

Research on Student Studio Assisted Education for Discipline Construction of Undergraduate Industrial Design in Local Colleges and Universities

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Abstract: The discipline construction of industrial design in local colleges and universities needs to seek for a characteristic path fitting for the actual conditions under the background of innovation talent training required. This study focuses on student design studio as a way of educational reform and suggests its advantages and disadvantages as well as improvement solutions in Xihua University, through adopting questionnaire and analyzing the predicament in the discipline construction.

Keywords: Design management, discipline and specialty construction, educational reform, industrial design, studio

INTRODUCTION

Under the background of changing the mode of economy growth, the manufacture industry of our country presents an unprecedented development trend for creativity and innovation. To accelerate the process of new type industrialization and promote the combination between producer service and model manufacture, our country put forward development of industrial design as an important approach to that change. National sustainable development centers on innovation, in order to raise core competitiveness it is essential to train lots of industrial design talents satisfying development requirements in new times. Currently, there is distinct unbalance and great gap in industrial design education, which only depends on some minority well-known universities. To boost the discipline construction and cooperate with local economy will be the access to promote industrial design development and the inevitable trend for improving the education quality. This study sets one typical local university Xihua University as an analyzing subject, through emphatically researching its student studio system carried out in the educational reform and exploration. It seeks for a positive way to match the characteristic and variation development of industrial design in local colleges and universities and a specific and feasible method of improving the education and training mode for student innovation capacity in industrial design even in art design. Wang (2009) study the innovation ability cultivation for industrial design students: for production development design lessons. Sun *et al.* (2009) analyse the great virtue and energetic circulation, innovation and entrepreneurship: art design talents cultivation modes based on studio system. Whitehouse (2002) study the design of calamari: an ad-hoc localization system for sensor networks. Galstyan

et al. (2004) study the distributed online localization in sensor networks using a moving target. Wang *et al.* (2004) analyse the lower bounds of localization uncertainty in sensor networks. Xiang *et al.* (2007) propose a node localization algorithm based on connectivity in wireless sensor networks.

In this study, to satisfy the new times requirements of higher education talent training and industrial design talent ability, we analyse industrial design teaching to construct a characteristic path fitting for college position and local economy. In process of educational reforms, student studio system can be regarded as one efficient assisted education way and a developing stage limited by different student quality and teacher resource. Although there are lots of improvement spaces, the assisted education has multi-flexibility that can be used in most of the colleges combined with their actual conditions. To realize diversity development can promote form positive circle among teaching, learning, researching and practicing and even establish characteristic discipline construction.

Predicaments of industrial design discipline construction in local colleges and universities:

The discipline of industrial design was established in a great deal of colleges in 2000. So far, it has experienced ten years accompanied with continuous college expansion. The running school tends to be stable, but more or less meets a development bottleneck. Compared with the above mentioned well-known universities, the development of industrial design in quantities of local colleges and universities are unbalanced. Though the limitations and difficulties met in the discipline construction are different, the educational aspect problem exhibits quite uniformity on certain degree.

Numerous student quantity: The scale of running school becomes much larger for the college expansion in recent years, which brings inevitable problem for teacher allocation. Considering long-term school enrollment and insufficiency expenses, job vacancies are adopted in running school. The ratio of teachers can't be satisfied for the requirements of art design, so having large classes is as a quite common means. The discussion process in design classes is neglected and expansion of design thought such as brainstorming still stays on paper. It's impossible for teachers to give adequate guidance in class. The lack of design thought training leads to insufficient innovation capacity, which is far away from the requirements of industrial design talents, even is deviated from the trend of industrial design education

Different student quality: The potential problem accompanied with above mentioned scale of running school is obviously more different student quality than that in key universities. The major isn't correspondent with the discipline declared in the college entrance examination. Most of the students lack system understanding on the major, which studied by students isn't the one they preferred, so there appears the phenomenon such as lacking of learning power and interesting in industrial design (Wang, 2009). More seriously, the college expansion brings that students just learn for diploma. Quite a few students declare sixty points best, whose learning attitude and purpose should be changed no matter whether they have interests in design or not. The student quality problem in art enrollment is more outstanding. Quantity of students couldn't pass their qualification in the college entrance examination, so they had to take part in so-called art training for the examination. After entering into the college, these students put the learning aside the reason why is that they think they will never work in the design field after graduation. See through the appearance that students learning design meet repelling problem in earlier stages much easily. Seeking continuously for perfection and details, positive interaction in industrial design education can be satisfied with such study aims. The origin and quality of the student backgrounds compose the biggest challenge.

