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Planning and Furnishing of School Facilities to Support Learning Transformation

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Abstract: Recently Japanese schools are returning to hands-on experiences, project-based learning, and authentic educational opportunities for children while cultivating environments that encourage students to be innovative and critically thinking through science, technology, engineering, arts, and mathematics (STEAM) education. Given that schools are one of the key learning media, it is crucial to consider the construction and design of the school space in response to the learning transformation in Japan. This paper outlines the preconditions for nurturing a ubiquitous environmental strategy that permits learning at anytime, anywhere, by anybody, and about anything.

Keywords: Learning transformation; Ubiquitous/whole school diverse learning space; Integrated and compulsory education schools; Community schools

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1. Introduction – learning transformation

An overview of new developments related to school activities in Japan can be summarized as follows: (1) the revision of the study course with an emphasis on "independent, interactive, and deep learning" based on the development of living ability, as well as new learning content such as programming and foreign languages and the development of information application skills, the establishment of one terminal per student and high-speed telecommunications networks to promote "individualized learning", the implementation of flexible learning instead of the one-size-fits-all class format, and the promotion of individualized and collaborative learning through Global and Innovation Gateway for All (GIGA) school concept that fosters science, technology, engineering, arts, and mathematics (STEAM) education; (2) the reformation of educational methods and the establishment a multiple school system through the creation of compulsory education schools, integrated schools, etc.; (3) the development measures consisting community schools and regional schools' cooperative activities as well as curricula open to society, etc., to transform the content, methods, and management of learning, including the proactive and multifaceted participation of local community in school management and activities, supporting children's learning and growth throughout the community, and promoting lifelong learning and community development with schools as a base.

The Japanese society aims to: (1) transform mass-based uniform and equal education into individualized, personalized, and optimized learning based on differences in each child's interests, concerns, and abilities; (2) shift from "passive education" in which children absorb knowledge through traditional fixed learning styles to "active learning" in which children actively and independently construct their own

knowledge systems; (3) foster the children's ability to live in society; and (4) respond to internationalization and informatization. To achieve this, there should be a fixed limit on the number of students allowed in a single classroom or group setting. Additionally, there should be major changes made in learning forms and teaching methods for greater flexibility, diversity, and particularity, including group formation, content, methods, progress, and learning material.

Individual, proactive, and collaborative learning is supported through the expansion and deepening of new measures that include the three components of "people involved in schools," "school functions and activities," and "the (social and physical) space and domain of the school," as well as the diversification and advancement of "learning media" in the broad sense as the totality of people, goods, and services related to the school. The "people involved in school" can be increased and diversified, in particular, through the involvement of local human resources and organizations in compulsory education schools' activities (young to old residents, parents, neighborhood associations and community organizations, nonprofit organizations, private companies, groups, institutions, etc.), the integration of elementary and junior high schools leading to an expansion of the children age range in compulsory education schools and integrated schools as well as the formation of a diverse group of teachers (which has not been the case in the past), and the connection through exchanges and guidance with remote areas via the Internet.

The movement for change can be said to be about enhancing the school and its collaborative nature if publicness is defined as the human and functional expansion of the school, and collaboration is defined as the overlap of the connections among people, goods, and services related to the school. It is expected to revitalize, diversify, and advance school activities, which may lead to a significant change in the image of schools. Toward such learning reformation, the following section focus on school space, which is (or should be) positioned as one of the various learning media, and consider its nature in relation to the expansion and deepening of "people involved in schools" and " school functions and activities".

2. The plan for "ubiquitous/whole school diverse learning space"

The formula [LS (Learning Style) = nTC (Teaching class) → TC = LS/n] shows a shift from the conventional learning style (LS: Learning Style), which is based on a one-size-fits-all format of classes (TC) being developed in several classes, to one in which one-size-fits-all teaching is one of the various learning styles (1/n). On the other hand, the corresponding learning opportunities are considered to be as follows equation: [LP = nCR → CR = LP/n], where the Learning Place (LP) used to consist of only several classrooms (CR) is shifting to the classroom being one of the learning places (1/n). A learning environment that corresponds to the diversification and flexibility of learning styles, where independent, individualized, and collaborative learning can take place, should break away from the monotonous and uniform structure of classrooms and corridors to create an intellectually stimulating environment that is full of change, diversity, and place. In addition, it is necessary to create a ubiquitous learning environment where students are allowed to learn "anytime," "anywhere," and "whatever" they want. In order to respond to this change, it is necessary to expand and develop learning spaces, which used to consist mainly of regular and special classrooms, into all areas of the school and the school as a whole, including multipurpose spaces (open space, workspace, etc.), hallways and alcoves, open classrooms, library, multipurpose rooms (lunch rooms, multipurpose halls, etc.), stairways, gymnasiums, semi-outdoor spaces, outdoor areas, and so on. In addition, the open interconnectedness and overlap of learning sites will enhance the ease of accessibility and learning sequences (continuity and development).

