Eco-cycle based primary and middle schools’ campus planning and architectural design practice

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Abstract: By taking into account the regional features of the planning and design project, this paper sets to discuss the design ideas in campus planning and architectural design for primary and middle schools. Based on the project, it goes deeper to ponder on what kind of features should primary and middle schools’ buildings should have in the macro-environment of Chinese education, and what kind of campus atmosphere should be created. The paper also explores the universality of eco-cycle in campus and interest campus.

1. Introduction

Campus planning and architectural design for middle and primary schools stays as an important link in the campus construction, for reasonable planning and design matters a lot for improving teaching quality and promoting mental and physical health among students. As for campus planning and architectural design in middle and primary schools, many planning and design experts have developed a large number of targeted researches and practices and discussed in depth such topics as climatic conditions, earthquake-prone areas, mountainous areas, and the districts with significant regional cultural features.

However, when facing Wuhan—a city without significant regional characteristics, we start out from a new perspective, namely “eco-campus”, to seek a universal campus design mode in present project.

2. Project overview

The design project is located at the northwest of Wuhan away from the inner-city area. In its early development stage, it is amid several residential quarters. Around the project site, there are several kindergartens. In addition, the place enjoys convenient traffic, pleasant natural environment in neighborhood, and is close to Huangshihai Lake on the west.

The basic design goal is to build a new 9-year-system school consisting of both primary education and junior high education. According to the plan, the primary part is to incorporate 36 classrooms (6 for every grade) with a total area of 14,580m² while the junior high part to have 24 classrooms with a total area of 13,800m². The project occupies a total area of 86.4mu and the floor area is inclusive of 40,000m² aboveground and 32,000m² underground. The plot ratio can’t exceed 0.84 while the greening rate should be no lower than 35%. On this basis, high requirements are put forward in terms of underground motor pool, aboveground parking space, and the playground size.

Our final design plan is as follows: the total aboveground floor area amounts to 39,248m², total site area is 7,622.6m², the plot ratio is 0.68, greening rate is 39.8%, and there are 560 underground parking
spaces. The plan meets the goal in all the aspects, and public activity places are provided as much as the limited campus land permits.

Figure 1. General layout.

3. Design philosophy

We integrate all the steps in the whole thinking process, from the initial investigation to the examination of middle and primary schools and the final decision-making. In this process, we go deeper and deeper into thinking about the traits in design of primary and middle schools in the current Chinese education environment and finding out the universality behind the design.

3.1 A brief introduction to the architectural environment characteristics of Chinese traditional primary and middle schools and their counterparts in foreign countries

Most of traditional Chinese primary and middle schools adopt the plate-type linear architectural pattern with single verandah and flat roofing. The plate-type teaching buildings are of U-shape, hollow square shape, or some independent units. The campuses feature less greening, hard pavement, fewer playground, and are basically separated from the outside world. The schools are covered with a kind of monotonous and serene atmosphere, in which students are limited to the verandah during their breaktime. By comparison, their counterparts in the foreign countries tend to be more active with larger playground, more greening, and diversified architectural and roofing patterns. Within those foreign campuses of primary and middle schools, the inner space deviates from stale design rules, for teaching is no longer limited to classrooms. Their teaching functions are also richer with interest rooms and club rooms available for the students. Such campuses offer not only knowledge but also life for the students therein.

3.2 Necessity in reforming the existing educational pattern in Chinese primary and middle schools

As we combine our own experience with data collection and investigation, we roughly analyze the features of Chinese and foreign education patterns. Traditional Chinese education promotes “intensive” development, namely further study after mastering of basics; whereas foreign education advocates “extensive” development in which school teachers always try to lead their students to the ocean of knowledge beyond the textbooks and maintain their curiosity and exploration desire for the great world, encourage and develop the habit of independent thinking and problem-solving ability among the children.

When compared with foreign education, Chinese education appears to be slightly closed and monotonous. With the development of times, the utility of Chinese education style is gradually weakened. Educators slowly gain the awareness that education should be free and open. Campuses should offer the students all sorts of chances of getting closer to novelties and finding out their own
interest and gift. This is consistent with the education philosophy of “all-round development in morality, intelligence, body, aesthetics and labor” in traditional education.

3.3 Tendency of comprehensiveness in campus building reform

Architectural industry plays an important role in the educational reform. We are obliged to reflect how should the campus buildings adapt to the ever-changing social development, cater to the demand of campus users, and establish their own uniqueness and sustainable development. The design of primary and middle schools is to meet the demand of students and teachers in such schools. For teachers, a new campus is supposed to be bring comfort, convenient and creativity to them. For instance, up-to-date teaching media technical equipment can make teaching easier and more active while getting rid of the staleness; the availability of labs and multi-functional classrooms enables the teachers to pass diversified knowledge in a convenient way; the existence of active space in teaching buildings can indirectly incite the proactivity and passion among the teachers. As to students, the advent of internet age increases the chance of primary and middle school students in learning about the world. The underlying merit is they can keep enhancing their independent learning capability and perceive this world through cellphone, computer and television. On the other hand, lacking the ability of distinguishing novelty things, they are more inclined to be addicted to the virtual cyber world and accept the mixed network information. In such case, the campus should function to impart the correct academic knowledge to the students and bring real and active life to them. New-style campus buildings are not only a place for teachers to educate students but also a place exerting positive effect on their users with its influence. For example, the campus combined with natural world appears to be more amiable and active so as to better incite children’s natural intimacy with the nature and bring a more pleasant mood to the teachers.