Limit resource conditions: The conditions of running school need to be improved step by step in a long period. Parts of the local universities are short of basic conditions, like basic multi-media equipment, computer teaching center and student special classroom. Many professional equipments and lab needed in industrial design discipline construction are stagnated. After previous investment in supplying for the major, further construction is feeble. It's not clear whether to purchase relative equipments for teaching or researching. It's difficult to support to form

stable researching direction. Required quantities limited by the scale of running school were insufficiently satisfied for teaching. Teaching and researching needed to own a positive interaction, but the consumption of hardware reversed proportion in the shift. For most of universities, conditions of running school needed in the industrial design discipline construction were improved in a gradually development process.

Low economy participation: With promoting the reformation of economic, scientific and educational structure, universities perform the function as centre of teaching and researching and enhance the service consciousness for local economy and social development. Industrial design has close relative with manufacture industry, so it is quite practicality and utility. However, to a great extent, industrial designers can't service for local economic development. There are three reasons. First, industrial design is out of connection with pillar industry of local economy, lacking of direct cooperation with enterprises and projects. Another, the structure of local industry couldn't possess space for long-term industrial design requirements. Abundant of industrial design graduates have to seek for employment in Eastern and Coastal Regions for their developed manufacture industry. Last, the same educational means had no diversity and characteristic. The graduates had insufficient innovation ability.

SURVEY RESULTS AND ANALYSIS

Studio system has been carried out in many colleges as an educational reform to seek for a suitable teaching mode for school conditions, especially well-known key universities and art colleges went ahead. School of art in Xihua University began to establish student design studio in 2009 in order to find out the teaching mode for responding the problem and bottleneck of industrial design development in local colleges and universities. The questionnaire was adopted to understand studio running situations and improve running system.

Survey overview: The questionnaire was adopted paper investigation form this time. The number of questionnaires was 60, in which 56 were recalled validly. The validity rate was 93.33%. The software of data analysis was Stata 11.

- **Authenticity and representativeness:** The questionnaire was tried best to avoid any basic personal information which may be identified. On the other hand, the surveyed was contacted by student not teacher. Both of them could ensure the questionnaire to reflect students' inner thoughts. Furthermore, questionnaire covered most of the

Table 1: General purposes selected to join in studio of students

Purposes & expected description	To improve one's specialty ability (%)	To have a stable learning space (%)	To have more communications with other classmates (%)	To have more communications with teachers (%)	To have practice chances for design projects (%)	To participate in competitions & get awards (%)	To expand one's visions (%)	To have more chances than ones not join in studio (%)	To prove one's ability better than others (%)	Other (%)
Numbers of low division (ratio of this age)	19(100)	14(73.7)	18(94.7)	16(84.2)	15(79.0)	17(89.5)	17(89.5)	9(47.4)	0(0.0)	0(0.0)
Numbers of upper division & working students (ratio of this age)	30(81.1)	19(51.4)	28(75.7)	24(64.9)	29(78.4)	22(59.5)	24(64.9)	13(35.1)	3(8.1)	0(0.0)
Total numbers (whole ratio)	49(96.1)	31(60.8)	46(90.2)	40(78.4)	44(86.3)	39(76.5)	41(80.4)	22(43.1)	3(5.9)	0(0.0)

Remarks1: Low division contains freshman and sophomore. Upper division contains junior and senior. Except otherwise defined that the definition of low division and upper division are the same diversion mentioned below. 2: In 56 samples, there are five not belonging to student studio members. The whole ratio means that samples numbers/51. 3: The dark columns mark the top three high data.

