

The Enlightenment of Co-operative Education in University of Waterloo to Architecture Specialty in Local Universities in China

Huiyan Zhao

School of Civil Engineering and Architecture, Wuhan Polytechnic University, Wuhan, Hubei, China

774625545@qq.com

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Abstract. The disconnection between school education and social needs is the most common problem reflected by students and employers in architectural specialties of local colleges and universities in China. Taking architecture of Wuhan Polytechnic University as a representative, briefly introduce the overview and the shortcomings of architecture on practical teaching. Drawing lessons from the co-op education of University of Waterloo, Canada, which is internationally renowned for students' professional practical ability, some inspirations are discussed. It is necessary to change the original school-running thinking and educational thinking, make full use of social resources, and let practice out-of-school run through the whole learning stage. For this, we may start from the easy-to-implement campus arrangement, such as adjusting term time design.

1. Introduction

Undergraduate Architecture is a highly practical specialty, which belongs to the engineering discipline. As far as those in local universities are concerned, they have neither the resource advantage of famous universities nor their own professional basic advantages. Only by improving the students' employment ability can make the major progress in higher education.

The improvement of students' employment ability cannot be separated from the cultivation of practical ability. China has been aware of the importance of practical teaching, and various departments have issued a series of documents, such as Outline of the National Medium and Long Term Education Reform and Development Plan (2010-2020), to emphasize that colleges and universities should attach importance to practical teaching. Looking back on the development in recent years, practical teaching has indeed received more attention and the form has become more standardized than before. However, from the current situation of architecture specialty, the achievement is far from the expected goal. How to improve the practice teaching has always been the subject of architectural specialty exploration in local colleges and universities.

The University of Waterloo in Canada is internationally renowned for developing students' professional practical abilities, and the Co-operative education is worthy of our reference.

Here, taking architecture of Wuhan Polytechnic University as the representative of local universities, briefly analyzes the shortcomings of practical teaching, and briefly introduces the Co-op education of University of Waterloo. Then, some inspirations are discussed.

2. The shortcomings of practical teaching in architecture in Wuhan Polytechnic University

2.1 Overview of Architecture Teaching Arrangement

Architecture in Wuhan Polytechnic University are still based on theoretical teaching and supplemented by practical teaching. Students have less opportunities and time to practice. It adopts a 5-year educational system, 2 semesters per academic year, about 20 weeks per semester. There are about 8 weeks of summer vacation and 4 weeks of winter vacation between the two semesters.

Architecture major has arranged some practical teaching, such as curriculum design practice in-school about 3 weeks per semester, sketching practice or ancient building surveying and mapping

practice out-of-school led by teachers in summer vacation which usually lasts about 2 weeks. Among all practice, only once is really arranged for off-campus work, set in the 7th semester, about 14 - 16 weeks. On the whole, although there are many forms of practical teaching, the teaching arrangement is still based on theoretical teaching.

2.2 The shortcomings of practical teaching

2.2.1 It is difficult for students to find internship positions related to architecture.

Needless to say, there is no time for internship during the semester. But for 8 weeks of summer vacation, it is difficult for students to find internship positions related to architecture, too. This is because there are 2-week practice teaching inserted and only 6 weeks left to be free. Because of the project cycle, construction companies generally like interns for a longer period of time, preferably more than half a year. So, often, most students take a leisurely vacation at home or do other jobs unrelated to architecture.

2.2.2 The only off-campus practice is set late in the 7th semester.

When students come to practice, they usually find that they know too little or haven't studied professional courses well in school. But regrettably, it's too late to realize that. There is no more chance for them to study in school for the 8th term without the professional course. This time arrangement of practice is not conducive to the transformation of students' learning needs in social practice into the motivation of theoretical studying in school. It turns the mutually promoting relationship between studying and practice into a one-way irreversible relationship, which goes against the original intention of education and finally affects the cultivation of students' practical ability.

2.2.3 It is not conducive to students' understanding of occupation and themselves.

Because only one semester, about half a year, is used for practice out-of-campus, students have few practical opportunities and limited positions to try. According to the survey, most of students have 1 to 2 internships, few have 3 internships, and most of them are in the same career like design. This has greatly affected students' understanding and recognition of other companies and other positions, as well as the cultivation of post competence. Certainly, it is also not conducive to students' comprehensive understanding of their own strengths and preferences.

3. A Brief introduction to co-operative education in University of Waterloo

University of Waterloo, which was founded on nearly 60 years ago and had a similar background and historical needs with local universities in China, now has become a model of co-operative education. It not only has the world's largest co-operative program, but also is recognized as the most innovative university in Canada for 27 years by Maclean's magazine in its reputational survey [1]. Co-operative education has been become the synonymous with University of Waterloo [2].

3.1 What is Co-operative education?

Co-operative education combines academic studies with work experience. Each academic year has three terms, which are fall (September to December), winter (January to April), and spring (May to August). Each term is either academic term or work term, which means a co-op student will be in school full time in academic terms or in a full-time job relating to his specialty in work terms. [3]

Usually, Academic terms alternate with work terms, which form study/work sequences. And there are many variations of co-op study/work sequences, such as those (including architecture) listed in Table 1. In most programs, co-op takes about five academic years to complete, and students will gain up to two years of relevant work experience.

