A Study on the Direction for Regional-Linked School Complex Facilities

Jeong, Ji-Won[1][0000-0002-7938-2851] and Yoo, Hae-Yeon[2] [0000-0001-5534-4669]

[1] Dept. of Architecture, Soongsil University, Seoul, Republic of Korea
[2] School of Architecture, Soongsil University, Seoul, Republic of Korea
zenism@ssu.ac.kr

Abstract. It is necessary to study the changes in school facilities in response to social needs. This is because in this process, schools are not only performing existing educational and learning functions, but also symbiotic and linked development with the region. Therefore, the purpose of this study is to identify regional and complex cases for each district for schools in Seoul, analyze the planned characteristics, and suggest the institutional and planned direction.

For this study, reports and data analysis, field case studies, and consultations with officials of the Seoul Metropolitan Office of Education were conducted through literature research. The procedure of this study is as follows. First, this study investigated and analyzed the emergence and necessity of school complex facilities in Korea. Second, the current status of school complex facilities conducted at elementary, middle, and high school levels in Seoul was analyzed. Third, the types were divided according to the planning characteristics, and the characteristics and limitations of the main cases were analyzed. Finally, the direction of improvement was proposed in terms of planning and institutional aspects.

The results of examining 103 schools in Seoul are as follows. First, the number of projects decreased from a specific year, and second, the complexation ratio was lower than the total number of schools, and there were variations by region. Finally, similar programs were combined. Based on this, the institutional and planned direction of the regional-linked school complex facilities was proposed.

Keywords: Regional-Linked, School Complex Facilities, Smart Living-Lab.

1 Introduction

1.1 Background and Purpose

Recently, in Korea, various programs for education, such as education systems and programs, are being developed along with the reorganization of the curriculum in 2022. However, the operation of uniform educational spaces, modular classrooms, and closed

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school facilities is still emerging as a problem. Therefore, there is a growing demand for improvement in school spaces and uniform facilities that need improvement.

In particular, the "High school credit system" has been introduced at the high school level, and various types of "Optional subjects" are being applied. At the middle school level, the curriculum is being reorganized so that students can decide their own career paths through the "Free school year program." At the elementary school level, children's emotional development, tendencies, and academic ability are promoted, focusing on the introduction of "After-school programs" and "Play-oriented schools." In addition, demands for changes in school space, such as the development of smart devices and response to infectious diseases caused by COVID-19, are continuously being made.

It is also necessary to study the changes in school facilities in response to social needs. This is because in this process, schools are not only performing existing educational and learning functions, but also symbiotic and linked development with the region. In particular, the decrease in the school-age population and the lack of empty spaces in urban spaces were need for changes. So it is necessary to study the direction of regional-linked facilities and space design using the school's playground, empty classrooms, and spaces.

Therefore, the purpose of this study is to identify regional and complex cases for each district for schools in Seoul, analyze the planned characteristics, and suggest future development directions.

1.2 Methods and Procedures

For this study, reports and data analysis, field case studies, and consultations with officials of the Seoul Metropolitan Office of Education were conducted through literature research.

The procedure of this study is as follows. First, this study investigated and analyzed the emergence and necessity of school complex facilities in Korea. Second, the current status of school complex facilities conducted at elementary, middle, and high school levels in Seoul was analyzed. Third, the types were divided according to the planning characteristics, and the characteristics and limitations of the main cases were analyzed. Finally, the direction of improvement was proposed in terms of planning and institutional aspects. The scope of the study is 103 schools in Seoul. This is the sum of 60 elementary school, 30 middle school, and 15 high school. In terms of timing, part or all of the facilities were planned through complexation after 2000, and schools shared with the local community were studied.

2 School Complex Facilities in Korea

2.1 Appearance and Necessity of School Complex Facilities in Korea

Total birth rate decreased by 0.852 in 2021(0.808) compared to 1985(1.66), while the school-age population (6-17 years old) also decreased by 4,910 in 2021(5,442) compared to 1985(10,352) in Korea. As a result, as the extra space of the school increased,

the land area for education per student increased, and unused classrooms appeared as problems.

As the number of students decreased, interest in space utilization increased, and the Ministry of Education has been carrying out the "School Space Improvement Project" since 2018 to solve various problems. In addition, since 2015, individual local governments have been carrying out various small and medium-sized space improvement projects considering the characteristics of each region.

