



# DISCUSSING SKETCHUP SOFTWARE IN THE APPLICATION OF ARCHITECTURAL DESIGN TEACHING

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## ABSTRACT

In order to help the students of architecture out of the errors of studying architectural design, this paper briefly introduces the application features of the Sketchup software. They should truly understand the origin of architectural design and master application skills of Sketchup software. Based on the description of the current lack of architecture education and the feature of Sketchup software, such as keenness in generating program, convenience in modifying the program, flexibility in dealing with environment and so on, we expound how to organically integrate the software into teaching of architecture to guide the students to focus on the form and space design in the design process. Through thorough understanding of the content of the architectural design, students will enhance their professionalism.

**Keywords:** *Sketchup; Architectural Space; Architectural Design; Architectural Form*

## 1. INTRODUCTION

Mix clays can form the implement, just because it is hollow and useful. Chisel uses the door and the windows to build a house, just because it is hollow and useful. So the “exist” could bore the facility; the “empty” plays an important role<sup>[1]</sup>. More than 2500 years ago, Laozi proposed that the value of the architecture is the space which it formed. The modern architectural concept emphasizes that the space is the essence of architecture, it requires us to study and comprehend the architecture in its space and the form so that we can carry on the architectural creation to form architecture with graceful feather and suitable space. At the same time, architecture education emphasizes on culture the students the ability of space shaping. However, due to various reasons, architectural education now has deviated from this subject.

And building design, drawing, the three dimensional simulation is done with the aid of computer software to implement the operation. Computer architecture performance easily can be modified and the stylization bring convenience which win the general design workers and the design professional teachers' and students' favour. 3D effect is undoubtedly the easiest to understand the designer's intent, among the many 3D model software, Sketchup was making very practical

architectural rendering 3D design software. If it is used properly, it can provide excellent show means for architectural design.

Section 2 mainly discusses the current lack of architectural education. Section 3, mainly introduces the Sketchup software and its application characteristics. Section 4 explores how to introduce the Sketchup software into the teaching of architectural design. Section 5 gives a conclusion to the whole paper

## 2. LACK OF ARCHITECTURAL EDUCATION AT PRESENT

### 2.1 The Plight Of Architectural Education During The Information Age

During the 60-70 years of the 20th century, we have stepped into the information society. It means that the communication has been fundamentally changed. Digital and information-based means of communication have been infiltrated into various fields. Architectural design industry is one of the industries who has early realized the computer-aided design. As technology advancing, there is essentially difference between the modern architectural design patterns and the traditional design patterns. Architects can use computer to build architecture digital model, directly carry on the architecture design through three-dimensional views without spending too much



energy for space conversion<sup>[2]</sup>. With the information technology penetrating deeply, architectural design is moving toward a paperless era of digital design. But the current architectural education still cling to the traditional teaching methods, the talent is unable to adapt to today's design environment.

## 2.2 Ignore The Architectural Design Process

Regarding a specific program, it is better for the teacher not to comment the program too detailed, otherwise it can be easily restrict student's cogitation, and the students will make a lot of identical design. It is hard for the students to design if they didn't get specifically guide from the teachers: At first, they often do the plan functional division according to the architecture features and the task book, and then they consider the introduction of elevation and section when the plan have been carried to a certain extent. It is hard for the students verbally to express their design ideas clearly just by their several sketch, and the teacher can hardly understand the students' creative intents<sup>[3]</sup>. Though the students always communicate with the teacher, they often neglect the architect design progress; it is hard to enhance the students' design ability.

## 2.3 Ignore the Architectural Environment

In reality, each architect has their specific existents, and there is some relationship between the surrounding environment and the architecture. Most students never consider the surrounding environment carefully to make the architecture coordinate with the environment, and never consider the how the surroundings restrict the architecture programs. Many students never do a wide range of research about the surroundings environment when they get the task book; their knowledge about the site is just limited to the task book. Because the information the students collected are not enough, they hardly think comprehensively when they design. The design which the students made out often full of loopholes or became the castles in the air and hardly to be built.

