Considering Social Change and Future Environment in the School Renovation Movement: A Student-Centered Approach

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Abstract
The aim of this research is to discuss a renovation model for school buildings built by Korean government design guides. Since 1950s, South Korea has experienced unprecedented population growth and rapid economic growth. The school buildings should be built very quickly to meet the demands, and the design was enforced by the public-school standardized guides for efficiency. Now in the 21st century, a new wave of social changes and desire for modern environments become a new norm for students. Therefore, local governments in South Korea step in to renovate old classrooms by introducing projects, i.e., the Dream Classroom Project of the Seoul Metropolitan Office of Education. In this study, we present three key features of school renovation, which are the aesthetic experience for creativity, biophilic, and design affordance for teaching and learning activities. Also, we provide specific cases per each approach from the Dream Classroom.

Keywords: School renovation, social change, futuristic environments, user experience design

Introduction
Recently, the 4th Industrial Revolution as a buzzword was triggered public interest by "the AlphaGo shock" in 2017. The public has seriously considered the future preparedness of their children in current school education. Current students will face a volatile, uncertain, complex, and ambiguous world where change happens quickly. To survive in the Fourth Industrial Revolution, people have the question that what the core competencies for preparing the era of the convergence of physical, digital, and biological technologies[1] are. One of the core abilities in this era is creativity. However, South Korea's education is influenced by emphasizing test-taking for college entrance examinations occurring every year in November even though the national curriculum emphasizes the creative and convergent abilities as essential 21st-century skills.

Recently, South Korea has a serious social change from low birth rates and school-aged children. South Korea has experienced rapid economic development and population growth since 1950. The explosion of the population in the 1950s to early 1980s after Korean War caused social transformation as well as lack of social resources to educate students. At that time, school buildings of all levels were built by using standardized drawings distributed by the government to quickly construct the school building till 1990s (Fig.1). The standard drawings included floor plans, elevations, sections, and structural drawings as well as prioritized the simple design to be easily applied in school construction[2]. The decrease in the school-aged population caused a decrease in the number of classroom students over the last 20 years.

In school education, student's well-being, which is a students' sense of purpose in life, self-awareness, positive emotions, and expectations, should be emphasized and considered to perform education [1]. December 4, 2019, OECD announced the results of PISA (Programme for International Student Assessment) test to measure countries' preparation of their students for the future as well as student's life satisfaction to measure their subjective level of well-being. The survey for student's life-satisfaction showed that students in South Korea showed very low level of life satisfaction. As the

Figure 1. Standardized school building and classroom arrangement in 1975 (Lee, 2009).

primary venue, schools need to play a role in promoting students' life satisfaction with engaging activities, a positive school climate, and a place for positive experiences. These social changes in South Korea lead society to reconsider current school environments with a futuristic approach to make them better for students. One of the representative movements in South Korea is the renovation of schools built by adapting standardized drawing.

School Renovation Movement in South Korea

The functions and needs from school space tend to reflect upon the social change (i.e., how to increase creativity, the decrease of the school-aged population, and low well-being perceived by students) as public facilities considering the requirements and circumstances for student's successful growth. Recently, local governments in South Korea are renovating classrooms of public schools built in standardized drawings on the school building plan, such as the Dream Classroom Project from the Seoul Metropolitan Office of Education (since 2017), the Renovation Project for Future Education from the Daegu Metropolitan City Government (since 2018), the AJIT project from the Gwangju Metropolitan City Government (since 2018), Byul-Byul-Space project from the Pusan Metropolitan City Government (since 2018), and other local projects. Further, these projects recently led a national project of renovating schools with 18 billion dollars on the renovation and construction of 1250 schools until 2023. According to the Ministry of Education in 2019, old school facilities (total 68,577) are built in 30 year-ago (total 23,136, 33.7%). The Ministry of Education emphasizes that school space, particularly old-school facilities, should be restructured and renovated to answer social changes and to prepare future through improving flexibility for student-centered educational activities including learning, playing, and resting. Further, the renovation of old school space can make opportunities to teach and learn in innovative ways. Collaborative, active engagement and personalization of students in the current national curriculum are difficult to implement in traditional classroom space of classroom module in 9 X 7.5 m, height of the story in 3.3 m, and width of the corridor in 2.5 m under standardized spaces.

