The Relationship between Spatial Design Courses and the Students with Diverse Backgrounds

Yi-Ching Liu* and Shih-Yung Liu**

** Chung Yuan Christian University, Doctor of Design Program*
Tungnan University, Department of Construction Technology
liu0129@mail.tnu.edu.tw
*** Chung Yuan Christian University, Doctor of Design Program*
deshouse@ms46.hinet.net

Abstract: Due to educational reformation emphasizing on diverse entrance, technical colleges and institutes in Taiwan now recruit graduates from both high schools and vocational schools. However, the uniform course design prevalent in colleges and institutes does not take students' diverse backgrounds into consideration. In addition, the difference in students' spatial design ability, a core quality required in studying architectural design, inevitably causes learning problems among students and poses difficulties in teaching among teachers. The purpose of the study is to explore how to redesign courses to fit the various needs of students with different training backgrounds. Double variables analysis is applied to analyze the performance of students with different training backgrounds in design courses.

Keywords: professional background, diverse entrance, spatial design, technical college

1. Introduction

After implementing multiple entrance programs for some years, technical colleges and institutes in Taiwan recently not only have to deal with screening tests and assigned-subject tests before joint admission by placement, but also need to handle cross-section students from all aspects. However, schools are not assembly lines; students with alike ages are different from mentality, aptitudes, recognitions and learning motivations. It's even more obvious when it comes to professional training from high schools and vocational schools.

Taking spatial design teaching as an example, the core objectives are to nourish abilities such as, rational thinking, liberal creativities, quality judgments, spatial observations, delicate coordinating and clear expressions. After all, spatial design is so complex that it contains visual, mental, physical and actual components in order to form the practical space usage in a scientific way. Followings are the potential difficulties to spatial design training courses in architecture majors through years of teaching and observations.

(1) Students from different professional backgrounds may lead to frustrations and learning outcomes.

(2) Despite of having professional skills, vocational school students in general lack of humanism quality, creativity and logical thinking ability.

When it comes to overall teaching environment, it is obvious and predictable that different professional

backgrounds result in design ability discrepancy and various design methods. Nevertheless, enormous design comprehension and immense know-how is the key to spatial design ability. Therefore, the study aims to explore discrepancies between students from different professional backgrounds after multiple entrance program was put into practice using teaching evaluation analysis, then try to find out academic problems and policies regarding to spatial design courses.

2. Literature Review

Spatial design is so closely linked to our daily lives among all design that it takes our living space as a design object. Moreover, the main concept of spatial design is to create physical space in pursuit of aesthetics, cultures and practical proposes.

Discrepancies among professional design abilities can be found in considerable researches. Many indicate that personal spatial ability can improve after proper trainings (Rhoades, 1981), Lohman and Kyllonen (1984) believe that spatial comprehension is not a single ability, which is formed with moving, transforming and level-framing. Pribly and Bordner (1985) defined spatial ability as containing two sub factors-spatial visualization and spatial orientation. Spatial visualization is the ability to mentally manipulate pictorially presented stimuli; involved in the processes of manipulation are the abilities of recognition, retention, and recall of a configuration in which there is movement along the internal parts. Spatial orientation is the ability to remain unconfused by changing orientations in which a configuration may be presented. Ho (1988) concluded that design courses are the core for teaching architecture major students to inspire them to think, analyze and brainstorm. That is to say students with general education background have better learning abilities.

To sum up, design is logic operation ability and empirical rule's inference. Design decision-making is the conclusion from question after design know-how and experiences, which result is obtained by way of feedback and revision. In addition, spatial design ability components result from not only individual’s perception, knowledge and memories, but also the designer’s personal experiences.

3. Research Method

In quest to observe students’ learning scale, difference from various study groups learning progress and influences to learning from all aspect, the research adopts the following two types of curriculum assessment to record and observe spatial design courses after a long period of time.

1. Spatial relation operation: this operation is a part of aptitude test. Testers can only picture object in different directions to measure spatial perception. They even have to imagine shapes and materials to form various objects in three-dimension so that they can visualize actual components for each object. Students then make some multi-view and isometric drawings and models to finish the test.