## 2.4 The Students Lack the Knowledge about the Construction Material, and don't Understand the Architectural Detail Enoughly

Architecture is composed of different materials, and materials are the emotion symbols of the architecture. There will have different effects if we endow the same architecture with different materials; even the effects are extremely opposite. A qualified architect can skillfully use various materials. Unfortunately, now the students cannot be aware of the importance of architectural materials yet. The architectural details are the

important aspect to reflect the professionalism of the architects. Skilled architects are better in the construction details design. Now the students' programs hardly involve the two aspects.

## 3. SKETCHUP SOFTWARE

### 3.1 R & D background

At present, though the computer technology is widely used in the design of construction industry, this application is only made the software as a drawing tool. Architectural design software and not play right role in design, it just demonstrates the superiority at the end of the program. There are two reasons to cause this effect: one reason is the software itself. Before the Sketchup, a large number of architectural design software can not to adapt to the architect's work habits. The line in the two-dimensional design software (such as AutoCAD) always restraint the architect's thinking, 3D Design Software (such as 3dsmax) like the ability to control two-dimensional graphics. Another reason is that the architecture cannot be really aware of the meaning and advantages of computer-aided design. During the design they adopt the traditional design process and add a computer plot course to instead the original hand-drawing process.

### 3.2 The Features of Sketchup

At the beginning, Sketchup are made to "A specifically medium in order to explore motif and synthetic informations"<sup>[4]</sup>. This software has concise user interface, thus can be operated easily with powerful function. (Figure 1. The most important is that it conforms to the architect's work habits, completely catered to the architect's work plans. There is little operation system in Sketchup, the novice could just familiar with a few commonly used commands and then designing the program in the Sketchup as the same as they Sketching with a pencil. Architects can quickly use Sketchup to manifested their own design inspiration in the form of three-dimensional ways. It is easily to revise the design express them in many ways. Sketchup communicate perfectly with the revelatory of the architects' sketch design and the certainty of the computer software design, it is not a conditional design software but a real architecture design software.

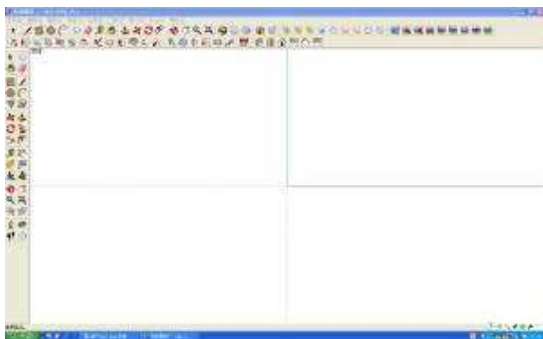


Figure 1: Concise User Interface Of Sketchup

#### 4. THE USE OF SKETCHUP IN ARCHITECTURE EDUCATION

Aiming at the shortcomings of modern architecture education, it have enormous practical significance to bring Sketchup into architecture education according the software's characteristics. They can enhance the effectiveness of architecture education to a large extent and help the students step out of the architectural design errors to the origin of architectural design.

##### 4.1 The Meaning of Architectural Lies in its Three-dimensional Space, The Main Content of Architectural Design is the Architectural Space and the Physical of the Construction

Sketchup itself is a three-dimensional design software which has a very strong three-dimensional design functions.( Figure 2). In Sketchup, the architecture design is carried on the three-dimensional space from the initial concept module body research to the finalization of the construction program. Architects can observe each step of modification from the three-dimensional through multi-angle and then to determine whether the modification is reasonable. But the conditional design process are carried on the two-dimensional environment. The architect have always to consider what the three-dimensional space looks like, when they do the three-dimensional model, they have to consider whether it is consistent to the two-dimensional design. Thus the architects design process appears tortuous. The aim is to design three-dimensional space and the architecture form, but have to be achieved by means of two-dimensional means, the architect wastes a lot of energy. If we use Sketchup, we can omit the conversion between the three-dimensional design and the two-dimensional design process, it is true that the three-dimensional

design and the architects will have more energy to pay attention to architectural design itself. During the process of architecture education, Sketchup lifts restrictions of two-dimensional design, let the students never be restricted by the two-dimensional design. They can do the architectural design at higher and more direct point of view. Sketchup can also help the students enhance the ability to control architecture space and architecture form. After we use convenient and efficient means to built model by Sketchup, we can observe, amend, and compare the architecture form, interior space, architectural detail in various angles, thereby we can constantly improve the design and enable students to get to know the origin of architectural design, we can enable students to understand the real architecture design is not just the plans, elevations, sections and the unrealistic effect pictures getting together. but a architecture three-dimensional shape design. In addition, through a round of changes can let the students understand the construction program design is a gradual process. To establish a program can not be achieved by just one design, during this period, the design must be constantly changed and improved.