Moreover, the quality of the learning environment is greatly affected not only by spatial planning but also by the way teaching materials and equipment are arranged. Appropriate learning media (books, ICT, materials, displays, artwork) and appropriate furniture for each place and subject are provided to stimulate the students' motivation and awareness to learn and develop their own independent learning. This paper

will introduce the concept and specific methods of planning and furnishing each space in the school to accommodate the diversification of learning styles.

2.1. Creation of multifunctional areas around the classroom

Regular classrooms with desks and bag racks in a limited area restricted the development of learning from a traditional one-size-fits-all format to individualized, optimal, cooperative, independent, interactive, and deep learning. The multipurpose spaces planned (or to be planned) around classrooms and vacant classrooms with ambiguous uses alongside regular classrooms are required to be viewed as continuous and integrated spaces that share roles with regular classrooms, which are the place for simultaneous classes with diverse and flexible learning styles. Hence, learning is developed in an open-ended manner through (1) a variety of group formations, including individuals, groups, small groups, grade levels, different age groups, as well as local- and Internet-mediated partners; (2) a variety of learning methods, such as moving from the same progression and content to individualized progression and content, from knowledge impartation to researching learning, information utilization, interactive and hands-on learning, from dynamic and static learning to regional cooperation, etc.; and (3) a variety of specialized group teaching systems in addition to classroom and subject homeroom teachers, including team teaching, peer teaching, regional collaboration, and remote instruction via the Internet.

For this purpose, the following ideas for planning and furnishing classrooms as well as creating spaces with a variety of affordances are required.

(1) The entire area will be a learning area for one grade level, ensuring continuity and unity within the classrooms while maintaining a cohesive space that can accommodate a variety of activities.
(2) The overlap between the passages of different grades, etc., and the entry and exit passages of the classrooms should be avoided.
(3) The use of multipurpose spaces and open classrooms with a variety of characterizations such as static (quiet and calm) or dynamic (spaciousness and smoothness), enclosed or open spaces, with good or poor visibility, bright or dim lights, wide or narrow spaces, and high or low ceilings according to the scale of children (**Figure 1**).
(4) The multi-purpose space, in particular, is to be used by the entire grade level as a common area for mutual class use.
(5) The entire space should be designed with high sound absorption specifications, and the location and shape of the multipurpose space should be designed to avoid disturbs to the classroom due to sound and sight lines. In addition, storage lockers (bag racks, spaces, and dens), and partitions such as glass doors should be provided in the buffer zones between classrooms and multipurpose spaces.
(6) Various quiet spaces such as soundproofed rooms or dens/alcoves should be provided around the classrooms for small group study.
(7) In addition to the spatial planning, the space should be divided into sections or areas for activities by arranging stackable or individual furniture, including movable tables (large, individual, combination) and chairs, movable display and storage shelves, whiteboards and bulletin boards, movable partitions, etc. depending on the appropriateness of location and content of activities (**Figure 2**).
(8) Sufficient and appropriate learning materials such as books, computers, printed materials, resources, equipment, and teaching aids should be provided.
(9) Classroom functions should be differentiated instead of combining the areas of learning, living (eating, resting), storage, notifications, etc. For example, locker spaces (bag racks) and wet areas (sinks) should be planned separately from the learning areas as they tend to disrupt the learning atmosphere.
(10) Alternatively, the learning and living area can be improved by expanding the size of classrooms from the traditional > 60 m^2 to > 80 m^2 (100 m^2 is also possible), providing a variety of places within the

classroom, accommodating larger individual desks, and increased storage.

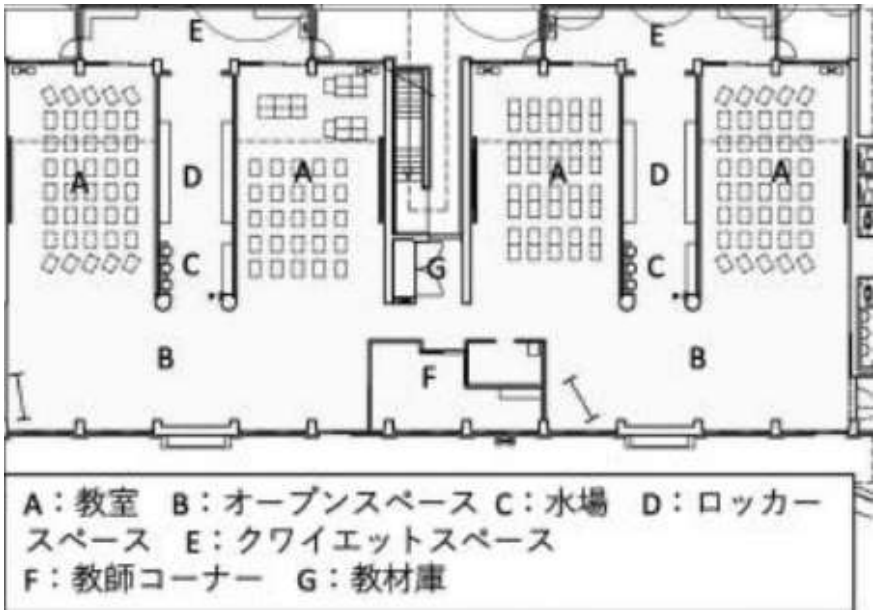

Figure 1. Various places around the classroom, A: regular classrooms; B: open spaces; C: wet areas (sinks); D: locker spaces; E: quiet spaces; F: teacher's corner; G: storage for teaching aids

