



Research Article

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Close the rift between rational thinking and perceptual thinking-cultivation and exploration of design thinking in students majoring in architecture

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ABSTRACT

Design thinking is of great importance in architecture design. To solve the problem that rational thinking and perceptual thinking cannot integrate in students' design thinking activities, this paper explores how to train design thinking of students in daily teaching through four teaching pilots, including experience and evaluation of space, expression of space experience, enhanced perceptual thinking, and correction of the error between rational construct and the sensory experience.

Key words: design thinking; rational thinking; perceptual thinking; architecture

INTRODUCTION

Architecture belongs to the first level discipline in engineering. It is an integrated science that involves both engineering technology and artistic aesthetics. The main purpose of architecture is to teach students how to construct rich architectural space and build the living place that is full of vitality. Architecture teaching consists of two parts: one part is science and engineering subjects based on natural science, such as mechanics, structure and construction; the other part is liberal arts subjects featuring social science, such as history, culture and arts. As architecture contains subjects in both arts and science, it involves knowledge spanning a broad range. Furthermore, with the high requirements for practical ability, it usually takes five years for an architecture student to graduate from the university. For the source of students, due to reasons like the feature of this major and the tradition, nearly all the students in this major are science students since high school. Few arts students get involved.

1. THE RIFT BETWEEN RATIONAL THINKING AND PERCEPTUAL THINKING

Similar to other design majors like environmental arts and industrial design, architecture requires students to equip themselves with rational thinking ability, which emphasizes abstraction, extraction and logic reasoning, and perceptual thinking ability, which stresses acute sensible perception, exquisite sentiments and rich imagination. The most important is the communication and integration of the two abilities. With the integration of rational knowledge and sensible experience, students are capable of reproducing the vivid world. The communication and integration of perceptual thinking and rational thinking is rational intuition, a kind of distilled comprehensive sensible consciousness from the digestion of rational knowledge. It is obtained after the common cognition process reaches rational depth. Thus it is a spiral of the cognition process and it is a state in which rational thinking and perceptual thinking interweave with each other and coexist. Such state enables mind to wonder freely between the two thinking. It is full of the collisions of freedom and restriction, creation and observation, agility and laws, simplicity and complexity, and contingency and necessity. It is the tensile mental state that contains infinite possibilities and creativities, serves as the source to inspire design and is pursued by every practitioner in this field [1].

Nevertheless, in daily teaching, students usually get confused by the unsuccessful communication of perceptual thinking and rational thinking, which also confuses teachers as well. Such problem does not refer to the directional cognition process from perceptual thinking to rational thinking but a reversed process in which the reconstruction of

rational thinking extends to perceptual thinking and the integration of the two. These problems mainly manifest in following two ways: 1. The design process of the plan is stiffly controlled by a kind of sensible consciousness (like some space fragments once the designer has seen and favored). Then the final design may just be pieced together by various sensible elements like what has been mentioned, weak in logic. In this way, the final design will be deficient in the sort-out and instruction of rational thinking. 2. The other manifestation is that the design is completely instructed by rational thinking, which mechanically organizes the architectural space by logic rules like functional relationships and circulation. Although the design based on rational knowledge seems to be perfect, it lacks the immersion and integration of life vitality and sensible sentiments into the architectural space. These manifestations reveal there is a disconnection between perceptual thinking and rational thinking in students' mind as these two are deficient in communication and interaction. The reasons for these problems are as follows.

