The Assessment and Research on the Reconstruction of Enclosing Wall into Open Type in Elementary School Campus – Taking of Erlin Township, Changhua County as Example

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Abstract

The purpose of enclosing wall is to demarcate, segment field and blocking of school. The Taiwan government encourages schools to perform the enclosing wall to become the open type campus with friendly affinity. The change of enclosing wall caused concern from the teachers and parents. This paper article takes the elementary school at Changhua as the research objects, made field investigation, collecting data and interviewing by experts, design the questionnaire and made analysis to explore the reaction. It hopes to provide as the reference for the design of elementary school.

Key words: One-Way Analysis of Variance (ANOVA), Open Type Enclosing Wall, Enclosing Form, Design Questionnaire, Factor Analysis

1. Introduction

In the early 2000s, most of the school enclosing wall were the solid wall made by concrete or bricks, towering with the barrier and protective function, and the shape feature was monotonous, the wall surface lacked of aesthetic feeling. Usually, the school building focuses on the schoolhouses and sports facilities used as the activity spots and educational environment for teachers/students. The school enclosing wall always separates the campus from the surrounding environment area, and just like forming an enclosed space [1]. After 921 earthquake occurred in the year of 1999, there were many school buildings and schoolhouses collapsed and ruinous, there were many school campus near the disaster area facing the reconstruction. It coincided with the open education, green school and campus open concepts promoted by Taiwan government [2]. That promoted the open type campus without walls idea and hoped to bring the cohesion between school environment and community closer.

The reconstruction plan causes doubt from the parents with respect to the security level of school children, i.e. if the open type enclosing wall is applicable for different schools which shall be the part to be discussed. This paper takes part of elementary school campus located at Chung Hua, Taiwan as the research objects, it is expected to explore the recognition of teachers and parents with respect to the reconstructed open type enclosing wall, and the status, problems faced and solution of the schools. The research collected the related literatures, questionnaire, expert interview and made statics analysis, and provide the result to the government departments as the design reference for

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planning the reconstruction of campus enclosing wall in the future.

2. Literatures

The main functions of building enclosing wall are interval, demarcation, segmenting field, defining scope and uses as the construction of barrier, the function of school enclosing wall is to segment the space between the inside and outside of school environment. It has the functions of anti-strong wind, dust and noise isolation, it also has the effect of security and blocking plus the function of aesthetic appearance and education [1, 3]. Currently, there are many European countries adopted open styling for schoolhouses and open space design for classrooms, and lower the enclosing wall or without walls. It indicates that the school construction planning toward to the development trend of open style [4].

In the early 2000s in Taiwan, most of the school enclosing wall were the solid wall made by concrete or bricks, towering with the barrier and protective function, however, the form was monotonous, wall surface lacked of aesthetic feeling. The government prompted to the idea of campus without wall promoted by Ministry of Education that is gradually push to expand, it expects to demolish the old enclosing wall structured by cement or barbed wire, and replace by the greening planting or are design products to achieve the school opening and increase community interaction.

The campus enclosing wall can be categorized by its different aspects of function, height, materials, shapes, features, performance and visual penetration, greening/beautify degree etc. [5, 6], this article categorizes the forms of enclosing wall as follows:

1. Close Type Enclosing Wall: Height is over 140cm, with solid wall, no visual penetration, shown as Fig. 1.1~1.2.
   (1) Traditional Solid Enclosing Wall: Most of them are made by concrete or bricks, with solid wall.
   (2) Color Painting, Collage Wall: Add color painted patterns or mosaics collage on the solid wall.