Figure 2. Open spaces arrangement

2.2. Openness and continuity of media space/media networks

The quantitative and qualitative enrichment of learning media is an indispensable requirement for independent learning and the development of information utilization skills. For example, special classrooms, preparation rooms, resource rooms, and reference rooms, which are the treasure troves of learning media, should be designated as media spaces, and existing experimental and practical equipment as well as teaching materials (excluding hazardous materials) that are stored there should be openly displayed around special classrooms and preparation rooms so that they are easily accessible to students and readily available for use at all times. In addition, it is effective to create a learning network by deploying various learning

media continuously, openly, and according to the characteristics of the place throughout the school. For example, the library, which is a place to store and read books and whose opening hours are limited to midterm, lunchtime, and after school, can be transformed into a learning media hub equipped with equipment and resources at all times to enhance opportunities for use.

2.2.1. Library and media center

The library can be transformed into an open and highly visible space in the center of the school, as a learning media hub, so that it can be easily accessed as needed. A rich environment that can accommodate a variety of reading styles and ways of spending time, as well as provide a place for a variety of activities such as reading, research, subject study, group study, ICT education, after-school study, creative writing, and formal and informal interactions between students of difference grades should be cultivated. In other words, it is considered a media center equipped with a variety of learning materials, including not only books but also equipment and resources. In conjunction with this, a reevaluation of the computer room that is often located adjacent to the library is required. The provision of one terminal per student will decline the usage of the computer room, which is based on the one-size-fits-all learning as well as fixed table arrangement corresponding to the desktop type, leading to a revamp as a learning common integrated with the library for flexible accommodation of various learning styles and ways of spending free time, such as interactive and research learning, group learning, ICT education, and exchange activities. Hence, movable furniture (chairs, tables, shelves, etc.), whiteboards, bulletin boards, and projector screens should be provided, and the specifications should be such that the furniture can be freely changed according to the use of the room (**Figure 3**).

Figure 3. Library and media center + learning commons (photo: courtesy of Showa Sekkei Co.)

2.2.2. The plan for special classroom passage

Traditional special classrooms were generally built in a similar way as regular classrooms while having the same equipment and different contents and transformed into classrooms for specific subjects when they are equipped with teaching materials, equipment, furniture, and facilities corresponding to the subject. In contrast, for example, a music room should be shaped and furnished like a music hall with a stage, sound equipment, and audience sections; an arts and crafts room should be furnished as an atelier with stable

lighting, a floor that can be stained freely, and an exhibition gallery; a technical room should be designed as if they were a factory; and so on.

In addition, special classrooms are a treasure trove of equipment and resources that attract children's interest, such as experimental and practical equipment, specimens, musical instruments, and artwork. A multipurpose or alcove space is placed around the special classrooms (or a hallway may be used instead), and a media corner (MC) is set up, where learning media such as resources, works, documents, books, and computers unique to each subject are openly displayed (**Figure 4**). By making equipment and educational materials more accessible and interesting, children are more likely to drop in and use the center daily, leading to casual learning. This does not require any extensive planning, but rather a renovation of the previously closed preparation room attached to the special classroom into an open media corner and openly deploying learning media and artworks that were previously confined.

Figure 4. Science media corner in front of the science classroom

Meanwhile, it is expected that new areas of learning, methods of learning, and depth of learning will be created in the future through cross-curricular and collaborative efforts, as exemplified by STEAM education. Special classrooms, which have been used in a fixed, limited, and closed manner as subject-specific classrooms, should not only be furnished to reflect the individuality of each subject but should also be loose enough to allow students to freely select a place that transcends subject boundaries according to the content and form of activities for practical training and experiments. For this purpose, it is effective to plan a set of special classrooms and multipurpose spaces for arts and crafts and science as a STEAM education zone, arranged together in planar and three-dimensional form, and mutually open and continuous, while taking sound and contamination into consideration (**Figure 5**). The joint and integrated use of special classrooms is expected to improve the freedom and quality of learning.