3.4 Summary of concepts

By keeping exploring the campus demand, we find that when meeting the basic functions, campus buildings must be able to include different students, keep close relationship with the nature, maintain enthusiasm for life, and present sustainable development and positive influence. For example, people quite down automatically after entering a library and become active after stepping into a playground. This display the effect of atmosphere created by the buildings on human beings. Therefore, the best campus building reform is the one utilizing new campus buildings to lead students to develop healthy mind and body at the same time.

Since interaction among nature, building and human within the campus is just like that among different substances in an eco-system and primary and middle school students are easily attracted by interesting things, we can summarize this idea as a nature-building-human eco-cycle within the campus. When added with the interest element, will this eco-cycle form a new preliminary campus building mode? What kind of campus style will it display when being applied to practice?

Figure 2. 1Floor plan of comprehensive teaching building.
4. Eco-cycle idea-based campus planning and architectural design practice

Below an introduction is made to our design plan in which aforesaid ideas are embodied:

In the first place, we adopt hexagonal plane for the classrooms, because such shape can better enhance the audio and visual effects within the space and it is more active than the rectangular one. On the plane, the classrooms are not arranged side by side but in a separated way both horizontally and vertically. The final effect is that the classrooms in every six vertical bars enclose to form a courtyard. In this way, we can ensure every classroom can have sufficient sunlight and pleasant landscape. From each classroom, the students can directly look down at Huangshihai Lake and get close to the nature in real sense. On this basis, to bring the students closer to the nature, we also design an overhead gallery and suspended viewing platform which overlap each other to form a canopy so that the students can feel the nature and the natural wonder in whatever weather. Such design can strengthen the interest of campus and better attract the students on one hand and provide larger space for the activities of the children on the other hand.

Secondly, besides the major teaching buildings, the science & technology complex, multi-functional building, library, overpass, and gallery also adopts multi-functional design idea. In designing such buildings, we adhere to following principles: 1. Maximize the space use; 2. Use greening to blend the building with nature; 3. Add interest to the buildings; and 4. Enhance the connection among buildings and ensure accessibility. Therefore, we design the science & technology complex into a twisted up-revolving circle which provides the best place for students’ breaktime activities. This is not only an educational building incorporating all sorts of labs and activity rooms (such as calligraphy, dancing, and music) but also a medium connecting nature with human. With limited space, it enlarges the activity space of children like a spring.

The multifunctional building integrates different functions, including canteen, multi-functional hall, public teaching room, and underground gym. Against the large building volume, we conduct softening processing on the whole building by changing the original huge block into several curves overlaying one by one and shrinking from the bottom to top. Such practice weakens the volume sense of the whole building and constitutes an extension of the teaching building. On the roof, a large ladder-like greenery is built to act as a small pilot field for the students, in which the students can try to cultivate plants by themselves and play with each other and have a rest.

As to the gym, we compact a 400m playground into a building which integrates an indoor gym and swimming pool in its lower part. No doubt this is a huge building. With the playground on the upper part and excessive parts suspended, its lower space gets fully released. In the meanwhile, all the cuttable parts within the building are eliminated and only those effective areas are preserved in order to reduce the volume. A great deal of glass plus white materials is used as the major components of the building to further lighten the building. On the outer surface, a changing hollow cover is provided to...
combine with the skylight on the roof in covering half and disclosing half on the flanks and presenting a kind of changing lighting. The released space in the lower part is used as an area containing the activities of the students and green plants cultivation. Moreover, the releasing of right plot also enables us to have more space for the outdoor activities of the students.

5. Analysis and conclusions

In the third step, we combine the summarized nature-building-human eco-cycle within campus and the interest-oriented core design idea with the actual project, from which we can find the feasibility and universality of the idea in the project. The whole campus is just like a huge eco-system in which knowledge, buildings, students, teachers and environment play their own roles and affect each other to form a virtuous cycle. Knowledge liberated from the from becomes freer; buildings are no longer stale but become full of humanity; students change from monotonous to diversified; and teachers abandon the dogmatism but embrace approachable attitude. Environment is no longer decorative only, but starts to function in real sense. For example, when campus buildings interact with the natural environment, students can fully feel the nature in the campus, decorate their hard-working academic life with the tranquility and beauty of natural environment, maintain curiosity and inspiration for the nature, and learn about tranquility after nature and then study tranquilly from inner heart. On the other hand, the natural environment gets blended with the students’ life so that the vigor of students also touches it and incite its prosperity.

This core design idea can be applied not only to Huangshihai Primary School but also other primary schools, junior high schools and even senior high schools. It owns strong university and plasticity without any significant regional characteristics. It is not developed for specific climatic or geological conditions or especially unique cultural atmosphere; instead it embodies a new form of education. In different areas of China, as along as they share the same core educational idea, this design can be applied to any of them. We need only determine one thing: the building is created to contain both physical and teaching activities. We can adopt all sorts of design techniques such as twisting, splicing and suspension so as to create different platform spaces. Applicability prevails here. We may take the circular complex building as an example. Such form of building can be used in different schools, because it is hardly incompatible with the campus due to its green and natural elements. This sort of building is most likely to blend with the surrounding environment.

In the whole design process, we revise the plan repeatedly and even re-design it. Although we still don’t know whether it can achieve our expected state, we do hope this nature-building-human eco-cycle within the campus combined with interest-oriented core design idea can shed some light on the campus building reform movement.

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