1.1 1.2 2.1 2.2

Fig. 1.Close Type Fig. 2. Semi-open Type

2. Semi-open Type Enclosing Wall: Height is over 140cm,solid wall with partial hollow treatment, the visual penetration is higher than the closed enclosing wall, enhance the visual penetration but still able to keep the privacy, shown as Fig. 2.1~2.2.
3. Open Type Enclosing Wall: Height is lower than 120cm, good visual penetration, most of them have the beautiful styling, but due to the height is lowered, barrier and blocking are lower, also able to achieve the purpose of natural monitor, comply with Newman's Defensible Space theory [7]. The open type enclosing wall is categorized as follows, shown as Fig. 3.1~3.5:
   (1) Barrier Type Enclosing Wall: Full hollow or partial hollow, high visual penetration, lower the height decrease the protective, easy to create the climbing opportunity from the schoolchildren or outsiders.
   (2) Green Hedge: Low shrubs or flower stands, constructed with plant material, high visual penetration, but easy create the problems of crossing by the outsiders or maintenance & Management.
   (3) Dwarf Type Enclosing Wall: Lower the original wall height, most of them are below 80cm, high visual penetration, width and height are suitable for pedestrian sitting and resting, poor protective and blocking function.
   (4) Hybrid Type Enclosing Wall: Wall combined with more than two different forms or material, consolidate the advantages of multiple forms or material, good visual penetration and beautiful styling.
   (5) No Enclosing Wall Form: Demolish solid wall, adopt full-open design, highest visual penetration, poor protective and blocking function.

3.1 3.2 3.3 3.4 3.5

Fig.3. Open Type

3. Research Method

This research adopts the literature exploration, environmental status survey, expert interview and questionnaire, through the statistical analysis on the

questionnaire results, use ANOVA to inspect the differences of various different opinions from the teachers and parents, simplify the questionnaire opinion variables to the demand dimensions through the principle component analysis, and able to briefly and concisely express the user demands [8].

The questionnaire objects are the teachers and parents of elementary schools where the campus enclosing wall has been reconstructed to the open type, through the approach of questionnaire survey to understand the recognition and satisfaction of questionnaire objects with respect to the reconstruction of open type enclosing wall in the campus. Questionnaire adopts five-level of Likert scale, survey scene first, collect data and after interviewing by experts, design the pretest questionnaire items, adopt the closed questionnaire which will allow the participants answering fully in accordance with the options provided by the researcher, item design are all 18 items for both teachers and parents questionnaire. First start with pretest questionnaire, randomly issue 120 copies in the research area, After performing the statistical analysis, test its reliability and validity analysis, and then determine based on the test results, and re-establish the formal questionnaire items.

This research takes the questionnaire results performing the descriptive statistics, ANOVA and factor analysis to analyze and compare the objects with different background, and their views to reconstruct the campus enclosing wall to the open type enclosing wall. ANOVA inspects the opinion differences between the different identities, ages, principle component analysis simplifies the questionnaire variables to demand dimensions. When perform the principle component analysis, the test of KMO and Bartlett shall be performed, it is applicable for performing the principle component analysis when KMO value is over 0.8; the larger value acquired by Bartlett sphericity test, the more suitable for analysis.

After determining the data suitable for the principle component analysis, select suitable factor dimensions in accordance with the eigenvalue, select eigenvalue large than 1 or the factor selecting point when the slope of scree plot starts to downward, the factor with small eigenvalue does not have the explained variable difference which can be discarded, and the selected cumulative explained variance percent shall reach 70%. The principle component analysis is to show the correlation between the measurement variable and extracted component through the eigenvalue, if the difference of component loading is not too large, the rotation may be used to change the factor loading of each component, after the rotation, the variance of new component become the largest, this research uses the Varimax rotation.

4. Research Results & Analysis

The total formal questionnaire for the teacher portion are 155 copies, valid questionnaire are 137 copies, the parents portion are 210 copies, valid questionnaire are 163 copies. Take the questionnaire results performing the descriptive statistics, one-way analysis of variance and principle component analysis. The descriptive statistics and ANOVA analyze and compare the objects with different background, and the view difference with respect to the campus enclosing wall reconstructed to the open type enclosing wall.

