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Equipping Construction and Related Engineering Students for the Market Needs in Mainland China

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ABSTRACT

Thanks to a strong internal demand, the economy of mainland China has been increasing sharply during the last decade. It is generally expected that the economic growth in China will persist in the foreseeable future. The economic development of China has given rise to an immense demand for infrastructure and construction facilities. While a number of these projects are complex and large in scale, construction and related engineering professionals who have experience on projects of these kinds should have a good opportunity to provide their services in China. To help promote exporting the services of construction and related engineering professionals, the tertiary education sector and professional institutions have a crucial role to play to equip their students. However, many construction and related engineering programs are tailored for the local markets. Broadening the international exposure of students should become the future direction of construction and related engineering programs. In this paper, the results of a survey conducted with students and professionals in Hong Kong are highlighted. The teaching and learning activities having been built into the construction and related engineering programs are identified. Finally, recommendations for improving the construction and related engineering program structure conclude the paper.

Keywords: Construction education, competitive edge, tertiary education institutions

1. INTRODUCTION

No one can deny mainland China is becoming the engine of global economy in the foreseeable future. The rapid economic development of this vibrant country has resulted in an unprecedented demand for infrastructure and construction facilities [1]. Statistical reports reveal that construction development in the first and second-tier cities of China has experienced a three-fold growth during the last decade. Not only would the trend in those cities persist, the construction volume of the third-tier cities is also expected to surge as their economy begins to prosper.

Following China's economic reform, more and more overseas companies have set foot in mainland China. With the targets for China's future development laid down in the mainland's Eleventh Five-Year Plan, mainland enterprises are prompted to demand greater support from difference kinds of services especially the professional services. Construction and related engineering professionals from around the globe should seize the opportunities while proactively respond to and cope with the challenges arising from the development in mainland China and the implementation of her Eleventh Five-Year Plan.

While many tertiary education institutions offer a spectrum of construction and related engineering programs *viz*. architectural, civil, building services and cost engineering, those programs gear predominantly towards the local industry instead of exposing students to the global markets. Without understanding the system, legislation, practices and culture of mainland China, it is difficult if not impossible for graduates to venture into this rather peculiar and unfamiliar market.

In Hong Kong, for instance, the curriculum of construction and related engineering programs has been rather conservative with little fundamental reforms throughout the years. However, as the territory is so close to China, more and more graduates would choose to work across the border. Providing students with the necessary knowledge about mainland China is thus indispensible. With the downturn of construction activities in other advanced economies, construction and related engineering programs in those countries should also consider broadening the international exposure of their students.

To do that necessitates a better understanding of students and professionals' concerns as well as the limitations of the existing curricula. In this paper, the results of a survey conducted with students studying construction or related

engineering programs and the practitioners in Hong Kong are highlighted. The contents being incorporated into the curricula and the activities provided to the students are unveiled by interviewing the directors / leaders of construction and related engineering programs in Hong Kong. Based on that, recommendations on the future program development are provided in this paper.

2. EMPLOYMENT PROSPECT IN CHINA

A number of cities in China have recorded phenomenal economic growth over the past decade. Cities with substantial construction activities include Beijing, Shanghai, Chongqing, Guangzhou and Shenzhen [2, 3]. In recent years, infrastructure development and housing projects in the second-tier cities of China have also provided golden opportunities for overseas investors to take a share of this rapidly growing market, and this has generated a huge demand for architects, engineers, planners, estimators and other construction professionals.

In Hong Kong, a Closer Economic Partnership Arrangement has been established with the Chinese government and the territory since 2003. Through which, consultancy firms and construction companies can enjoy a preferential access treatment in the mainland market and a number of construction professions are benefited from the mutual recognition arrangements. Many construction stakeholders in Hong Kong including developers as well as architectural, engineering and cost consultants have already been successfully engaging in the mainland market. A number of Hong Kong architectural and engineering firms considered CEPA beneficial to their future development in China [4].

Despite that, the demand for overseas construction and related engineering professionals is rather confined to foreign funded construction projects or those schemes which are constructed by overseas contractors [5], as they prefer recruiting professionals who are more technically, managerially and contractually competent. Having become a member of the World Trade Organization, the procurement legislation must be strictly observed and there should be plenty of opportunities for foreign companies and professionals to participate in the construction development of China.