Table 2: Most important purpose selected to join in studio of students

Purposes & expected description	To improve one's specialty ability (%)	To have a stable learning space (%)	To have more communications with other classmates (%)	To have more communications with teachers (%)	To have practice chances for design projects (%)	To participate in competitions & get awards (%)	To expand one's visions (%)	To have more chances than ones not join in studio (%)	To prove one's ability better than others (%)	Other (%)
Numbers of low division (ratio of the age)	10(52.6)	1(5.3)	0(0.0)	0(0.0)	3(15.8)	1(5.26)	3(15.8)	1(5.3)	0(0.0)	0(0.0)
Numbers of upper division & working students (ratio of the age)	15(40.5)	2(5.4)	6(16.2)	0(0.0)	6(16.2)	0(0.0)	3(8.1)	0(0.0)	0(0.0)	0(0.0)
Total numbers (whole ratio)	25(49.0)	3(5.9)	6(11.8)	0(0.0)	9(17.6)	1(2.0)	6(11.8)	1(2.0)	0(0.0)	0(0.0)

students in existing studio because the studio system has been established in Xinhua University just for two years. The survey conclusion has certain representativeness.

- **Shortage and limitation:** Investigation scale was mainly chosen in existing studio student members. Total 56 samples contained 6 former members and 5 non-studio students. Those two kinds of samples covered a little bit short. Another is, as for the statistics technology, a few samples may cause some data trend unnoticeable and part of evidences for the conclusion inadequacy.

Analysis and findings:

Purpose and the expected: According to the survey analysis, improving specialty ability is the main reason for students to apply for join in student studio, no matter low division or upper division. (Table 1) to have more communications with other classmates is another important purpose after improving ability. There were different purposes for grades between design competition and practice. Low division was partial to design competition and upper division was partial to design practice. It shows that with the design ability enhance students will take the practice opportunities as an important method to test their design ability. It also reflects, the experience in studio will help promote specialty level and the design ability will be gradually promoted in studio. Furthermore, for students in low division, to expand design visions are much more important than upper division students. (Table 2)

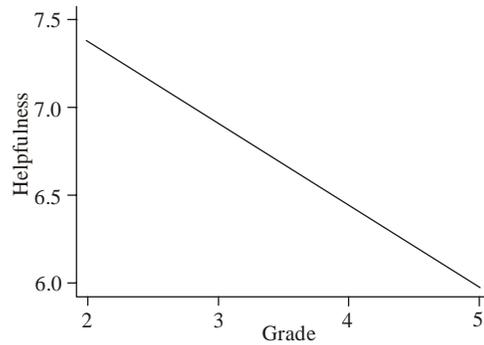


Fig. 1: Relations between grades and satisfaction for promoting specialty

Relations between grades and satisfaction:

Specialty promotion satisfaction degree: According to the reflection, studio learning experience indeed played a role in specialty promotion. Student studio assisted education reached a degree of 7.7 for helping promote specialty, which meant this educational form had a quite obvious function for enhancing design ability. But for relevance analysis, the coefficient between grades and specialty promotion was -0.1, existing negative weak correlation. The negative weak correlation meant that grade growth leads to decrease the degree of specialty promotion satisfaction. (Fig. 1)

Tutor satisfaction degree: Students gave an average point 8.04 for the helping function of tutoring. Guidance effect of teachers in industrial design could promote the