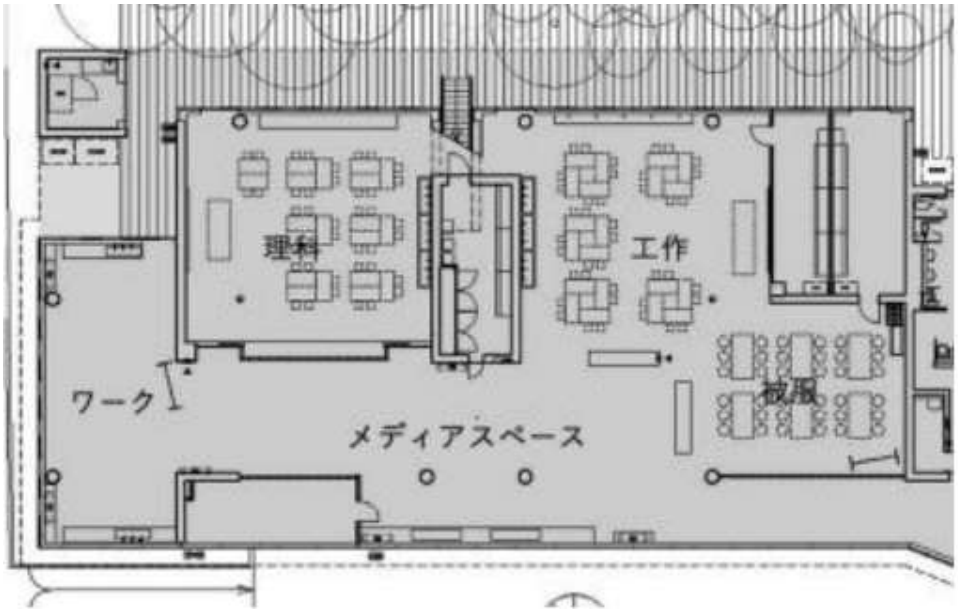

Figure 5. Open and integrated planning of special classrooms

In upper elementary school and junior high school, where academic learning needs to be enriched, it is effective to set up media corners (MCs) for subjects such as Japanese, mathematics, social studies, and English in multipurpose spaces around classrooms, vacant classrooms, or around the library media center, for example, to improve the quality of the environment for learning each subject (**Figure 6**). Subject MCs will be considered in terms of their size and the type and quantity of furniture to be available for the deployment of learning media and for class-based learning activities. These plans propose a third management method, the "subject media type," in which not all subjects have dedicated classrooms, but each subject has a stable class base and a high-quality learning environment, in contrast to the conventional two-party management method of "special classroom type or subject classroom type".

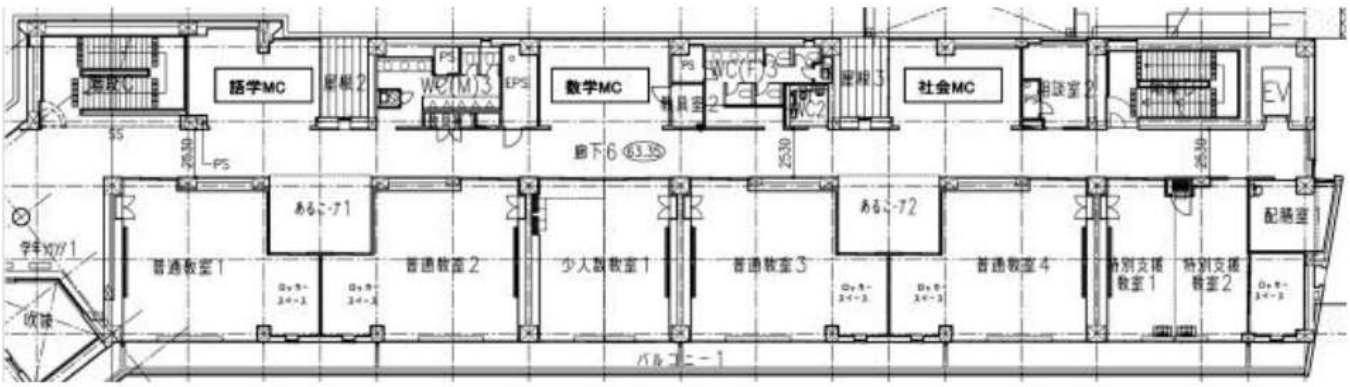

Figure 6. Subject media corner (MC) around a regular classroom (floor plan: courtesy of Ishimoto Architects Osaka Office)

2.2.3. Other multipurpose spaces and common room

Lunchrooms and multipurpose halls would be space-consuming areas with reduced use frequency if they are used only during lunch periods or for special occasions such as large-group gatherings or events. Instead, the furniture in the aforementioned computer room, including tables and chairs which are already in place, may be changed from a uniform, enumerated arrangement to a small grouping with a freely changing atmosphere, and ICT equipment, teaching materials, books, etc. are rearranged accordingly. It can be redesigned as a freely accessible place for children to utilize the ICT and expanse of the space in groups,

class units, grade level groups, and different grade level groups, and to enjoy independent and active learning and activities (dynamic learning and activities, programmed learning, presentations, local cooperative learning and activities, different grade level activities). By making the computer room a place that anyone can use freely at any time, including during breaks and after school, it will become a place for rest, self-learning, interaction with different grades and the community, and students who are not attending school.