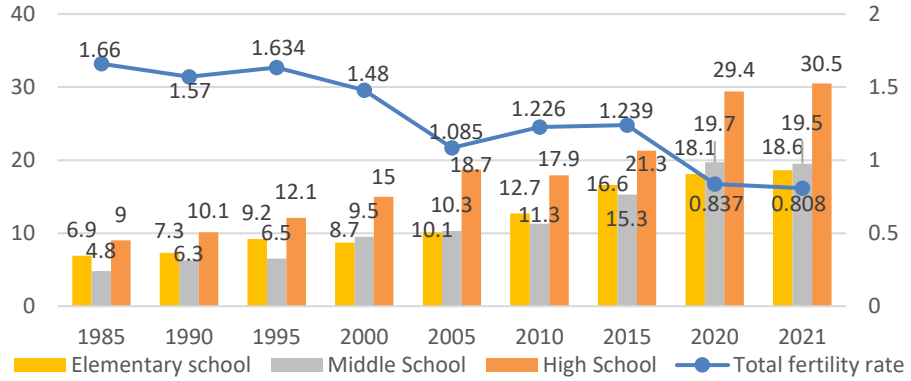

Fig. 1. Total fertility rate and School site area per student by school level [1,2]

After 2019, as the COVID-19 situation faced, it took on a new aspect, not the existing school and classroom. In this process, other problems were raised, such as the absence of a comprehensive promotion model linked to the curriculum, the demand for fundamental changes in the learning space, and the lack of digital environment-based infrastructure. To solve this problem, a new type of school space improvement project called "Green Smart School (GSS)" was promoted in 2020. At that time, "Green Smart School" was one of the top 10 representative projects of the Korean New Deal project, and it was a project to renovate and remodel old schools that have passed more than 40 years.

The core elements of Green smart School are divided into five areas: "Space Innovation (Restructuring), Smart Classrooms, Green School, School Complexation, and Safety." Among them, school complexation is linked to the Living SOC (Social Overhead Capital) complex project. The Living SOC Complex Project is one of the core tasks of the Living SOC Three-Year Plan ('20~'22'), and the Living SOC project was implemented to alleviate the lack of infrastructure and regional gaps that promote the benefits of the people in daily life. In this process, problems such as difficulty in securing new sites, excessive construction and operation costs, and overlapping functions and programs occurred to expand infrastructure.

In order to solve these problems, "Living SOC Complex Facility" was promoted. The term "Living SOC Complex Facility" means a project to build two or more living

SOC-related state-funded projects[2] on one site as a single or linked facility [3]. A total of 530 projects[3] were selected from 2020 to 2022, and the complexation will be carried out through three methods (**Table 1**). By combining facilities(functions) that existed on different sites into one site and planning them as a complex building, it is easy to secure the site, economical, link functions and programs, and increase the efficiency of movement (**Fig. 2**).

The Living SOC Complex Facility Project is divided into four categories: 1. specialized in cultural and sports facilities, 2. specialized in welfare facilities, 3. complex of school facilities, and 4. complex of public rental housing. Among them, the aforementioned Green-smart School's core elements, the school complexation and the school facility complexation of the life SOC complex project, are linked. Through school complexation, it was used as a complex facility suitable for local community demand to respond to the decrease in the school-age population and ease the burden of securing local governments sites. The Living SOC complex facility is not just a place where functions and facilities are shared and used together, but is meaningful as a place where residents of various classes gather to express life innovation through communication and exchange.

Table 1. Type of living SOC complex facilities [3]

Verticality Complex	Horizontal Complex	Duplicate Complex
Use1 Use2	Use1 + Use2	Use1 Use2 + Use3

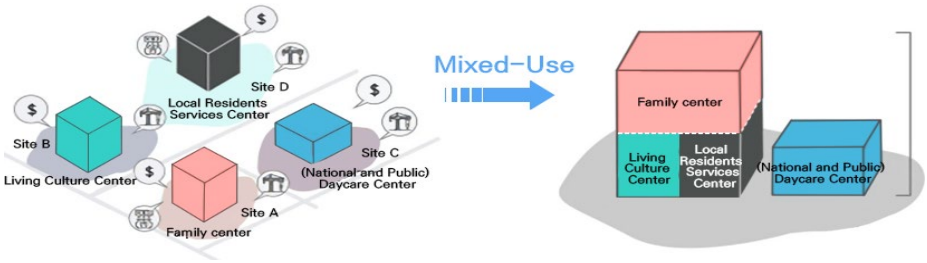

Fig. 2. Concept diagram of living SOC complex facilities [4]

As the school's role as an urban hub facility is re-examined, it is very significant that the shortage of alternative spaces has been resolved through school-community linkage amid rapid urban development.