The Dream Classroom Project from the Seoul Metropolitan Office of Education (Fig. 2) was the founder of this movement in 2017. The project to renovate old-school spaces is individually directed by architects hired by the local government, who are qualified as public architects, award-winning architects, or other qualified architects. The master plan and planning process are managed by officials of the Office of Education and master architect. Each architect operates a school-based process including user-participatory design workshops, foundational design, and post-monitoring of design. The overall processes of Dream Classroom Project are as follows: (1) architect selection for each school, (2) officials and architects meeting, (3) analysis of target schools by architect and officials, (4) workshops for user experience design (students, teachers, and parents), (5) confirmation of the renovation design, (6) renovation by the Office of Education, (7) completion of the renovation by the Office of Education, and (8) post monitoring by the Office of Education.

Figure 2. The Dream Classroom Project from the Seoul Metropolitan Office of Education.

Design Approaches

Aesthetic experiences for creativity

Aesthetic experience with sensibility is important to improve student's creative thinking and learning because the experience can influence student's thinking skills and behaviors [2]. Classroom space and design can affect student's attitudes and learning outcomes in various ways such as motivation to in school activities, general satisfaction, learning progress and achievement, and creativity. Particularly, physical school environments can stimulate student's imagination and creativity in terms of exposing to the physical school environment for fostering creativity with the following aesthetic design elements in the space: Furniture, indoor plants, colors, windows with views on nature, daylight, positive sounds, and pleasant smells. These elements can inspire students' certain creative behaviors, classroom climate, and thinking. In the school space considering aesthetic experiences for creativity, students can have the experiences of detecting patterns, combining unrelated ideas, and creating artistic works through the fusion of thought and feeling in the space. These experiences can enhance students' imagination and colorful thinking in the classroom, further influence innovative thinking and behaviors. To provide an aesthetic experience for creativity, there are four considerations in designing school space as the follows: (1) space for stimulation and inspiration supporting student's non-verbal means, reinforcing messages, attitudes, and values in the space, (2) space for reflection and thinking allowing students to refresh and recharge, (3) space for sharing and collaboration encouraging the sharing of information and knowledge in a non-hierarchical way and engineering collisions, accommodating impromptu get-togethers, sharing thinking, and cross-functions, and (4) space for playing, connecting and exploring allowing students to attempt deep exploration and experimentations as well as to build relationships without stress[3].

This designing approach applied to many cases in the Dream Classroom Project from the Seoul Metropolitan Office of Education in 2017. In fig. 3 (a), the renovation concept of the Myundong Elementary School is "Inside out in the game of hide-and-seek" to find hidden color and feeling of the color as a journey. Through remodeling classrooms and open classrooms, which are the main spaces for students, creative space was created. A space for playing in the school building was designed with the concepts of game, emotion, and communication and was suggested as a model of future education space. The concept of separated spaces for 1st graders of three floors was recreated with a differentiated theme per each floor. The theme of the 2nd floor is quiet space as reading activities, and the 3rd floor is designed for dynamic and physical activities as a play area. On the 3rd floor, the lower space of the slide and the space with the maze was equipped for personal relaxation. The 4th floor which is the same size as the 3rd floor, has a stage space for watching the video together because upper and lower graders overlap in the corridor. Seven classrooms were designed to be a space for active and smooth communication as well as students' creativity. In order to secure a space for autonomous thinking and exhibition space, the student storage space at the back of the classroom was moved to the wall in the classroom hallway.