3. RESEARCH METHOD

To find out how to equip undergraduate students and sharpen their competitive edge to work in the construction market of China, a questionnaire survey was conducted in Hong Kong. Since the education system and curricula of the territory should be comparable to other advance countries like the United States, United Kingdom and so on, the lesson learnt from Hong Kong shall be relevant to the tertiary educational institutions of other countries offering construction and related engineering education. In the context of this study, construction and related engineering programs include but are not limited to architecture, civil engineering, building engineering and management, surveying, building services engineering, etc.

Final year students enrolled in various construction and related engineering programs offered by the universities in Hong Kong were targeted, and 650 self-administered questionnaires were distributed to the undergraduate students. The questionnaire strives to establish the adequacy of the current undergraduate programs in equipping them with the necessary skills and exposure to work in mainland China after they graduate. In the end, 381 valid responses were received representing a response rate of 58.6 percent.

The questionnaire survey was also extended to construction professionals in Hong Kong to uncover whether the Continuous Professional Development courses / activities organized by their professional institutions can help equip them working in China. With the help of relevant professional institutions, 267 self-administered questionnaires were received through a web-based survey. Of which, 260 completed questionnaires were found valid and used for further analysis. Over 70 percent of the respondents were at professional level, and around half of the respondents had over ten years post-qualification experience.

To get to know more about the curricula of construction and related engineering programs being offered by the local universities and to determine how well undergraduate students are equipped to work in mainland China, five program leaders / coordinators were interviewed. They were invited to share about the measures being put in place by their department and / or university to prepare their students to work in mainland China.

4. ENVISAGED BARRIERS

As shown in Table 1, over 70 percent of the students surveyed rated 'familiarity with local laws, regulations and bureaucratic procedures' and 'sustainability of the local market of host countries / cities' as the major barriers to move into the markets outside Hong Kong. In addition, about two-third of the surveyed students considered language and communication as well as cultural differences the significant hurdles for working outside the territory.

Table 1: Barriers for student to work in China

Attributes	***Yes*** **(%)**
Familiarity with the laws, regulations and bureaucratic procedures of other countries	73.5
Sustainability of the market of host countries	73.5
Language and communication	67.7
Cultural differences, understanding local conditions and acceptance by locals / colleagues	66.7
Competition from local professionals of host countries	57.5

From the perspective of the practitioners, the major barriers to work in mainland China (Table 2) were the 'familiarity with local laws, regulations and bureaucratic procedures' (64.2 percent) and 'cultural differences, understanding local conditions and acceptance by locals / colleagues' (51.2 percent). Moreover, over one-third of the surveyed professionals considered 'language and communication' as a significant obstacle for working elsewhere.

Table 2: Barriers for professionals to work in China

Attributes	***Yes*** (%)
Familiarity with the laws, regulations and bureaucratic procedures of other countries	64.2
Cultural differences, understanding local conditions and acceptance by locals / colleagues	51.2
Language and communication	39.6
Competition from local professionals of host countries	24.2
Sustainability of the market of host countries	21.9

5. ADEQUACY OF TRAINING

Tables 3 and 4 summarize the perception of students and practitioners regarding the training provided by the universities and professional institutions respectively. More than 70 percent of the students surveyed perceived that the program they were studying has covered the experience and knowledge of local industrial practices. 64.0 percent of the students surveyed were satisfied with the training on languages provided by tertiary education institutions. Despite that, only 51.4 percent and 53.0 percent of the students participated in the survey considered that their universities have adequately equipped them to work outside Hong Kong and help them to appreciate the culture of other countries respectively.

Table 3: Trainings offered by undergraduate programs

Attributes	***Yes*** (%)
Experience and knowledge of local industrial practices in your discipline	78.5
Critical and creative thinking	76.4
Life-long learning	69.3
Languages (bilingual / trilingual)	64.0
Leadership	61.7
Global perspective	60.4
Social and national responsibility	60.1
Entrepreneurship	54.1
Cultural appreciation	53.0
Adequately equipped to work overseas	51.4

The practitioners surveyed were generally less satisfied with the Continuous Professional Development programs they had taken part in as demonstrated by a lower percentage of affirmative answer on every aspect. Only a third of them (33.8 percent) perceived that those courses have enriched their 'global perspective'. In terms of helping them to appreciate the culture of other countries and equipping them to work elsewhere, only 19.2 percent and 15.8 percent of the surveyed practitioners respectively considered that those Continuous Professional Development courses beneficial.