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[2] There are 13 types of facilities subject to complexation, including public libraries, small libraries, national sports centers, living and cultural centers, national and public daycare centers, care centers, and parking lots [3].

[3] 289 cases in 2020, 149 cases in 2021, and 92 cases in 2022 [5]

2.2 A Preliminary Study on the School Complexity in Korea

The following table shows previous studies conducted in Korea regarding school complexation. As a result of examining previous studies, it was confirmed that the connection between local residents (local facilities) was important through the complexation of school facilities, and safety issues were also being studied.

Table 2. A preliminary study on school complexity

Author (Year)	Contents
Reigh, Y., B. (2011) [6]	• Development of complex sharing of facilities and education programs for local residents through the complexization of school facilities. • Based on coexistence and sharing with the community, it is necessary to pursue sharing of communities and facilities, sharing of education, sharing of talents, and sharing of values.
Hwang, S., H., Park, S., B. (2010) [7]	• Various usage needs are analyzed according to the characteristics of local residents. • As demands for various types of facilities appear according to the characteristics of local residents, it is necessary to provide types of facilities not provided in the local community.
Lee, J., Y., Kim, Y., H (2018) [8]	• An analysis of the necessity, operation system, and space of the opening and complexation of school facilities through the connection between school facilities and the community identifies external factors that cause problems and suggests solutions accordingly
Kim, J., S., Yoo. H., Y. (2020) [9]	• Proposed community-linked school facilities. • Emphasize connection within the region through connection with idle spaces in the region.

As the need for school complexation increased, the Ministry of Education enacted the Act on the Installation, Operation, and Management of School Complex Facilities (School Complex Facilities Act) on March 24, 2020. The School Complex Facility Act aims to contribute to the development of schools and communities by installing facilities that students and local residents can use together in accordance with Article 1 (Purpose). In addition, an online matching platform was established on January 2021, which connects the Office of Education with the idle school site and local governments wishing to utilize the school site [10]. Fig. 3 shows the current status of the nationwide complexation of school facilities as of January 31, 2021. It can be confirmed on school complexity, and it can be confirmed that school complexity was mainly conducted

around elementary school. Accordingly, the school complexity was intended to analyze Seoul.

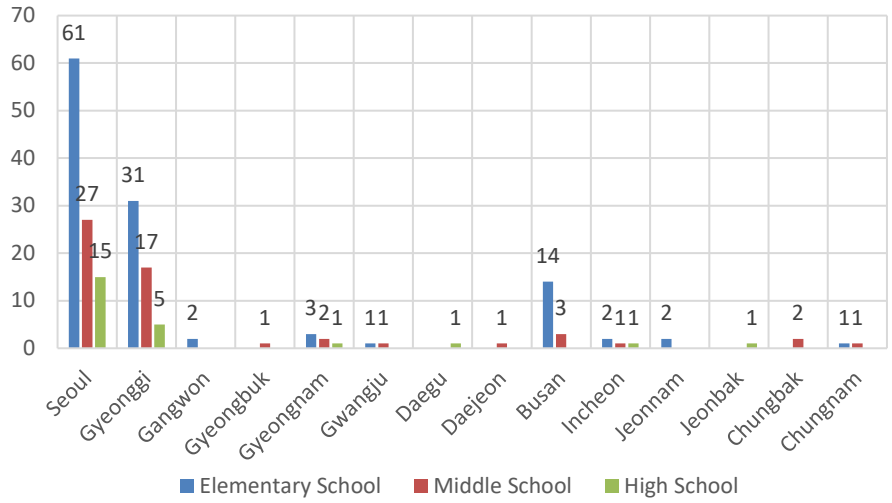

Fig. 3. The status of school complex facilities in Korea [11]

3 Status of School Complex Facilities in Seoul

As of 2022, the current status of school facilities in Seoul is as follows, and a total of 103 schools have combined school facilities in Seoul.