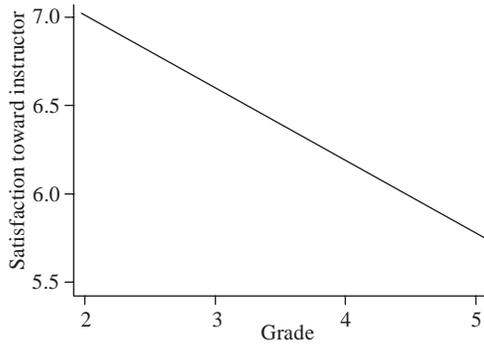


Fig. 2: Relations between grades and satisfaction for tutor

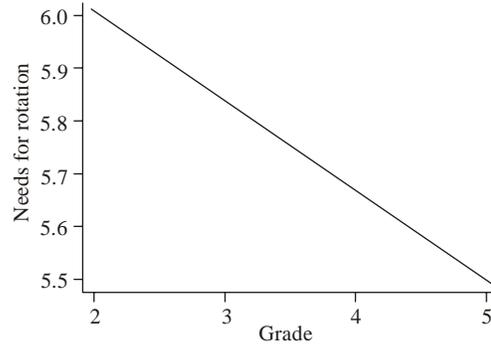


Fig. 4: Relations between grades and needs for rotation

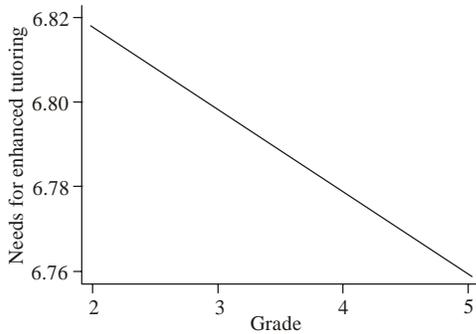


Fig. 3: Relations between grades and needs for enhanced tutoring

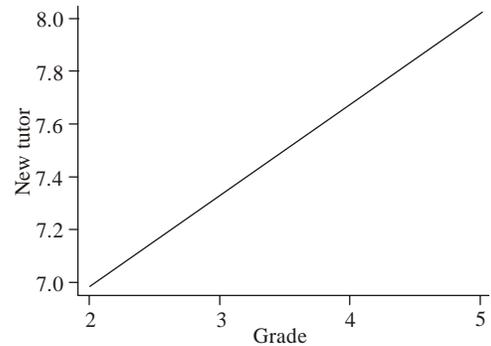


Fig. 5: relation between grades and teacher rotation

Table 3: The satisfaction of studio running from different grades

	Numbers	Averages	Deviation	Min	Max
Sophomore	19	7.05	1.96	2	10
Junior	36	6.25	2.91	0	10

Min: Minimum; Max: Maximum

progress of students design ability. But for relevance analysis, the coefficient between grades and tutor satisfaction was -0.08 , existing negative weak correlation. The unobvious relationship and negative weak correlation meant that grade growth leads to decrease the tutor satisfaction. (Fig. 2)

Tutor demand relation: The willing of tutor reinforcement was 7.7. According to statistics relevance analysis, the coefficient between grades and tutor demand was -0.004 , existing negative weak correlation. The unobvious relationship and negative weak correlation meant that grade growth didn't need to specially enhance tutoring. (Fig. 3)

Total satisfactory degree: The satisfaction for studio was concluded from grades as following: deviation of sophomore was 1.96 and the deviation of junior was 2.91. (Table 3) It showed different opinions especially in sophomore. Above mentioned, accompanied with grades increasing, the satisfaction degree for specialty promotion

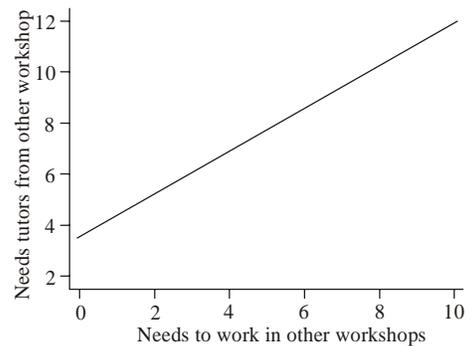


Fig. 6: Demand relation between studio and teacher rotations

and tutor reflected downtrend, which matched with the survey result of total satisfactory degree.

