

Learning Approaches of Construction Engineering Students: A Comparative Study between Hong Kong and Mainland China

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Abstract

Hong Kong is a developed city that utilizes innovative technologies. However, students in Hong Kong, especially in recent years, have been criticized for not adopting a deep learning approach in their studies. In contrast, students in Mainland China are often commended for their diligence. In this generation, education is a critical step in the production of qualified graduates capable of serving society. In higher education, both the learning motives and learning strategies of students are essential components of the entire learning process, since the learning approaches of students at university influence their working attitudes in the industry. This study investigates the learning approaches of 2,364 construction engineering students across nine universities in China. The learning approaches of construction students are compared among three student groups (i.e., three first-class and three second-class universities on the mainland, and three universities in Hong Kong). The results indicate that construction students in Hong Kong and those on the mainland adopt different learning approaches and have different learning motives. The deep learning approach (deep motive and deep strategy) is the most popular learning approach used by construction students on the mainland, while Hong Kong students tend to use an achieving motive and surface strategy. This means that students on the mainland will spend a lot of time and effort on the construction subjects that they are interested in, while students in Hong Kong are eager for quick success without becoming deeply involved in their studies. A revision of construction programs (training in basic values and study techniques) and teaching techniques/approaches used in Hong Kong is recommended.

Keywords: China, Construction Engineering Students, Learning Motives, Learning Strategies, Learning Approaches

Introduction

The construction industry's contribution to Gross Domestic Product (GDP) in Hong Kong has been in the range of 4.9 - 6% since 1990 (Tang, 2001; Chairman of the Construction Industry Review Committee in Hong Kong), while it stood at 7% on the mainland in 2003 (Huang, 2004). It is one of the main pillars of the economy both in Hong Kong and on the mainland with any major changes in the industry in either place affecting the state of the economy. In recent years, the Chinese government has paid more attention to civil works, including residential and commercial buildings, and infrastructure (road and bridge projects). A construction graduate has the potential to become a professional in the industry, and then to contribute towards pushing the construction sector forward. Construction education is vital for anyone who wants to become a professional in this industry.

In recent years, many Chinese students have entered famous international universities. They are often described by educators as diligent students who achieve outstanding academic results. Meanwhile, many international universities are planning to enter the educational market of Mainland China. In order to meet market demands and compete with its global counterparts, the Chinese government began reforming its education policy in 1998. For example, an expansion policy aimed at increasing the quota for both undergraduate and postgraduate programs (from 2.09 million undergraduates in 1998 to 4.64 million in 2001), an upgrade policy aimed at integrating some first- and second-class universities into first-class universities (e.g., Hangzhou University, Zhejiang Agricultural University, and Zhejiang Medical University have been integrated into Zhejiang University, which is ranked within the top 10 universities on the mainland; Wu *et al.*, 2002), and an international policy aimed at emphasizing English during the teaching and learning processes. Since the learning attitudes of students at university (either attitudes toward objects or attitudes toward situations) directly influence their future professional attitudes/behaviours in the industry, students' learning approach is one of the key indicators of the impact of recent educational reforms on the mainland and simultaneously illuminates the development expected in the future.

Mainland China is part of the developing world, while Hong Kong is part of the developed world. Higher education in Hong Kong immerses Chinese culture into a British educational system. Hong Kong university students have many opportunities to participate in different interest groups, departmental or university societies, or forms of entertainment. New knowledge and up-to-date information can easily be searched and obtained through innovative information technologies. Such technologies greatly assist and support the teaching and learning processes in higher education (e.g., web sites facilitate information searches, e-mail facilitates communication, and PowerPoint software facilitates presentations). Cross-cultural studies of teaching and learning processes (Niles, 1995; Wong *et al.*, 1996) have become of great interest to many investigators. A lot of educational studies have been conducted in Asian cities and countries, including Hong Kong (Kember and Gow, 1990; Tang and Biggs, 1996; Watkins and Biggs, 1996; Zhang, 2000; Biggs and Watkins 2001), but they seldom focus on construction engineering education. Studies that

have been conducted include business (Lehmann and Norman, 2005), English language (Boyle, 2000), and physics (Lingbiao and Watkins 2001). Hence, it is difficult to generalize the results of studies on Hong Kong students with university students studying in Mainland China. A comparative study of construction education in these two locations can provide valuable insights into how the teaching and learning quality of construction education can be improved in both regions.

As higher education is becoming increasingly important for practicing professionals who wish to meet the challenges of the construction industry in China and throughout the rest of the world, an understanding of the construction educational system and the intrinsic learning approaches of construction students in both places has become crucial. This paper introduces the existing educational systems in Hong Kong and Mainland China, while simultaneously recounting a detailed investigation and comparison of the learning approaches of construction students in the two places.