Table 1 Study/Work Sequence Information [4]

Year Example	First			Second			Third			Forth			Fifth		
	F	W	S	F	W	S	F	W	S	F	W	S	F	W	S
Example 1	A	B	※	A	※	B	※	A	※	A	※	B	※	A	/
Example 2	A	B	off	A	※	B	※	A	※	A	※	B	※	A	/
Architecture	A	B	off	A	※	B	※	A	※	B	※	※	A	※	B

Notes: 1. F- Fall term, W-Winter term, S- Spring term; 2. A, B: Academic term; 3. ※ : Work terms;
3. Off: Denotes a term in which students are not registered at University for classes and are not on a co-op work term.

3.2 The achievements of Co-op education [5]

Now, University of Waterloo offers more than 120 co-op programs. The incomparable co-operative education program is the reason 70% of incoming undergraduate students choose Waterloo. And more than 60 percent of undergraduate students are enrolled in the program. With multiple work terms, one can try different careers to see what he likes – or dislikes, learn how to identify his strengths and develop skills essential for future careers, gain experience, make money, and get access to employers.

In a word, the competitive education gives students more opportunities for success, for example, the university has more than 6,700 co-op employers in 60+ countries, co-op student employment rate of 97%.

4. Enlightenments of the CO-OP Education on practical teaching of architecture

4.1 Change the thinking of running universities and make good use of social resources

Teaching is the core task of universities. However, how to teach students well is a realistic problem that can be enlarged to the society. It has been proved that universities cannot cultivate students to meet the needs of the society only by virtue of their own strength. In this case, why don't we change our thinking? We can make good use of social resources, make society be a part of our school, and let social needs guide students to learn actively. University of Waterloo has done very well in this regard. We can learn from its school-running mode that is good at utilizing social resources, and introduce social resources into practical teaching, or put practical teaching in the big class of society. This will open a new direction for our practical teaching, that is, to go out of campus and integrate into society.

4.2 Change educational thinking and make practice out-of-school run through the whole learning process

Architecture in local colleges and universities in China, as mentioned above, has set up practical teaching which links to enterprises and institutions, but only at the final study stage. This kind of arrangement is often based on the thinking that students should learn most of knowledge in school and then go to work. It has proved that students are relatively confused in their study, because they have no sense of urgency and lack of goals. When they go to practice outside or even when they graduate, they still don't know what they can do, what they are suitable for and what they like or dislike to do. Therefore, we need to change the original understanding of practical teaching. We don't have to pursue to master all theoretical knowledge before practicing, such as setting off-campus internship in the 7th semester. Making practice run through the whole learning stage is not only conducive to training students' employment skills, but also conducive to arousing students' inherent desire and improving the quality of learning in-campus.

4.3 Starting from the easy-to-implement campus arrangement

The success of the Co-op education model in University of Waterloo lies not only in the convenience and guarantee of students' participation in practice, but also in the support of many departments, such as the acceptance of co-op students by enterprises and institutions, the tax reduction policies of the state for enterprises participating in CO-OP.

For local colleges and universities in China, the construction of education similar to the Co-op model cannot be accomplished overnight. We can start from the easy-to-implement campus arrangement. For example, adjust the time of curriculum setting to provide opportunities for students to participate in engineering practice.

The school system of Wuhan Polytechnic University is 2 semesters a year, 20 weeks per semester. Among 20 weeks, theory teaching is 16 weeks, curriculum design and other school practice are about 3 weeks, and examination lasts 1 week. Summer vacation is 8 weeks, winter vacation is 4 weeks. If we keep all the theory teaching contents and weeks, we can move out of the 3 weeks of each semester (curriculum design practice in-campus) and the 2 weeks of winter vacation and merge them into the summer vacation, so that the summer vacation will have $8 + 3 + 3 + 2 = 16$ weeks, about 4 months.

These 4 months, which can give students opportunities to practice outside school, would better be placed in summer. This is because winter vacation has a national holiday Spring Festival.

In this way, on the basis of the original once off-campus internship, 4 opportunities can be increased, and each time is about 4 months, which is more in line with the characteristics of the architecture internship. It is relatively easy to operate and implement. The detailed adjustments are shown in Table 2.

Table 2. Time Adjustment of Specific Week

Semester	First (week)			Winter vacation	Second (week)			Summer vacation	
	Theoretical teaching	Campus Practice	Test		Theoretical teaching	Campus Practice	Test		
Current		16	3	1	4	16	3	1	8
	Totle	20			4	20			8
Variation		0	-3	0	-2	0	-3	0	+8
After adjustment		16	0	1	2	16	0	1	16
	Totle	17			2	17			16

5. Summary

From the successful experience of the co-operative education of University of Waterloo, we have learned that there are still many things to be done to improve students' practical ability in architecture major of local colleges and universities in China. We need to change our school-running thinking, make full use of social resources, change our educational thinking, and let out-of-school practice run through the whole learning stage. For this, we can start from the school work which is relatively easy to implement, such as adjusting term time design, increasing the time of off-campus practice.

References

- [1] <https://uwaterloo.ca/>
- [2] <https://uwaterloo.ca/co-operative-education/>
- [3] <https://uwaterloo.ca/co-operative-education/about-co-operative-education>
- [4] <http://ugradcalendar.uwaterloo.ca/page/Study-Work-Sequence>
- [5] <https://uwaterloo.ca/co-operative-education/why-co-op/benefits>