Changing relations between grades and communication demands:

Demands for workshops rotation: According to relevance analysis, the coefficient between grades and demand for workshop rotation was -0.03 , existing negative weak correlation. The unobvious relationship and negative weak correlation meant that grade growth didn't need to specially enhance rotating. (Fig. 4)

Demands for tutors rotation: According to relevance analysis, the coefficient between grades and demand for tutor rotation was 0.07, existing positive weak correlation. The positive weak correlation meant that with grade growth the demand of tutor rotating enhanced. (Fig. 5)

Demands for adding rotation opportunities: According to relevance analysis, the coefficient between studio learning opportunity rotation and other studio tutors rotation was 0.70, existing positive strong correlation. The strong relationship and positive correlation meant that students had strong willing to communicate with other studios and to communicate with tutors coming from other studios. (Fig. 6)

Thinking and suggestion: Student studio system of industrial design discipline construction in local colleges and universities starts late. Meanwhile, it also faces the plight in the development of local universities, whose conditions are too different to list them out. Although gaining some results, the student studio system still wades across the stream by feeling the way in order to find out and solve the problems and seek for further improvement. As one of important assisted education form in industrial design education, the student studio system needs to listen to students' heartfelt requirements and adjust the construction steps real-time.

To perfect examination system in student studio: For example, Zhejiang University of Technology put scientific and research funds and thesis into research examination system of studio (Sun *et al.*, 2009). However, it was more suitable for teacher studio than for student studio. To establish an efficient and reasonable examination system is the power to encourage and promote self-development. The examination system can't only depend on students' satisfaction, because student studio can obviously promote the new low division students' ability for above mentioned purposes and expected. According to the survey display, the satisfaction degree reached 7.14 for industrial design student studio in Xihua University. Although the condition of studio belonged to partly satisfaction, examination was in blank and lacked vertical comparison targets. If judged with award quantities or project quantities, the examination system may be in a simplicity dilemma, which was contrary with the original intention of assisted education. Therefore, in a stable period of student studio system, self-development and positive competition among studios should be promoted. Reasonable examination and comparison standard should also be constructed and completed.

To promote communications among studios: One of the most obvious problems in recent student studio forms is lack of normalized communication system among

studios. The will on students rotating to different studios to learn and communicate reached a degree of 6.47, but the will on rotating other teachers to tutor and communicate in self studio reached a high point at 7.9. In relevant analysis of studios rotating demands, students decreased their desire for communication with other studios while entering higher grades. In fact, at the beginning of student studio construction, the so-called parochial prejudice was neglected how to avoid. Studios lack communications and teachers with different knowledge background hardly move in studios, so problem of requiring mutual communication begins to appear. Understanding between students and teachers need a certain adjustment period and the student's will for communication is outstanding in the survey. So the write suggests adopting flowing system in upper division, which considers train transit of professional skills and realize the necessity of flowing communication.

To reinforce the combination with teaching: Student studio system can't break away from classroom teaching as a supplement of assisted education out of classroom. The real situation was that 24% students join in studio at second semester in freshman year, 39% students at first semester in sophomore year and 22% students at the second semester in sophomore year. It can be seen that lower division students have quite large proportion of studio members. For them, learning basic skill and essential knowledge is more important task. Therefore, 73% students regarded stable learning space and location provided from studio. Most of the studios are service and assisted for teaching, so it's very necessary to expand and tutor classroom teaching in studio. No matter skill or design ability, student studio cooperated with the communications and discussions among classmates and teachers could promote students to handle and finish classroom tasks quicker and better. Especially for students in upper divisions, student studio makes them have more energy and time to participate in learning section and practice opportunities out of the classroom.