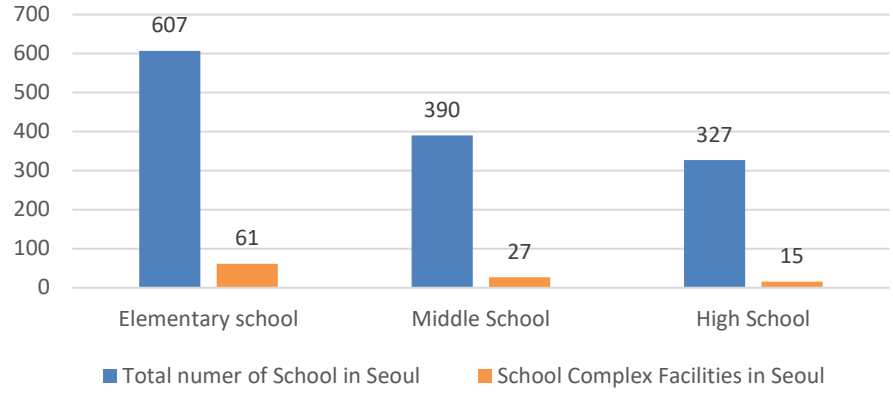

Fig. 4. Total number of school facilities and complex facilities in Seoul

3.1 Current Status of School Complexation by Year

In Seoul, the complexation of school facilities began in 2001 and began in earnest in 2004. Since then, the largest number of complexes has been combined to 19, but the number of complexes has decreased again since 2006.

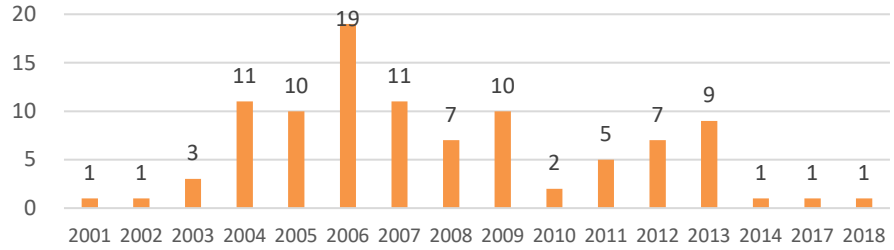

Fig. 5. Number of school complex facilities in Seoul

3.2 Current Status of School Complex Facilities by District

In order to examine the current status of complexation by autonomous district, the ratio of school complexation is summarized as shown in Fig. 6. Three out of 25 autonomous districts in Seoul did not integrate schools, five autonomous districts with less than 5%, four autonomous districts with 10.1-15.0%, and two 15.1-20.0%. There were 10 autonomous districts with 5.1 to 10.0%, and 1 autonomous district with 20% or more was Gangbuk-gu. Through these analysis results, it was found that the progress of school complex facilities varies greatly depending on the region.

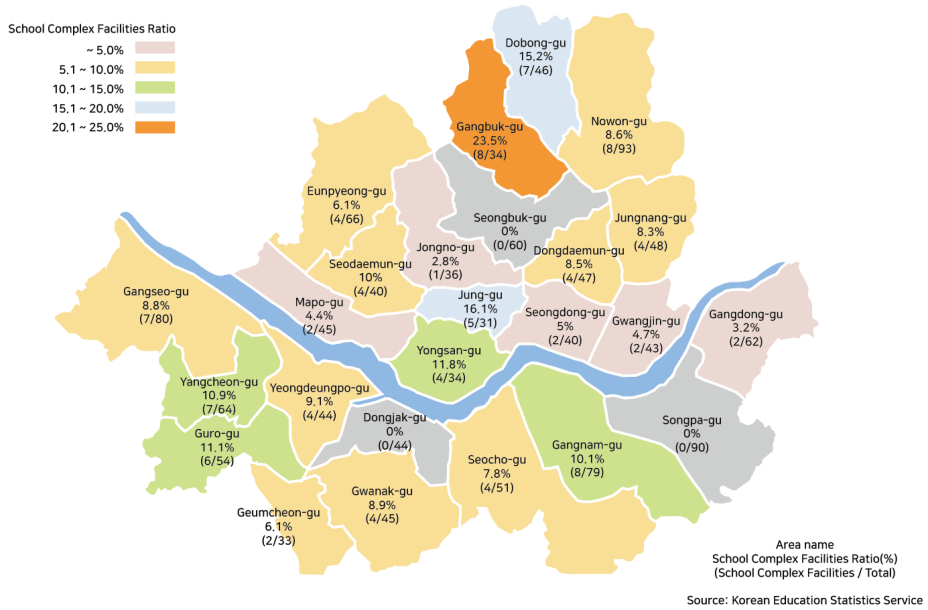

Fig. 6. A Diagram of the school complex facilities by autonomous region in Seoul

3.3 Current Status of School Complexation by Programs

As a result of examining 99 complex facilities, it is divided into three types of complex facilities: underground parking lots, sports facilities, and cultural facilities. Among them, sports facilities are the most common, followed by underground parking lots and cultural facilities. In the case of sports facilities for all, it occupies the largest number of auditoriums (sports centers) in existing schools.

