastorality in Historical Landscape Preservation. A Case-Study of the Town of Cres Olive Grove. *Land*, 978. doi:10.3390/land10090978

Li, W., & Samuelson, H. (2020). A new method for visualizing and evaluating views in architectural design. *Developments in the Built Environment*, 100005. doi:10.1016/j.dibe.2020.100005

Li, Y., Tang, J., & Cui, S. (2022). Dynamic Changes of Nitrogen Loads in Source–Sink Landscapes under Urbanization. *Land*, 1371. doi:10.3390/land11081371

Liu, R. (2022). Incomplete Urbanization and the Trans-Local Rural-Urban Gradient in China: From a Perspective of New Economics of Labor Migration. *Land*, 282. doi:10.3390/land11020282

Liu, Y. (2022). Space Reproduction in Urban China: Toward a Theoretical Framework of Urban Regeneration. *Land*, 1704. doi:10.3390/land11101704

Lynch, K. (1960). *The Image of the City.* Massachusetts: The MIT Press.

M.O.E. (2019). *USR.* Retrieved from Center for University Social Responsibility: https://usr.moe.gov.tw/tw

M.O.E. (2021). *K-12 Education Asministration*. Retrieved from Ministry of Education: https://www.k12ea.gov.tw/News/K12eaNewsDetail?filter=9F92BBB7-0251-4CB7-BF06-82385FD996A0&id=d93e038f-6885-4d5d-bf47-e7128350181f

M.O.E. (2021). *Study In Taiwan.* Retrieved from Ministry of Education, Taiwan: https://www.moe.gov.tw/News.aspx?n=0217161130F0B192&sms=DD4E27A7858227FF

M.O.E. (2022). *Policies.* Retrieved from Ministry of Education, Taiwan: https://english.moe.gov.tw/np-8-1.html

M.O.F. (2010). *Campus Community Reconstruction Plan*. Retrieved from Department of Planning: https://www.edu.tw/Default.aspx

M.O.I. (2022). *Dept. of Household Registration*. Retrieved from 中華民國內政部戶政司全球資訊網: https://www.ris.gov.tw/app/portal/346

Mang, P., & Reed, B. (2020). Regenerative Development and Design. In *Sustainable Built Environment* (pp. 115-141). New York, NY: Springer US.

Meng, P., & Haggard, B. (2016). *Regenerative Development and Design: A Framework for Evolving Sustainability.* WILEY.

MEXT. (2022). 学校施設のバリアフリー化の推進. Retrieved from MINISTANY OF EDUCATION, CUCLTURE, SPORTS, SCIENCE AND TECHNOLOGY-JAPAN: https://www.mext.go.jp/en/

MINISTRY OF THE INTERIOR, T. (. (2022). Retrieved from MINISTRY OF THE INTERIOR, T.O.C. (TAIWAN): https://www.moi.gov.tw/

Modesto, A., Kamenečki, M., & Tomić Reljić, D. (2021). Application of Suitability Modeling in Establishing a New Bicycle–Pedestrian Path: The Case of the Abandoned Kanfanar–Rovinj Railway in Istria. *Land*, 600. doi:10.3390/land10060600

N.D.C. (2023). *Policies.* Retrieved from National Development Council, Taiwan: https://www.ndc.gov.tw/

NDC, T. (2023, 11 15). *National Development Council*. Retrieved from REGIONAL REVITALIZATION: https://www.twrr.ndc.gov.tw/index

Norberg-Schulz, C. (1995). *THE GENIUS LOCI.* Taipei: 田園城市文化.

Pedersen Zari, M., & Hecht, K. (2020). Biomimicry for Regenerative Built Environments: Mapping Design Strategies for Producing Ecosystem Services. *Biomimetics*, 18. doi:10.3390/biomimetics5020018

Penn, A. (2003). Space Syntax And Spatial Cognition: Or Why the Axial Line? *Environment and Behavior*, 30-65. doi:10.1177/0013916502238864

Plaut, J., Dunbar, B., Wackerman, A., & Hodgin, S. (2012). Regenerative design: the LENSES Framework for buildings and communities. *Building Research & Information*, 112-122.

Porter, T. (2004). *Archispeak: an illustrated guide to architectural terms.* London ; New York: Taylor

& Francis.