Biophilic approach

Biophilic design is the attempt to translate an understanding of the inborn need for interacting with natural systems and processes–known as biophilia–into the design of the built environment [4]. In the modern building, biophilic design increases the importance in our society. Students and teachers in the buildings should continue to contact with nature because their senses, emotions, and intellects are developing

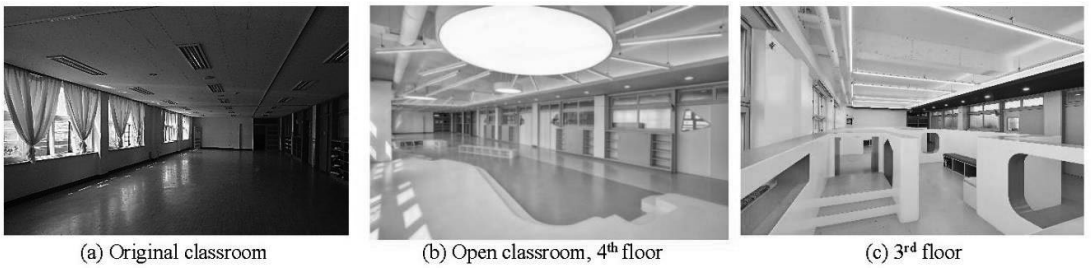

Figure 3. A case of remodeling an elementary school regarding aesthetic experiences.

in the association with nature. For example, children having higher test scores tend to show better attention when they are in schools with greater natural lighting, access to the outdoors, and fewer artificial materials[4]. The biophilic design in the school renovation adopted organic or naturalistic shapes and forms in the school environment that directly, indirectly, or symbolically reflect nature the inherent human affinity for nature. The elements of biophilic design include environmental features, natural shapes, and forms, natural patterns and processes, light and space, place-based relationships, and evolved human-nature relationships[4]. For example, the environmental features seem to well-recognized characteristics of the natural world in the built environment including color, water, air, sunlight, plants, animals, natural materials, views and vistas, façade greening, geology and landscape, habitats and ecosystems, and fire [4].

Architects for the school renovation adopted the attributes of biophilic design. Fig. 4-(a) shows the natural shapes and patterns of honeycomb in the wall of the corridor. Fig. 4-(b) shows that students and a teacher can see exterior views and landscape which connect with geological features and greening. Fig. 4-(c) is from the ongoing study by the present authors using virtual reality and eye-tracking technology to examine the biophilic attributes by focusing their attention in the virtual environment.

Affordance for teaching and learning by doing

Affordances mean "an action possibility available in the environment to an individual, independent of the individual's ability to perceive this possibility," coined the term by James J. Gibson in the domain of ecological psychology[5]. The idea of affordance begins to apply to the domain of architecture to improve the design process[6]. Affordance approach emphasizes the functional aspects of the person-environment relations and views the interaction as a system[6]. This concept is very useful to understand the relationship between person and environment. In the school renovation, the affordance approach has not been applied to the design of the space because of less discussed and studied in the field. Affordances can integrate different viewpoints among architects, clients, and users and compatible expressions of functionality and usability[6]. Affordances in school education building, leading educational actions' possibility available in the educational environments, is recently emphasized as an important consideration when designing the

Figure 4. A case of remodeling an elementary school regarding a biophilic approach.

Figure 5. A case of remodeling an elementary school regarding affordance approach.

educational spaces. Well-designed affordances in school space can apply it to both teachers and students when they are teaching and learning in the classroom. Thus, to identify all the desired affordances and undesired affordances from users, it is necessary to examine individual perspectives and their desirable features in the space.

In the renovated space, students were more actively engaged in the class activities (e.g., speaking in front of peers, working together, sensing colors). Interestingly, teachers after the completion of the renovation reported their change of teaching behaviors in that they were trying to apply new approaches for their students interacting with the features in the renovated environments (Fig. 5.)

Conclusion

Since 1950, school buildings in South Korea tend to built by the public school standardized guides for efficiency because of unprecedented population growth and rapid economy growth. This social change led that the traditional education spaces are changing into student-centered spaces, called School Renovation Movement in South Korea under the design approaches as the follow: Aesthetic experiences for creativity, biophilic approach, and affordance for teaching and learning by doing. These approaches are convergent with architectural design and educational considerations of a student as an independent learner and a member of current society for the future in the public space. Thus, the remodeling of the educational spaces should be designed under the integrated architectural and educational approaches to support student's growth and success.

Endnotes

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