In the case of cultural facilities, they were created along with other facilities, and there are significantly fewer cases where there are only cultural facilities. In addition, most of the programs configured were similar.

Fig. 7. Daedeok elementary school auditorium and library / Nanwoo middle school public parking lot[12, 13]

Table 3. Depending on the program & area

Area	A	B	C	A, B	A, C	A, B, C	Total
~ 1,000㎡	13						13
1,001㎡ ~ 3,000㎡	22	2	2	8	3		37
3,001㎡ ~ 5,000㎡	1		6	4	2	3	16
5,001㎡ ~ 7,000㎡			3	1	4	2	10
7,001㎡ ~ 9,000㎡			3	2	2	4	11
9,001㎡ ~ 11,000㎡			1		2	1	4
11,001㎡ ~						8	8
Total	36	2	15	15	13	18	99

(A: Sports facilities for all living / B: Cultural facilities / C: Underground parking lot)

4 Direction for the Integration of Regional-Linked School Facilities

The results of analyzing the current status of school complex facilities in Seoul are as follows. First, it started in 2001 and proceeded in earnest in 2004, but the number of projects has decreased sharply since 2016. Second, about 5.1-10% of the total school facilities were complexed, but there were significantly fewer places where the complexation took place and the regional variation was severe. Lastly, there were the largest

number of sports facilities to utilize existing auditoriums and playground facilities, followed by complex facilities that combine sports facilities, cultural facilities, and underground parking lots. However, most of them consisted of similar programs.

Based on these current status and limitations, this study would proposed a planned and institutional direction for the complexation of school facilities.

First, institutional incentives for school complex facilities should be provided. Regardless of the species of the zone, it is necessary to ease the floor area ratio and the building and closing rate. In addition, during the construction period of large-scale facilities, for the safety of students, the local education office's policy is also needed to conduct construction with a gap of one to two years after existing students graduate. In this case, cooperation from nearby schools must be made. In addition, it is essential to improve the stability, aesthetics, and environmental aspects of temporary teachers (modular teachers), which have recently become issues.

In addition, the direction in terms of planning is as follows. Appropriate programs should be provided in consideration of regional characteristics. In addition, a participatory design in which local residents participate on their own and set up planning and programs should be applied. In particular, an alternative is needed so that residents and schools can operate the "Living Lab" to proceed with the process and operation after completion. This is to minimize the possibility of civil complaints and to ensure sustainability as a regional hub facility. At this time, when preparing a hub facility, it shall be carried out in consideration of the safety of students, such as movement plan and opening time.

5 Conclusion

As the Korea’s step by step education curriculum continues to change, the absence of architectural spaces or uniform educational spaces that support this are becoming a problem. In addition, as the number of students decreases, interest in space utilization is increasing. The school space is changing according to these changes in the times and social demands, and the government has started to carry out the "Green Smart School" project. One of the main areas of this project is school complexation, and this project is linked to the "Living SOC Complexation Project". By compounding various facilities in one building, it is easy to secure a site, link functions and programs, and the efficiency of movement is high.

Accordingly, school complexation is necessary in that it can be solved by implementing a sustainable city and re-examining the role of the school as an urban base facility, and using insufficient space as a school space.

For this study, the results of examining 103 schools in Seoul are as follows. First, the number of projects decreased from a specific year, and second, the complexation ratio was lower than the total number of schools, and there were variations by region. Finally, similar programs were combined. Based on this, the institutional and planned direction of the complexation of regional-linked school facilities was proposed.

Above all, it is used as a school complex as a regional hub space by incorporating a smart living lab that allows local residents to continuously participate from planning to

post-construction operations and record, maintain, and manage local changes. This study is expected to be used as basic data for the introduction of new programs to complex facilities.

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