Quintana Vigiola, G. (2022). Understanding Place in Place-Based Planning: From Space- to People-Centred Approaches. *Land*, 2000. doi:10.3390/land11112000

Ramezani, S., & Hamid, S. (2010). Privacy and Social Interaction in Traditional Towns to Contemporary Urban Design in Iran. *American Journal of Engineering and Applied Sciences*, 501-508. doi:https://doi.org/10.3844/ajeassp.2010.501.508

Ramezani, S., & Hamidi, S. (2010). Privacy and Social Interaction in Traditional Towns to Contemporary Urban Design in Iran. *American Journal of Engineering and Applied Sciences*, 501-508. doi:10.3844/ajeassp.2010.501.508

Ramlee, M., Omar, D., Yunus, R., & Samadi, Z. (2015). Revitalization of Urban Public Spaces: An Overview. *Procedia - Social and Behavioral Sciences*, 360-367. doi:10.1016/j.sbspro.2015.08.187

Rosasco, P., & Sdino, L. (2023). The Social Sustainability of the Infrastructures: A Case Study in the Liguria Region. *Land*, 375. doi:10.3390/land12020375

Sánchez, Z., Gallardo, C., & Ceña, D. (2014). Rural areas face the economic crisis: Analyzing the determinants of successful territorial dynamics. *Journal of Rural Studies*, 15.

Sánchez-Zamora, P., Gallardo-Cobos, R., & Ceña-Delgado, F. (2014). Rural areas face the economic crisis: Analyzing the determinants of successful territorial dynamics. *Journal of Rural Studies*, 11-25. doi:10.1016/j.jrurstud.2014.03.007

Spader, K. (2007). Abandoned School Buildings in Rural Illinois and Their Conversions.

Spelmon, w. (1993). Abandoned buildings: Magnets for crime? *ELSEVIER*, 481-495.

Tainter, J. (2012). Regenerative design in science and society. *Building Research & Information*, 369-372. doi:10.1080/09613218.2012.671998

Tang, Y., Mason, R., & Wang, Y. (2015). Governments' functions in the process of integrated consolidation and allocation of rural–urban construction land in China. *Journal of Rural Studies*, 43-51. doi:10.1016/j.jrurstud.2015.09.010

TESAS. (2019, 1 1). *Taiwan Economic Society Analysis System*. Retrieved from TESAS: https://tesas.nat.gov.tw/lflt/vgrid

Trancik, R. (1996). *Finding Lost Space:Theories of Urban Design.* Tai bei shi: 田園城市文化.

Tsai, K.-J., Lee, M.-H., Tsai, Y.-L., & Li 4, J.-X. (n.d.). Investigation and Analysis on the Sediment Disasters Occurred at Remote Mountainous Communities of Chia-Nan Aera in Southern Taiwan. *中國礦冶協會*.

Tsai, Y., & Dewancker, B. (2020). Architectureal Design Process Combained with Social Media Technology:A Case Study on Urban Creativity and Placemaking Strategy in Taiwan. *ARTEPOLIS 8* (pp. 48-54). Indonesia: ATLANTIS PRESS. doi:DOI:10.2991/assehr.k.211126.006

Tsai, Y., & Dewancker, B. (2021). Investigation on the Regeneration Architecture Program of Abandoned Schools : An Overview into the Design of School Architecture Characteristic. *JAILCD* (pp. 7-12). Ktakyushu, Japan: JAILCD. doi:http://id.ndl.go.jp/bib/031356846

Tuan, N., & Hegedűs, G. (2022). Urbanization and Post-Acquisition Livelihood in a Peri-Urban Context in Vietnam: A Geographical Comparison between Hanoi, Danang, and Vinh City. *Land*, 1787.

Tyack, D., & Cuban, L. (1997). *Tinkering toward Utopia. A Century of Public School Reform.* Boston: Hardvard University Press.

UN. (2022). *United Nations*. Retrieved from Department of Economic and Social Affairs Population Division: https://population.un.org/wpp/Graphs/Probabilistic/POP/TOT/900

UNFPA. (2020). *The World at 7 Billion*. Retrieved from United Nations Population Fund: https://www.unfpa.org/

Van Nes, A., & Yamu, C. (2021). *Introduction to Space Syntax in Urban Studies.* Cham: Springer International Publishing. doi:DOI: 10.1007/978-3-030-59140-3

Welch, S. T., O'bnen, M., & Brown, W. (1991). *BETWEEN SOLID AND VOID.*

Wolff, S., Mdemu, M., & Lakes, T. (2021). Defining the Peri-Urban: A Multidimensional Characterization of Spatio-Temporal Land Use along an Urban–Rural Gradient in Dar es Salaam, Tanzania. *Land*, 177. doi:10.3390/land10020177

Wood, A. (2020). Built policy: school-building and architecture as policy instrument. *Journal of Education Policy*, 465-484. doi:10.1080/02680939.2019.1578901

Zhang, D., Yu, L., & Wang, W. (2022). Promoting Effect of Whole-Region Comprehensive Land Consolidation on Rural Revitalization from the Perspective of Farm Households: A China Study. *Land*, 1854. doi:10.3390/land11101854

廃校再生ストーリーズ. (2018). Tokyo: 美術出版社.