Moreover, the small-group classrooms that have been placed around classrooms in recent years will not be used only for small-group education but will also contribute to the diversification and advancement of the learning environment, for example, by being used in combination with subject MCs and grade-level library corners.

By overlaying a variety of uses rather than sticking to fixed and limited uses following the envisioned functions, it is expected that the efficiency and sophistication of use will be enhanced and that activities and places will be stimulated with a sense of presence and diverse human connections that are compatible with the affordances of the space.

2.2.4. Media network

The subject MCs around special classrooms, the library media center, MCs on the passages, lunchrooms, and multipurpose halls will be converted from closed rooms to open media spaces, and will be connected to multipurpose spaces around classrooms, forming a “highly accessible (easy for children to see and use) learning media network” throughout the school to create a “ubiquitous learning environment”.

2.2.5. The free address system of the staff rooms

The traditional limited, fixed, mixed-function staff room with one desk per teacher for each grade level, subject area, and division of school work, where all educational and administrative work is performed, will be reviewed. With the development and utilization of ICT, it will be possible to expand usable space through shared use (sharing) of space and to divide the space by function. Conversion to a free address system will be considered, which allows the staff to freely select a space according to the content of their work and activities, the way they spend their time and the situations they face. In addition to work and office work, this will allow for easy discussions, exchanges, and breaks at any time, which will not only improve work efficiency but also facilitate communication and collaboration among teachers.

3. Planning for new school systems and school functions

Currently, schools are undergoing a transformation and development from the complete systems and functions of the past. Specifically, there is a noticeable trend away from the limited function of schools, which were designed for children of a certain age to learn and live together as a group, to the diversification and sophistication of school functions through community schools and complexes of public facilities, and to a more multilayered school system through compulsory education and integrated schools (kindergarten, elementary school, junior high school). These new trends will not only change the structure and operation of schools but also provide an opportunity to fundamentally restructure school activities and space.

3.1. Plans for integrated and compulsory education schools

The rapid spread of integrated and compulsory education schools, mainly elementary and junior high schools, has led to the development of a multilayered school system. The significance of integrated schools lies in the establishment of an educational program with continuity and systematization over nine years, and in the existence of a variety of people (students, teachers, guardians, and community), things (teaching materials and environment), and activities (learning, life, and activities) that cannot be obtained in

elementary and junior high schools alone through collaboration and integration, and in their relationship and collaboration. In addition, special exceptions to the curriculum can be utilized to create unique subject areas or to switch instructional content across grade levels. While taking advantage of the diversity and uniqueness of the people, things, and activities, a system and spatial planning is required that allows them to interconnect, collaborate, and enhance each other. Although there are three types of facilities: integrated, adjacent, and separated, this study will consider the unique planning for integrated schools and compulsory education schools, focusing on the integrated type, which has the most prominent characteristics of an integrated school.

3.1.1. Classroom passage planning according to the appropriate developmental stages

Compared to stand-alone elementary and junior high schools, integrated schools, where students in grades 1–9 study together, have more distinct differences in their respective developmental stages. A unique learning and living environment that responds to the differences in developmental stage and age, especially the organization of grade blocks that correspond to the different learning content and forms for each grade level, is required. In the lower grades, where the action areas are narrower but dynamic activities and the use of equipment are more frequent, the size of the regular classrooms should be increased (80m^2 or more) and a general classroom type should be considered where wet area, workspace, library corner, etc. are provided inside the classroom so that many learning activities can be completed in the grade blocks. In addition to the regular classrooms, a variety of places with different characteristics should be planned around the classrooms, such as expansive spaces for practical training, work, books, displays of works, and dynamic activities, as well as places that can accommodate sound, and vice versa, closed and static spaces such as quiet spaces and den/alcoves (**Figure 7**).

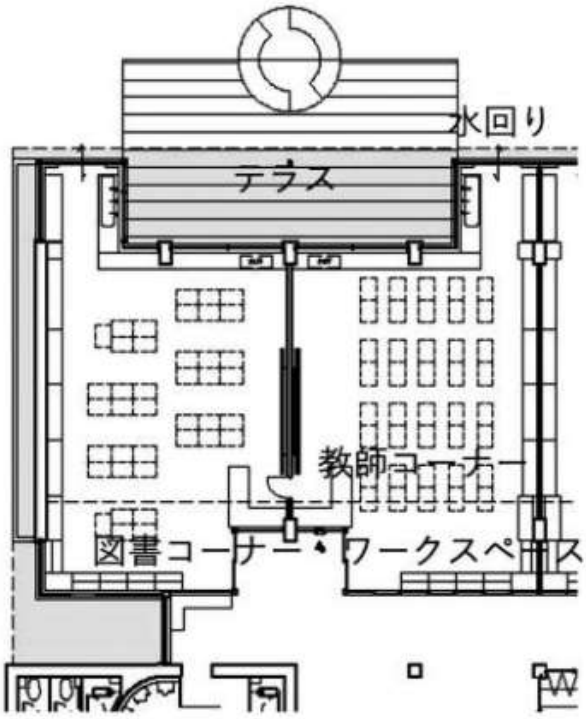

Figure 7. Integrated classroom type for lower grades

In the middle grades, where students are becoming more independent and self-directed in their learning activities with increased use of various media, a multi-purpose space is planned around the classrooms, and