2. Spatial recognition operation: Ruth, John, Harry, and Diran (1976) spatial orientation and visualization, using card rotation, cube comparisons, form board, paper folding and surface development to assess students’ spatial perception. Students then make some multi-view and isometric drawings and free-form models to finish the test.

The research applies the test on spatial design courses for freshmen from Spatial Design Section at Construction Technology Department in Tungnan University, Grades for each student are collected after each course from teachers’ observations and records to be used as analysis for course assessment.

4. Results and analysis

4.1 Grouping

Table 1 Grouping

Group	high school		Advertising design		interior space		drafting		other	
Number(pax)	8		20		11		10		4	
Gender (pax)	male	female	male	female	male	female	male	female	male	female
	3	5	8	12	6	5	7	3	4	0

53 freshmen from Spatial Design Section at Construction Technology Department in Tungnan University are divided into high school group, advertising design group, interior space group, drafting group and other group (includes beauty treatment section, marine section, and etc.) with 28 males and 25 females. Details can be seen in Table 1.

4.2 Assessment analysis

1. Spatial relation operation

Table 2. spatial relation assessment averages for groups

Groups	Average	Persons	Standard deviation
High school	75.13	8	10.01
Advertising design	84.25	20	5.24
Interior design	84.36	11	5.75
Drafting	78.6	10	11.85
Other	80.75	4	3.86
Total	81.57	53	8.3
F ratio	2.736		
significance	.039		

Table 2 indicates differences among each group based on average, standard deviation and average difference. Analysis of variance (**ANOVA**) shows significance $P < 0.05$ among spatial relation, in other words, differences do exist among each group when it comes to spatial relation operation assessment. Results from Table 2 show that assessment averages are: interior design, advertising design, other, drafting and high school group. Professional learning background causes vast difference between interior design group and high school group.

2. Spatial recognition operation

Table 3 spatial recognition assessment averages for groups

Groups	Average	Persons	Standard deviation
High school	71.25	8	13.10
Advertising design	81.10	20	11.765
Interior design	87.36	11	4.88
Drafting	82.70	10	12.31
Other	80.25	4	5.56
Total	81.15	53	11.40
F ratio	2.686		
significance	.039		

Table 3 suggests differences among each group based on average, standard deviation and average difference. Analysis of variance (**ANOVA**) shows significance $P < 0.05$ among spatial recognition, in other words,

differences do exist among each group when it comes to spatial recognition operation assessment. Results from Table 3 show that assessment averages are: interior design, drafting, advertising design, other and high school group. The same as spatial relation operation assessment, spatial recognition operation assessment shows biggest difference between interior design group and high school group.

The research concluded that results from assessment fit the heterogeneity hypothesis applied on multiple entrance program students. It also shows that high school and vocational education cannot seem to distribute students with their potentials and carry on with professional training completely. This leads indirectly to better perception from professional background students. In other words, high school education ought to work on more of distributing students comply with their natures and characters for more appropriate professional training.

5. Conclusions and suggestions

The research uses spatial design course by way of freshmen students in the vocational school, differences among various professional background training and different spatial design behaviors. Students reveal spontaneously their possible problems and difficulties via hand-on operation in design courses. Those can be used to redesign course outlines and contents towards architecture departments in vocational schools and institutes. Followings are the conclusions and suggestions from the research:

1. Conclusions

(1) Spatial design ability differences do exist among students with various professional backgrounds; (2) Promotion of basic design course assisted with multiple entrance programs should be encouraged; (3) It helps to upgrade learning effects to adopt mixed teaching methods.

2. Suggestions

(1) High school education ought to work on more of distributing students comply with their natures and characters for more appropriate professional training; (2) Lowering spatial design differences with various professional backgrounds by outlining spatial teaching programs; (3) Applying spatial design ability index assisted with spatial teaching programs for learning assessments; (4) Long-term spatial design ability observations, records and analyses are necessary.

6. References

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