Table 4: Trainings offered by professional institutes

Attributes	***Yes*** (%)
Experience and knowledge of local industrial practices in your discipline	57.3
Life-long learning	45.4
Global perspective	33.8
Leadership	30.4
Social and national responsibility	25.8
Critical and creative thinking	24.6
Languages (bilingual / trilingual)	23.5
Cultural appreciation	19.2
Adequately equipped to work overseas	15.8
Entrepreneurship	15.0

6. UNIVERSITIES INITIATIVES

As confirmed by most program leaders interviewed, equipping students' ability to work in mainland China and overseas has become a major educational objective of the construction and related engineering programs, as universities are well aware of the needs and importance to strengthen students' ability and readiness to work in mainland China and other countries. The curriculum design, therefore, would not only strive to equip students with the necessary hard knowledge and knowhow, but also the 'soft skills' and exposure so that they can capitalize on the increasing opportunities in other parts of the world including mainland China.

Practices, legislation and regulations related to mainland China are now built into various courses. Despite that, those courses remain relatively sparse and none of them were offered as core / compulsory courses. Some courses would be supplemented by the Chinese codes and practices so as to equip students with the first hand knowledge about the Chinese practices.

Table 5: Courses related to China's practices, legislation and regulations

Univ.	***Program***	***Courses***
A	Civil Engrg.	Engineering Practice in Mainland China (elective) Practical Project in China – involving the design of village schools to the standards and regulations of the mainland authorities (optional)
A	Architecture	The Building Process – Architectural Practice in Mainland China (optional)
B	Architecture	No specific course, but students' reading list includes Chinese codes and references
D	Surveying; Building Engrg. and Management	No specific course, but Chinese practice has been introduced in various courses, e.g. procurement and administration, property investment / economics / finance, etc.

Various activities such as exchange, study tours, competitions, and even practical projects were organized to help students appreciate the Chinese culture and lifestyle (Table 6). To further promote cultural exchange, a university has signed up an agreement with a university in China to enable around 30 Chinese students to study in Hong Kong for two years after finishing their first two years of study in China.

Another way to facilitate students to get to learn more about the Chinese culture and practice is through the summer internship schemes. Specific arrangements have been made between the educational institutions in Hong Kong and the relevant Chinese authorities and private companies to allow those students who are interested to work in the Design Institute, consultancy firms and so on to gain practical experience during their summer.

Despite Chinese is the native language in Hong Kong, peoples speak Cantonese (i.e. one of the dialects) instead of Putonghua. This has become a barrier for some construction and related engineering professionals to work across the border. In Hong Kong, all universities do offer Putonghua courses as optional courses and this should help improve

students' proficiency in mastering Putonghua. However, the real problem is that all the construction and related engineering programs offered by local universities are conducted in English, and students have not been exposed to the Chinese construction terminologies / jargons. Therefore, dedicated Chinese courses for construction students would help them communicate with the design team members and workers when they work in China.

Table 6: Activities to broaden students' international exposure

Univ.	*Program*	*Courses*
A	Civil Engrg.	Fee-paying Mainland Student Program (optional) Joint academic program – collaborate with one of the universities in China whereby students will first study in China for two years before coming to Hong Kong to finish their degree program (optional) Exchange program (optional) Inter-University Invitational Civil Engineering Competition – held once every two years in various Asian countries (optional) Introducing and demonstrating earthquake engineering research – through schools competition in Taiwan (optional)
A	Building Services Engrg.	Technical study tours – held in Singapore in 2006; Malaysia in 2006; and Taiwan in 2007 for about 1 week Student exchange programs to mainland China and overseas – about 1-2 semesters
A	Surveying	Visiting program in Shanghai, Beijing, Guangzhou (compulsory)
C	Civil Engineering	Summer internship in Beijing for at least 6 weeks (optional)
D	Surveying; Building Engrg. and Management	Overseas visit in the summer during the end of second year (core) Other opportunities to visit mainland China (optional)
D	Building Services Engrg.	Study tour and student exchange program (optional)
E	Surveying; Building Engrg.	Study tour to be held once per year