subject areas with a variety of learning media are provided. In the upper grades, in response to the increasing sophistication and specialization of learning content, it is necessary to improve the quality of the learning environment for each subject area. A media corner related to each subject is placed around the classrooms. The "subject classroom type" management system in which all subjects have dedicated classrooms and multipurpose spaces equipped with learning related to each subject to accommodate various learning styles. The planning of different classroom passages for each grade level will, at the same time, make a difference in the long nine years of school life and increase awareness of grade-level progression.

3.1.2. Planning for communal use and advancement – the "1 + 1 = 3" plan

One of the characteristics and significance of integrated schools is the ability to create connections and collaboration among people, things, and activities, as well as diverse relationships among people, things, and activities, such as activities in different grade groups with large age differences, interactive classes between elementary and middle school teachers, and lower grade students showing interest in advanced teaching materials of upper-grade students. For this reason, it is effective to share the areas of elementary and junior high schools by linking, integrating, and layering them in a complementary and synergistic manner, rather than dividing them into separate and exclusive areas. This can create spaces with diverse and sophisticated functions that are difficult to establish in single elementary and middle schools. The layering and sharing of elementary and middle school facilities is an emergent plan where "1 + 1 = 3".

Instead of having separate special classrooms for elementary and junior high schools in the same shape and design, rooms for specific functions can be designated and shared between all the students. For example, a combination of a music hall for choral and ensemble performances with a music room for classroom activities, a combination of a painting room furnished with easels with a sculpture room with work benches, a combination of a gymnasium dedicated to physical education with a small martial arts hall dedicated for light exercise, meetings, theater activities, and other multi-purpose activities. By planning the practical and experimental spaces that differ in form and function from each other and have appropriate advanced levels of equipment, it is possible to fully utilize various places for various compatible activities content and the group composition (**Figure 8**). The quality and range of activities can be expanded by providing unique facilities, for example, instead of lunchrooms and multi-purpose halls, a hall with audio-visual equipment as well as presentation and ICT facilities is considered.

Figure 8. Music rooms with different shapes and functions (left: hall for ensembles and choirs; right: music room for classrooms)

The sharing of spaces not only enhances the sophistication of functions, diversifies and improves the

quality of activities but also creates direct and indirect relationships between different age groups. For example, informal exchanges are generated through accidental encounters, younger students are exposed to the advanced learning, teaching materials, and works of older students, and conversely, older students are exposed to the fun and free learning, teaching materials, and works of younger students, and they work together in vertically divided groups. The characteristic of the widening age gap in the school generates mutual stimulation. To take advantage of this, it is necessary to prepare common spaces that create opportunities for connection and to improve visibility and accessibility by carefully planning special classrooms and other spaces in crowded locations along the main passage.

3.2. Planning for community school – a "school with a community"

A shift from "schools open to the community" to "schools with a community" can be promoted by the three pillars of the community school system, cooperative activities with local schools, and "curriculum open to society," which encourage the community to use the school facilities while developing closer and more substantial cooperation between the community and the school. This will lead to the local community-led planning, preparation, and implementation of specialized, immediate, and humanistic learning and activities (regional learning, career education, and highly specialized education) that take advantage of local human resources, resources, and activities, and to the diversification, flexibility, and sophistication of learning forms and opportunities, as well as formal and informal exchange and collaboration, as described above. In addition to lifelong learning and community activities and activities in partnership with schools, it is also expected that the community will be more active than ever in casual visits to local accommodations as community hubs.

School planning and facilities based on these considerations require the same approach and methods as those for planning in response to the aforementioned diversification and flexibility of learning styles. However, unique planning methods are required to ensure both security and ease of accessibility, and that the standards of facilities are upgraded while taking into full consideration the fact that the local community actively enters the school and is involved in cooperative activities with the school.

3.2.1. Public area and security of the schools

Residents should feel free to visit the school on a daily casual basis and get in touch with the school (e.g., by observing activities, feeling the presence of the school, and meeting the school in person), which will then increase their familiarity, interest, and attachment to the school while enabling diverse, sustained, and developed collaboration, and stimulating the use of the school facilities. It is fundamental to visually and physically open the school space, plan a clear and easy access passage and a community place where people can casually drop in while ensuring school safety.