To train innovation ability and research ability: The running contents carried out in recent student studio seriously lack of research training and guidance with above mentioned design competition and actual design projects. The content of researching type is a quite important way to train students' innovation ability and the reflection ability of "Find out problem-Solve the problem-Complete the problem". Pure actual design projects had requirement for commercial benefits. It's not fit for students' further development for the low innovation requirement of the projects. And the contents of competition type always lack of depth to a certain degree. The write adopts form of workshop when tutoring a group of student for a research named Research of Interconnected Mobile Situation Experience for the Relic and Museum Tourism. During a long period about 4

months, students took lots of surveys for museums and adopted plenty of methods like field research, questionnaire and customs interview. Students had no cognition on the Relic & Museum Tourism at the beginning, in the end they partial handled the research means and understood the design methods for thinking and solving the problems. That design work and research result had a certain originality and innovation. The example brings that the student studio still pays attention on the research ability training and research methods training. Real innovation needs research ability; otherwise the prototype design in industrial design can't be separated from copying.

To promote service for local economy: For development predicaments generally existed in above mentioned local colleges and universities, efficient use of studio system and development requirements combined with local economy service are thoughts of our school to enhance educational reforms. The school is attempting to bring in some enterprises with design desire to connect with several student studios and their tutors and change the way that a single teacher brought the design project. The participation of several studios will partly promote to increase the communication opportunities among studios. More importantly, considering the characteristics of local enterprises projects, it can match the industrial design characteristic construction combined with local advantage industry. To positively take part in the local economy development is an important times requirement and inevitable trend for local universities development.

To reflect teaching and training for non-studio students: The Student studio acts as an excellent form of teaching supplement and displays efficient teaching results, but the teaching and training problem of non-studio students becomes outstanding under the unchangeable scale of running school. During the survey, non-studio students expressed a high will to enter the studio at a high degree of 8.0. Parts of the students were negative to treat the situation of lacking opportunities entering studio. They thought their positivity for learning would be largely negatively affected for not entering the studio, especially some students expressed extremism emotion to give up study. There existed challenging problems that weather is fair for non-studio students to train after class as the limitation of teacher resources and school conditions and whether can give opportunities for most of students with positive learning attitude. Some students in middle level are a group neither belonging to so-called excellent student in studio nor giving up progress. In positive studying atmosphere and abundant communication environment, these middle level students will make a great progress, otherwise they will be influenced to improve their ability and train their literacy. Therefore, more careful and tolerated measurements are needed to select students enter and promote members flow.

CONCLUSION

The discipline construction of industrial design in local colleges and universities faces many self-development bottlenecks and homogeneous challenges like similar class settings and isolated teaching process. To satisfy the new times requirements of higher education talent training and industrial design talent ability, industrial design teaching should construct a characteristic path fitting for college position and local economy. In process of educational reforms, student studio system can be regarded as one efficient assisted education way and a developing stage limited by different student quality and teacher resource. Although there are lots of improvement spaces, the assisted education has multi-flexibility that can be used in most of the colleges combined with their actual conditions. To realize diversity development can promote form positive circle among teaching, learning, researching and practicing and even establish characteristic discipline construction.

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REFERENCES

- Sun, Y.D., Cao Z.K., Chen W., 2009. Great virtue and energetic circulation, innovation and entrepreneurship: Art design talents cultivation modes based on studio system. *Decoration*, 02: 104-105.
- Galstyan, A., Krishnamachari, B. and Lerman, K., 2004. Distributed online localization in sensor networks using a moving target. *The 3rd International Symposium on Information Processing in Sensor Networks (IPSN'04)*, Berkeley, California, USA, pp: 61-70.
- Whitehouse, C.D., 2002. The design of calamari: an ad-hoc localization system for sensor networks. *Master's Thesis*, University of California at Berkeley, pp: 1-73.

- Wang, H.B., L. Yip and K. Yao, 2004. Lower bounds of localization uncertainty in sensor networks. In IEEE ICASSP, Montreal, Canada, pp: 975-983.
- Wang, J.G., 2009. Innovation Ability Cultivation for Industrial Design Students: for Production Development Design Lessons as Example. *Decoration*, 05: 100-102.
- Xiang, M.T., H.S. Shi and L.H. Li, 2007. A node localization algorithm based on connectivity in wireless sensor networks. *Chinese J. Sens. Actuat.*, 20(10): 2308-2312.