Traditional teaching mode conforms to the research and teaching pattern of natural science, which is characterized by decomposition. In other words, under such pattern, complicated knowledge system and techniques are decomposed into independent basic subjects to teach. Inside independent subjects, the sort-out and teaching of the content also follows the decomposition, progressing from the general to the specific. Of course it is undeniable that such pattern has strong operability and works actively in the study on the level of basic teaching for college education. However, its defect lies in the neglect of connection and intersection between different disciplines, which them stand alone to each other therefore it is impossible for the interdisciplinary and cross-field integration to come into view in the academia. Furthermore, the directional decomposed knowledge system is relatively less difficult to learn but it does little help when students are required to recompose these disordered knowledge fragments to enable themselves to solve a problem. The disconnection between different parts of knowledge usually appears in this way. In the general background, architecture is impossible to manage alone from other disciplines and its feature of combining science and arts just makes the integration more difficult. On the other hand, most students majoring in architecture are science students who are good at rational thinking. With the similar in-discipline structure and traditional teaching method, science subjects are usually not difficult for these students. However while confronted with arts subjects in which involved perceptual thinking, things will not be such easy for these students. At this time, the traditional teaching pattern that transplants the pattern of arts major, which encourages self-consciousness through the artistic techniques education, usually calls question into the effect of teaching. Such method treats sensibility with the same kind of feeling. It relies too much on the extensive browsing and operations of perceptual materials, and pays a lot of attention to the highly subjective reviews, thus it is less likely to expect students to realize the artistic "meaning" based on their experience. Rudolf Arnheim once pointed out the problem of artistic research that lacks rational basis and he devoted his life into the serious and positive rational research of artistic phenomenon [2]. Apparently, the simple transplant cannot benefit science students' artistic education. Consequently, in the daily design instruction, most teachers prefer the method that features operational rational decomposition. Their revision of the work concentrates on the functional partition, circulation, structural construction, etc., thus to make the communication convenient and prevent from falling to the endless debate into the sensible world. This kind of method is also imperfect as teachers seldom talk about how to integrate science technology and artistic feelings. Even they do, they all set out from their own experience, which is less persuasive and credible compared with rational knowledge. Most teachers would rather skip that to avoid the "trouble" of struggling between arts and science. Therefore, it is rather difficult to lead students to integrate perceptual thinking and rational thinking. In fact, in the teaching case of integrating perceptual thinking and rational thinking to recompose the world, the reason why teachers usually skip that part is that there has not even been an effective method. How much or to what degree can students integrate just depends on their perception. According to years of teaching, only two of three of ten get relatively deeper in integration and perception of professional architecture knowledge, which is far below the target of our education.

On such basis, this paper designs the following experiments, aiming to train and cultivate the communication and integration of perceptual thinking and rational thinking in students. An emphasis is put on to the training and reinforcement of the reversed process in which the rational thinking re-extends to perceptual thinking. In this way, the rift between perceptual thinking and rational thinking will be closed and the two will get integrated.

2. SEVERAL TEACHING EXPERIMENTS

3.1 THE SPATIAL EXPERIENCE AND EVALUATION

The purpose of teaching architecture is to teach how to build life space full of vitality. It requires students to accumulate abundant space experience and sensible materials first. This experiment focuses on how to build the interactive relationship between perceptual thinking and rational thinking in the stage of sensible cognition. Different from the traditional architectural works appreciation course, it develops in a way that takes the finished works of some famous domestic architects as objects and organizes students to experience the real space inside to accumulate sensible materials and form a complete realization of the representation. After that, students would be required to discuss over the works. It turned out that students had got accustomed to the directional thinking pattern

trained by the traditional teaching method from sensible cognition to rational induction. They would extract and abstract from materials they have got, and then skillfully analyzed and evaluated the architecture from different perspectives. By then, traditional teaching activities came to an end while students had finished a thinking distillation from the shallow to the deep. However, it was just the beginning for the main part of the experiment as it arranged a reversed thinking procedure in which students were asked to write a visiting report. Such report is neither a narration, nor a science report with intact logic. Rather, it required students to write a prose or poetry, which restored the rational conclusion of the last procedure to a spatial experience once they had got from their life experience and then derives into life itself or a kind of sentiment. The prose or poetry provides the opportunity for students to express their perception on the topic of Space and Life. The experiment is designed to figure out whether students can reversely restore or derive the rational realization abstracted from the sensible cognition into the complicated life. In other words, the experiment reveals a process in which students try to put essence originated and abstracted from the life back into life and achieve a sensible consciousness after the reasoning. The result of the first experiment was not so satisfying as students all fell into a blank and struggled to finish the task. Hopefully, after repeating the experiment for several times, students can get used to and enjoy such thinking pattern thus to close the rift between perceptual thinking and rational thinking. What needs to notice is that girls show strong perceptual thinking ability in the experiment, thus to arrange boys and girls together to work on the task may bring about better effects.