The principle component analysis simplifies the questionnaire variables, after analyzing the questionnaire, select the one with eigenvalue large than 1, its referred scree plot is shown as Fig. 4, simply to 4 dimensions, namely as「Reconstruction Effectiveness」,「Visual Perception」,「Safety Sense」,「Environmental Facility」。

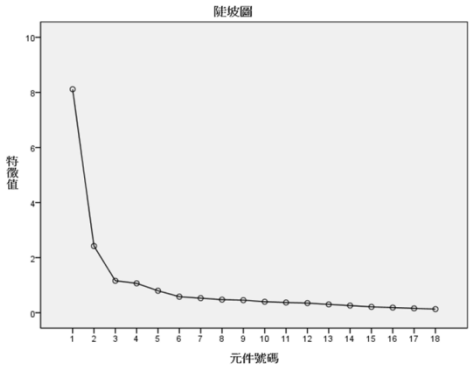

Fig. 4. Scree Plot

Analysis Results:

1. As found out from the survey results, teachers and parents have higher recognition to the perception of open type enclosing wall, and the recognition of parents is generally higher than teachers.
2. As to the part of invasion by outsiders, easy climbing by schoolchildren, both parents and teachers also recognize, it indicates that even the open type enclosing wall has enhanced the visual penetration and slightly enhanced

the security, however, due to the wall height is lowered, form is changed, there is still doubt on the teachers and parents mind with respect to the safety.

3. As to the selection of favorite enclosing wall form, collage enclosing wall receives the highest number of votes (shown as Fig. 1.2), the next one is the hollow enclosing wall (shown as Fig. 2), hybrid enclosing wall (shown as Fig. 3.4), it indicates that the teachers and parents recognize the various functional performance of open type enclosing wall, however, as viewing from the security of schoolchildren, the enclosing wall with traditional height, blocking, visual beautify and variability of color painting, collage wall and hollow wall is more favorable by the interviewee. In addition, although the height of hybrid enclosing wall is lowered, however, due to coordinate with planting, it has the plus effect to the overall campus greening which is also favorable by the teachers.

5. Conclusion

This research inspects the perception of reconstructing the campus to the open type enclosing wall as viewing from the teachers and parents angle through the questionnaire and expert interview, inspect by the statistical analysis and simplify the opinion trend dimensions of questionnaire items by factor analysis. This is able to distinguish the opinion difference of different identity in details, and also understand the common demands, the research results may provide as the reference for the follow-on planning and researchers, the research conclusions are described as follows:

1. After reconstructing to the open type enclosing wall, the overall response of teachers and students is good, however, due to the wall height is lowered, the blocking is more weak, easy to cause insecurity, therefore, the location of enclosing wall, circumstance of surrounding roads, community customs, environment conditions shall be considered when the reconstruction is selected, if the planting is collocated, then the geology, climate, monsoon, human impact factors shall be considered.
2. After reconstructing to the open type enclosing wall, even the school security event does not increase, but there are circumstances of taking shortcut to step cross the open type enclosing wall by the outsiders, the school shall reinforce the dissuasion and propaganda; the schoolchildren will also depend on the school to construct the concept and education.
3. Although the teachers and parents recognize the various functional performance of open type enclosing wall, but viewing from the security of schoolchildren, the enclosing wall with traditional height, blocking, visual beautify and variability of color painting, collage wall and hollow wall is more favorable by the interviewee. In addition, although the height of hybrid enclosing wall is lowered, however, due to coordinate with planting, it has the plus effect to the overall campus greening which is also favorable by the teachers.

This research takes the suburban schools as the research scope, due to the environmental factor, part of schools have reservation about the open type enclosing wall, the research results may not applicable for the metropolitan areas. Therefore, the follow-on researchers may focus on the metropolitan areas proceeding research and exploration to propose recommendation for the reconstruction of enclosing wall with different city attributes.

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