Rather than allowing the community to have free access to all of the school grounds and buildings, there should be divided into areas with tiered security (**Figure 9**). The primary security zone (SZ) is an open area that is freely accessible to everyone in the community. To increase the opportunity for community drop-ins, it is necessary to have good visibility from outside the school and an openness and welcoming plan that allows people to recognize the school's appearance, activities, and liveliness from the outside. There are examples where a town square that can be freely entered from the outside serves as a community gathering place, a buffer zone, and an entrance to the school. There are also examples where art rooms and other facilities are openly lined up along the shopping district and artworks are displayed for passersby to see, hence contributing to the creation of a lively town.

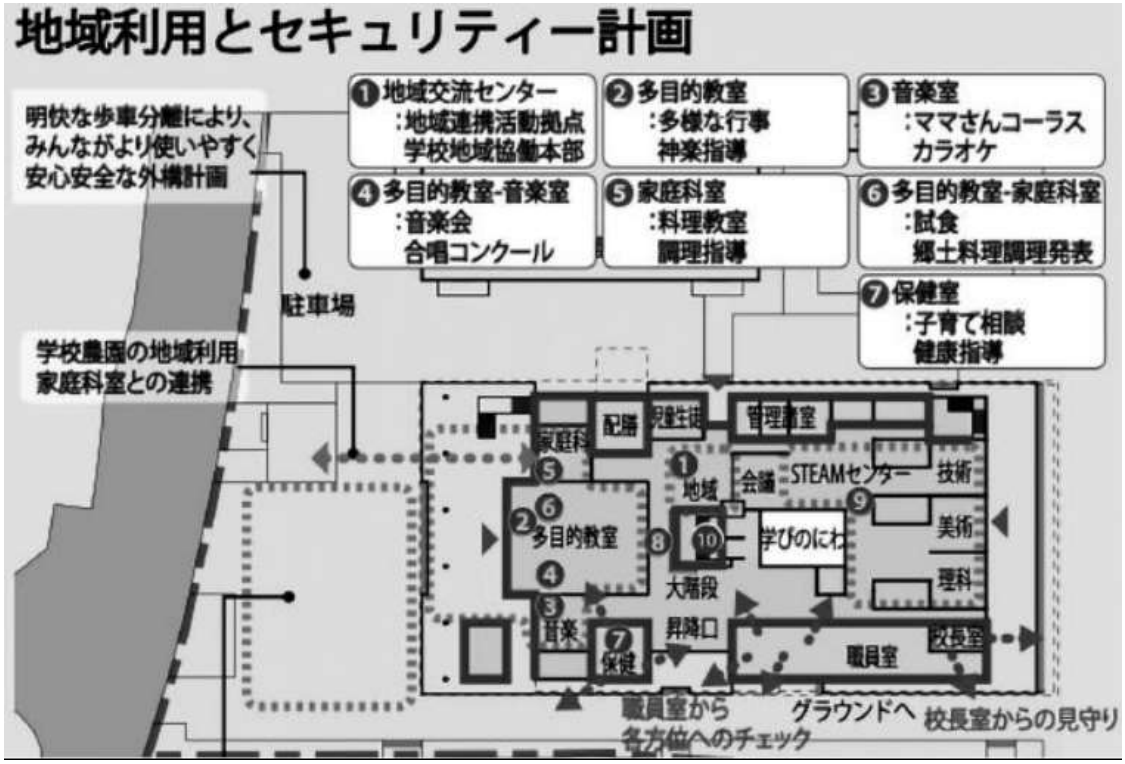

Figure 9. School security zone and community collaboration area

The secondary SZ is an area that may be entered via security checks. Security checks can be mechanical, such as auto-locks and face-to-face recognition by security guards, office staff, or residents, or procedure such as writing names or presenting name tags, or a combination of both, and the method should be considered according to the relationship between the school and the community. In the past, many secondary SZs including the library, multipurpose room, lunch room, special classrooms, etc. are accessible only during the hours when children are not in school, such as after-school, at night, and on holidays. If the development of collaboration between local schools is considered in the future, there is a need to extend the access hours to include weekday daytime, expand the common spaces that can be used by the community, and establish areas such as community exchange spaces and local accommodations that can be used proactively and centrally by the community at any time.

The tertiary SZ is an area that is off-limits to the community and generally consists of regular classrooms and administrative offices. To reduce administrative burdens and increase security, the planning of layout and passage is required so that the tertiary SZ can be made into a coherent area and managed collectively. On the other hand, with the development of cooperative activities, it is anticipated that there will be an increase in community access to regular classrooms in particular, subject to certain checks. For this reason, it is recommended to locate regular classrooms adjacent to the secondary SZ, hence avoiding overlaps of school passages within the SZ.

The primary, secondary, and tertiary SZs should be planned to be coherent, adjacent to each other, and layered, where the boundary design between the zones should be highly visible. Moreover, the main passages for children and teachers in and out of the school and the passages for community access should be separated, and a dedicated entrance for the community should be provided to clearly define the check and security zones.