Construction Education in China

The higher education system on the mainland bears some evidence of the planned economy that has been in place for several years. The purpose of higher education in Mainland China is to fulfil the government *plan*. The course contents, textbooks, teaching hours, and assessment criteria for university students are rigidly controlled by the government (Liu, 2002). In general, they involve 4 year undergraduate programs, 2.5 - 3 year Master's programs and 3 year Ph.D. programs. Since the basic requirement for a construction professional in the industry is a Bachelor's degree, this paper mainly focuses on construction-related undergraduate programs in China (Hong Kong and Mainland China) such as architecture, civil engineering, urban planning, building services engineering, cost engineering, and construction management. Relevant information regarding construction engineering programs in Hong Kong and on the mainland is listed in Table 1 below.

Table 1 Construction Programs in Hong Kong and on the Mainland

	Hong Kong	Mainland
Study period (years)	3	4
Weeks/year	24 - 26	40 - 42
Hours/week	40 - 50	30 - 40
Hours/lecture or tutorial	3	2 (no tutorials)
Teaching hours/program (1st/2nd/3rd/4th yr)	900+1130+900 *	830+1370+840+390 *
% of total hours - Basic courses	4% *	47% *
- Basic prof. courses	53% *	41% *
- Professional courses	43% *	12% *
Teaching methods	Lectures and tutorials, action learning and tutorials	Lectures only; no action learning or tutorial
Information resources	Libraries; the Internet, e-libraries, e-journals, and e-centres	Libraries; the Internet, e-libraries, e-journals, and e-centres (generally for first-class universities)
Supporting facilities	Whiteboards, overhead projectors, televisions, visualizers, computers with projectors and fixed screens, CD/DVD players, etc.	Green boards, chalk (for all universities); and white boards, overhead projectors, televisions, visualizers, computers with projectors and fixed screens, CD/DVD players (generally for first-class universities)
Counsellor support	Student development services centre for the whole university	Student counsellor employed by each department separately

Notes: (*) – Figures based on the “Construction Management” programs in Hong Kong and on the mainland (CityU, 2004; XAUAT, 2004).

Construction courses in universities can be divided into three main levels:

- *basic courses*, relating to basic theories or analytical methods for supporting students' general development;
- *basic professional courses*, including courses related to the basic principles and theories in the concerned professional fields; and
- *professional courses*, providing practical methods and techniques in a specific field.

On the mainland, a traditional one-way teaching method is generally applied. The basic courses in the first year involve public policy and social values, and fundamental technical knowledge, such as the Thoughts of Mao Zedong, the Theory of Deng Xiaoping, the Three Representations, College English, advanced mathematics, statistics, algebra, engineering drawing, and computer applications. In the second year of the construction programs on the mainland, students start to attend those basic professional courses related to the basic

theories and skills of construction (e.g., mechanics, building materials, structures, design principles, etc.). Therefore, students are able to accumulate and consolidate their construction knowledge and abilities gradually in the second year, and prepare a platform for study in the professional courses during the third year. In the third year, besides the professional courses, various cross-disciplinary electives are provided, such as business, finance, marketing, and public relations. In the final year (the fourth year), fewer professional courses are taught, and the total number of classroom teaching hours is reduced. The second semester of the fourth year is specifically allocated for construction students' final-year projects. Construction students are given the opportunity to solve and handle particular practical problems depending on the topic of their final-year project.

The higher education system in Hong Kong has largely been run according to the British system for a hundred years. Construction education is recognized by both local and international professional institutions (such as those in the United Kingdom and Australia). The basic courses are allocated in the first year, while the basic professional courses and the professional courses are arranged in the second and third years. There is no instruction in public policy and social values in Hong Kong universities. The Hong Kong government has made large investment to improve and upgrade the information technology (IT) available to primary schools, secondary schools, and universities in recent years (e.g., over HK\$30 million in 2001; refer to QEF, 2003). Various information sources that include innovative technologies (e.g., the Internet, e-libraries, e-journals, and e-centres) are available to Hong Kong students to help them solve assigned problems or merely for their personal interest. Educators also employ various forms of IT in lecture theatres and classrooms (see Table 1). Lectures, tutorials, and studio teaching methods are used in normal classes. Action learning in studios and cross-disciplinary projects aim at fostering students' creativity and ingenuity – qualities that they are expected to have when they begin their careers in the industry. Finally, some independent centres such as student services development centres and sports/social clubs are established in the universities to support student whole-person development and social activities during their university studies.