Table 7: Opportunity to acquire working experience in China

Univ.	*Program*	*Courses*
A	Civil Engrg.	Summer Industrial Training in China Design Institute – 8 weeks
A	Building Services Engrg.	Summer internship / training schemes to major cities in China, e.g. Beijing, Shanghai, Guangzhou, etc. for 2 months
C	Civil Engrg.	Summer internship in Beijing at least 6 weeks (optional)
D	Surveying; Building Engrg. and Management	About 10 undergraduate students are arranged to work in the Beijing and Shanghai offices of the consultancy firms during summer through the Work Integrated Education scheme
D	Building Services Engrg.	Summer placement for 8 weeks
E	Surveying; Building Engrg.	Summer internship for 2-3 months

Table 8: Courses to improve students' language proficiency

Univ.	*Program*	*Courses*
A	Civil Engrg.	Practical Chinese language course for engineering students Professional and technical written communication for engineers
A	Building Services Engrg.	Language communication courses (English and Putonghua) Language proficiency courses operated by the Language Centre of the university
A	Surveying	Chinese language and Putonghua (compulsory)
D	Surveying; Building Engrg. and Management	Putonghua courses offered by the university (optional) Chinese writing (core) General education courses which aim at improving students' language proficiency (compulsory)
D	Building Services Engrg.	Putonghua courses offered by the university (optional)
E	Surveying; Building Engrg.	Putonghua courses offered by the university (optional)

When asked whether there will be any new construction and related engineering programs which are particularly designed for the Chinese market, only a couple of universities in Hong Kong expressed their desire to explore that in future. This is understandable as there are already many universities in China offering construction and related engineering programs. One would expect that those who have greater opportunities to work in China are people with extensive experience in mega and innovative projects. Therefore, educational institutions around the globe should try to help their students to become all-rounded persons so that they are not restricted to work in one geographical location in future.

Table 9: New programs dedicated to the Chinese construction market

Univ.	*Program*	*Courses*
A	Civil Engrg.	No
A	Building Services Engrg.	No
A	Surveying	Yes, but will be considered along with the curriculum reform when switching from a 3-year to 4-year mode in 2012
B	Architecture	Not at the moment, but will definitely open up an opportunity in future
C	Civil Engrg.	Yes, this is under consideration as mainland will be a focus in future
D	Surveying; Building Engrg. and Management	Not at this moment
D	Civil Engrg.	It is more likely to expand the existing part-time M.Sc. programs to Mainland China instead

7. RECOMMENDATIONS

While there are still plenty of works for educators in Hong Kong to equip construction and related engineering students to work in mainland China, the experience gained over the

years can provide other universities some hints on how to further improve the competitiveness of their construction and related engineering students to work in China and other emerging economies such as Middle East and North Africa; South America; Russia; etc.

At the university level, more academic exchange activities for students should be encouraged. This shall not be restricted to student exchange program, but should also be extended to international competitions, study tour, internship or even a gap year so that students can get to know more about the culture and practice of China. Moreover, universities should actively consider including Putonghua as a credit bearing or compulsory course.

While Chinese scholars are frequently visiting universities around the world, it would be beneficial inviting them to give guest lectures related to Chinese construction practices and legislation. Elective courses on Chinese codes and regulations may also be mounted in the program if necessary. Since the drawings and documents for a local construction project are normally based on their native language, it is imperative to provide some basic training on the construction terminologies / jargons in Chinese.

8. CONCLUSIONS

Questionnaires surveys were carried with the students and practitioners in construction and related engineering field to solicit their opinions and feedback on the barriers for them to work in mainland China and the adequacy of training to equip them to work in mainland China. The results indicate that (i) familiarity with the laws, regulations and bureaucratic procedures of mainland China; (ii) cultural differences; and (iii) language and communication are the major barriers for them to work in China. Yet, the current undergraduate curricula and continuous professional development courses cannot adequately help equipping them to work in mainland China. In view of the vast opportunities for our next generation to participate in construction projects in China, it is necessary for the educational sector to provide students with more direct and indirect support and trainings in future.

9. ACKNOWLEDGEMENT

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