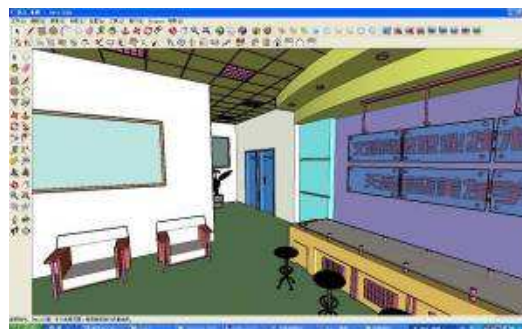


Figure 2: Three-Dimensional Space

After completed the model in Sketchup, we can rapid amend the model using groups and components of its functions, this can help the students to capture architectural design inspiration. And contrast through a multi-group model is conducive to enhanceg the students building physical analysis, Sketchup provides slice surface features which provides a convenient way to analysis architectural interior space.By this function can clearly observe each direction of the indoor space of the construction.

##### 4.2 Expression of the Construction Program

As a specifically construction software, Sketchupemphasizes on the building program expression : ( 1 ) Seeing shall be obtained.

Without a long wait for rendering, architectural models can be observed directly. (2) Multi-angle view and multi-mode instrument. Sketchup offers us the perspective, top view, back view, left view, right view five kinds of observation angle; it is easy to observe various elevations and perspective of the architectural model. And we can use mouse drag, rotate, zoom in, and then we can observe the architectural model from any point of view. Additionally, Sketchup offers us X-ray model, wireframe mode, blanking mode, color mode, map mode, monochrome mode six kinds of display mode for different architecture design performance (3) The use of the page regards some important elevation or the perspective, Sketchup can set free page. Through these different point of view and the different pages of display modes we can analysis the focus point of view of the architecture.( Figure 3). (4) The phased and diversification technique of expression can meet the needs of design expression. Sketchup can construct kinds of Three-dimensional model according to the performance characteristics of different stages of architectural design, some of them are concept sketches, some of them are delightful and full of artistic feeling,others are plain, and actually obey the virtual design effect. Therefore, the architect can express the design objects in accordance with the design phases, and then to provide the owners with the performance results relevantly<sup>[5]</sup>. During the communication of the architectural design, architects can use Sketchup or other architectural design software to create a virtual scene to express design intents.This virtual building can deepen the synergy between the design of relevant person<sup>[6]</sup>. Teachers and the students can communicate directly during the architectural education by using a variety form of Sketchup copy expression. Students can express the teachers their own design ideas and the development of the middle design process or the final establishment program.The teachers can observe the students' design from Multi-angle in Sketchup and then to understand the students design intent, clearly the process of program in-depth, analysis and establish program's strengths and weaknesses, and then to guide and help the students during the whole design process.

#### 4.3 To Cultivate the Students' Environmental Awareness during the Architectural Education

During the Sketchup application, we can construct the three-dimensional model space environment of sites by simple and convenient modeling tool. During the three-dimensional

environments, teachers can observe the architectural program at any angle, and then help the students develop the design.( Figure 4).At the same time,we can use the modue store of Sketchup to insert the components of the built environment according to the actual size of the object model,such as buildings, vehicles, characters, landscape, from this, we can learn more real sense of scale and the coordination with the surrounding environment. Additionally, the Sunshine Analysis System of Sketchup can analog sunset, sunrise, sunshine conditions, as solar altitude angle and so on. Architects can set a specific date of the analysis of sunshine and then drag the time slider to carry out the construction of the dynamic analysis of sunshine; through this we can see intuitively the relationship between the building block and every building of the sunshine state (Figure 5).