On the other hand, the scope of the SZ will depend on the school's approach and management for communal use, its relationship with the community, the status of collaborative activities, and the method of security checks. As collaborative activities progress in the future, the area and frequency of communal

access may be expanded, and daily collaborative activities may be developed around regular classrooms. Therefore, a plan that anticipates future collaboration is required.

3.2.2. Upgrade of facility standards through collaboration with local schools

In response to community needs for learning and activities, schools have been playing a major role as places for sports, social education (lifelong learning), leisure activities, neighborhood associations, community activities, and welfare activities, where such community use is expected to gradually and continuously expand. Collaborative activities with the community using classrooms, special classrooms, and multipurpose rooms are also expected to become more active as mentioned above. Active use of school facilities by the local community will lead to the improvement of facilities and furnishings that are designed for local use. For example, a library can be converted into a public library with a larger collection and various reading spaces (**Figure 10**), a music room into a music hall, an audio-visual room into a theater hall or presentation space, and various art-related rooms into ateliers or art centers with attached galleries, and so on. Local collaboration will lead to the upgrading of learning environments and functions, as well as the improvement of expertise. In conjunction with the issue of restructuring public facilities in light of the deterioration of public facilities, there is a strong possibility of combining school facilities with social education, community, and welfare facilities. The diversification and sophistication of functions will promote collaboration, human interaction, and qualitative improvement and diversification of activities, and this will be further reflected in facility planning, creating a positive cycle.

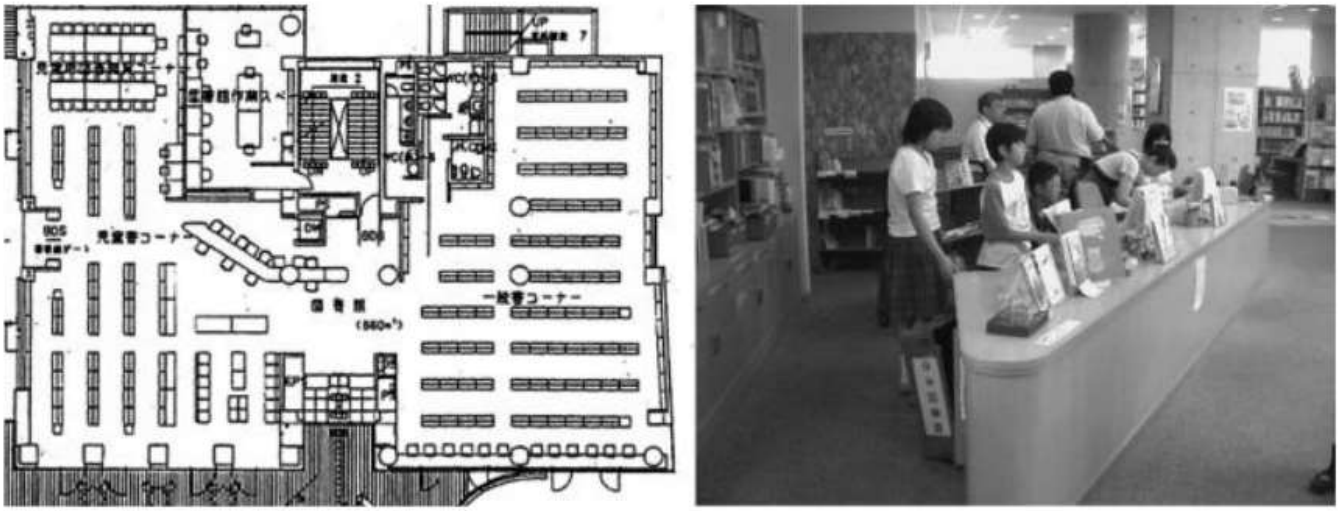

Figure 10. Integration of school and public libraries by combining with social education facilities

4. Conclusion

In the past, schools are often thought to be simply “containers for education” and that it is sufficient with just a space. However, if learning is based on the interaction of stimulus-response systems, both qualitative and quantitative aspects such as diversity, precision, intensity, and frequency of stimuli are required. In this case, the space itself is one of the important components of learning media, and its qualitative and quantitative improvement will be realized when the power of teaching and space becomes synergistically stimulating.

With hopes for the future transformation of schools, this paper summarizes the basic requirements for promoting a ubiquitous environmental plan that allows learning anytime, anywhere, by anyone, and about anything.

(1) Diversity: Planning of various places that inspire diversification open-endedness of activity, and improvement of the possibly selected places.
(2) Openness/continuity: To increase the attraction as well as the accessibility of the place, and to provide opportunities, develop, and expand the variety of activities.
(3) Communal use and multilayered nature: Vitality for diverse interaction and learning, the root of collaboration, and generation of new activities through fusion and emergence.
(4) Flexibility and resilience: Flexible response to changes in circumstances and time, ability to overcome fixed and routine situations, and ability to create novelty.

Disclosure statement

The author declares no conflict of interest.

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