3.2 LANGUAGE EXPRESSION OF THE SPATIAL EXPERIENCE

Engles once said that all the thinking is the thinking of language [3]. Here thinking refers to rational thinking. Modern researches indicate that language is a tool not only for human's communication but also for our mind. The results of human mind have to rely on language to consolidate and develop, and the further communication and diffusion also depend on language. Language and thinking cannot be separated. The experiment asks students to vividly describe their spatial experience in a specific architecture that is not quite familiar to them. By such language expression of the spatial experience, students are forced to express in language the relatively vague and shallow perceptive representation towards space in the stage of perceptual thinking. Dragged by the language, students then will be led into the stage of deep rational thinking from shallow perceptual thinking. The key of the experiment is that during the process of directional thinking, students have to turn the abstract conception into vivid description about their feelings to audience so as to push thinking quickly flow and collide between perceptual thinking and rational thinking. In the meantime, induction and deduction coexist with abstraction and extension. Via the training of language description, students will strengthen their sensible realization with the help of the rational language to deepen their cognition of space (like clearer spatial logics and more definite details) and get rid of the blindness of pure sensory experience [4]. On the other hand, this kind of training makes the communication and interaction between perceptual thinking and rational thinking more fluent, further closes their connection and unites them as a whole. Just as a student put it that before the experiment, he had never found the stiff and mechanical spatial relationship, circulation, etc. on the draft was so close to life. The description of spatial activities makes perceptual thinking and rational thinking so real and gets them together.

3.3 Perceptual thinking reinforcement

Usually the teaching of architectural style adopts the way of analysis, which is to decompose the Gothic style [5] into several independent elements or symbols that comprise the complete style. This method is well accepted by students (as this way can only provide with limited sensible materials, the representation of Gothic style is quite shallow), but when they are required to express their perception or reconstruct reversely the Gothic characteristics they can do nothing but mechanically copy the elements. Their realization of Gothic style focuses on the piling of architectural elements instead of its essence. The whole process indicates that students are only able to realize the sensible representation in the primary stage and simply analyze and imitate in the rational stage. The traditional teaching process seems to be a distillation of realization from the shallow to the deep, but the truth is that it still remains on the mechanical perceptive representation decomposed by the way of teaching. The evolution of thinking on Gothic style is not done in students' mind actively but finished by external stylized teaching activities. Therefore, it is imperative to carry on the reinforcement of the interaction of perceptual thinking and rational thinking. In the teaching experiment namely Gothic impression, teachers arrange content of Gothic style from multi disciplines, including architecture, interior design, furniture, fashion, music, painting, etc. Beforehand teacher will not inform students about what is Gothic style but leads them to analyze and compare towards different materials. In the comparison, students will go back and through between the perception and representation of perceptual thinking and analysis and abstraction of rational thinking. They construct the Gothic impression while receiving different sensory information. In the meantime, they revise and reconstruct again and again in the process of analysis, discrimination, application and verification before they establish relatively stable impression. The experiment helps students to break up barriers between various perceptions and form comprehensive and vivid feelings so that they will get the essence of Gothic style and are deeply impressed. After the class, nearly all students are shocked and affected by the abundant, stereoscopic and thick Gothic culture, thus we believe their experience with Gothic culture will benefit

their whole life.

3.4 Error correction of rational construction and sensory experience

In the teaching practice, another important problem is that after the rational operation and logical recombination, students find there is a gap, sometimes a huge one, between the real sensory experience presented by the constructed space and the expected spatial experience. The dislocation of expectation and result reveals the error of students' rational construction and real feelings between which students need to establish relatively accurate consistency. In fact, the counterproductive instances also appear in experienced architects engaged years on architecture design, which deeply illustrates the difficulty to accurately reconstruct sensible experience with rational thinking and reveals the importance to cultivate such accuracy. The traditional training mainly concentrates on making the effect picture and making small working model, however, both subjectivity and large-scale error in feeling all affect the process. Even though the appearance of 3D effect picture makes some improvements, it is only applicable in presenting the static results but does little help in promoting architectural space design and is especially weak in operability of dynamic experience. To cope with such problem, we introduce new software like SketchUp and VRP (Virtual Reality Platform). Students are asked to import their design into the software and then they can experience the real spatial feelings in the virtual environment with the strong operability and infiltration of the software. They can make revisions to where disagrees with their expectations and keep re-experiencing and revising. In such process, they keep improving the accuracy of rationally reproducing the spatial feelings and close the gap gradually thus to improve their ability to handle space design.

CONCLUSION

With the experiments mentioned above, this paper explores how to strengthen the interaction between perceptual thinking and rational thinking in architecture major students, especially the training of extension and deduction from rational thinking to perceptual thinking. During the experiment, it is comforted to see students' progress but it is also obvious that the several experiments are far from enough to achieve the integration of perceptual thinking and rational thinking. The integration shows the direction and serves as the emphasis for the architectural design teaching in the future and it needs further efforts as well as exploration. The author hopes to make some contributions to the education of architectural design with the research of teaching method.

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