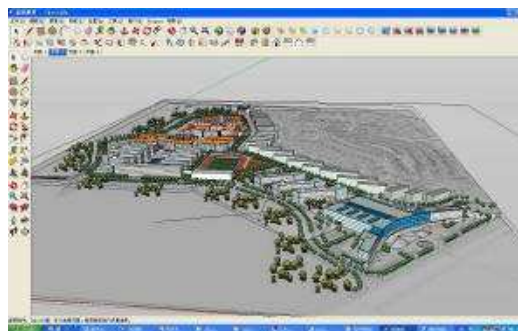


Figure 3: The Use Of The Page

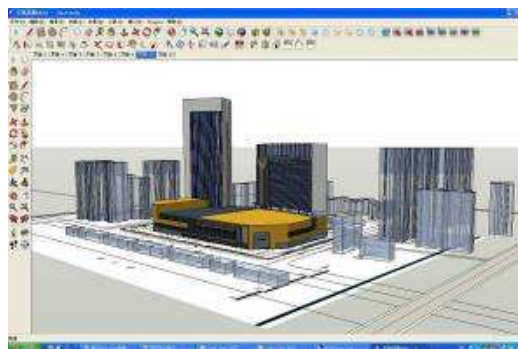


Figure 4: Environment Simulation

#### 4.4 The Building Colors and Materials Applications

Building colors and materials design is an important stage in architectural design, but also is a relatively weak link in architecture education. The Sketchup material texture, color editing capabilities and the convenient means of material endue can



help the students to complete the deployment of architectural colors and materials easily(Figure6). Different from the 3D Model (Which must be rendered after the rendering device in order to observe the effects of different materials), in Sketchup, we can observe the model immediately after being given material, it is easy to observe the effect and adjust the material, and ultimately achieving the best visual effect. We can comparative analysis the different colors and materials of the architecture, or simulate how the environment effect architecture. This man-machine interaction is a new way which the computer software technology creates for architects to analysis new ideas<sup>[7]</sup>. Through this approach, we can gradually culture student's ability to use colors and materials, and then culture students the architect's basic literacy.

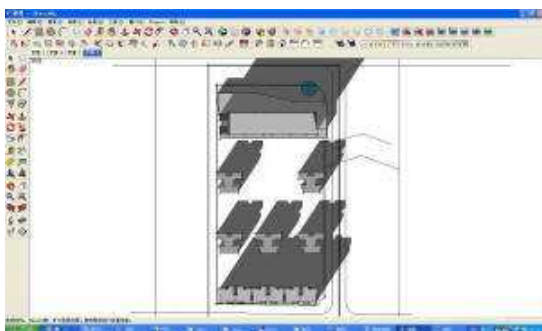


Figure 5: Sunlight Analysis

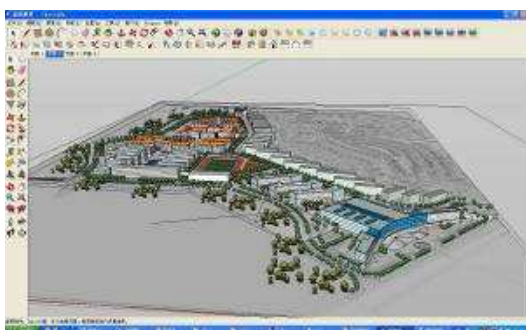


Figure 6: Color Simulation

## 5. CONCLUSION

Sketchup can generate a program quickly, it is flexible to amend a program and has convenience multi-angle expression, and these demonstrate that it is designed to meet the design process and

developed. It can conform to the architect's work habits. These two advantages made it to be a true sense of the architectural design software. If we introduce Sketchup into the teaching practice of architecture, coupled with the correct guidance of the teachers can help students out of the current study and design errors, and truly understand the nature of architectural design. But Sketchup only is a tool-aided design, and can not completely replace the traditional teaching methods to complete the architectural design of the teaching tasks independently. Computer does can be seen as an extension of our hands, but different from pencil, pen or typewriter, it is a completely different medium. For this medium, we have to use new way to work<sup>[8]</sup>. This requires us to combinat the traditional teaching methods and the Sketchup-aided design methods perfectly in architecture education in the future, and will greatly improve the efficiency of the architecture education.

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