Literature on Learning

Which learning approaches students apply depends on the courses they are studying in a particular environment. A definition of the process of learning was first provided by Marton and Säljö (1976) who distinguished between a *surface-level* process and *deep-level* learning process. Biggs (1987a, 1987b) then later established a general model of the study process (Values-Motives-Strategies-Performance) based on the personality and environmental factors. Personalological (personality factors, IQ, home background, etc.) and institutional (subject area studied, teaching method, evaluation method, etc.) factors influence the basic values, motives, and strategies in the learning process, which subsequently affect academic performance.

The three learning approaches outlined by Biggs (1979, 1987a) simply combine learning motive and learning strategy (see Table 2).

Table 2 Learning Motives and Learning Strategies (Biggs 1979, 1987a, 1992)

Three Learning Approaches	Learning Motive	Learning Strategy
Surface Approach (SA)	The surface motive (SM) is extrinsic motivation. The task is carried out because of either positively or negatively reinforcing consequences.	The surface strategy (SS) is rote learning. Students focus on what appear to be the most important topics or elements and reproduce them. They do not see the interactions between knowledge.
Deep Approach (DA)	The deep motive (DM) is intrinsic motivation or curiosity. Learning for the students is to satisfy their thirst for knowledge.	The deep strategy (DS) is to seek meaning. It involves processes of a high cognitive level such as searching for analogies, and relating to previous knowledge. The students love knowledge. They play with the task and think about it constantly.
Achieving Approach (AA)	The achieving motive (AM) usually relates to products, such as obtaining high grades or winning prizes.	The achieving strategy (AS) is thus to maximize the chances of obtaining high marks. There is no fixed learning method but it must involve optimal engagement in the task that helps to earn the most marks.

Learning motive is the reason for learning, which can be tangible or intangible, while *learning strategy* is the method of learning. The surface motive, deep motive, and achieving motive are often correlated to surface strategy, deep strategy, and achieving strategy respectively (Watkins, 1982; O'Neil and Child, 1984; Biggs, 1987a). Interest in the subject matter of an article read by a student encourages a deep learning approach, while a stressful learning situation produces greater surface learning (Ramsden, 1979). The application of different learning approaches influences the amount of time spent studying and the final academic outcome (Leung, 2003). Where students worked hard but obtained poor results this could be due to an inefficient application of a surface approach to the study tasks (Kember *et al.*, 1995). On the contrary, the use of a deep approach was found to correspond to both conscientious /effective study and examination performance (Svensson, 1977). Therefore, a deep learning approach is generally considered to be the most effective (Norton, 2000).

In order to cover the learning phenomenon widely from an initial point (motivation) to the action process (strategy), Leung *et al.* (2004) established a Matrix Profile of Learning Approaches based on the three learning motives and the three learning strategies. Table 3 shows nine (3x3) cells representing nine leaning approaches of students: the surface, discouragement, avoid failure, encouragement, deep, achieve success, fear of failure, hardworking, and achieving learning approaches.

Table 3 A Matrix Profile of Learning Approaches (Leung et al., 2004)

	Surface Motive (SM)	Deep Motive (DM)	Achieving Motive (AM)
<i>Surface Strategy (SS)</i>	Surface Approach (SA) Not interested in the subject so he/she is not willing to spend time on it.	Discouragement Approach (DCA) Is interested in the subject but his/her interest is discouraged by the learning environment, such as an overcrowded timetable.	Avoid Failure Approach (AFA) (Low need-achiever) Is afraid of failure. Likes tasks with high success rates to gain feelings of self-efficacy. Therefore, he/she is interested in easy tasks.
<i>Deep Strategy (DS)</i>	Encouragement Approach (ECA) Not interested in the subject but a contribution is made because of a good learning environment.	Deep Approach (DA) Is intrinsically interested in the subject so he/she is willing to spend extra time on reading related material.	Achieve Success Approach (ASA) (High need-achiever) Is very aggressive and has a strong mind to win. The more difficult the task, the greater the glory. Therefore, a competitive challenge is the only factor to motivate him/her.
<i>Achieving Strategy (AS)</i>	Fear of Failure Approach (FFA) Not intrinsically interested in the subject but fears getting a bad academic result and so he/she works hard.	Hardworking Approach (HWA) Is interested in the subject and is a hardworking student.	Achieving Approach (AA) Has the characteristics of both the high need-achiever and the low need-achiever, but no matter which strategy is used, getting a high mark is the end purpose.

This study investigated the learning approaches of university students in Hong Kong and Mainland China using these nine approaches to find differences between the two groups of students.

Questionnaire

Biggs' Study Process Questionnaire (SPQ) (1987b, 1992) is an effective instrument for evaluating the learning approaches of undergraduate students. It is a self-reporting test consisting of 42 items on six subscales (i.e., seven items on each subscale). The six subscales are *surface motive (SM)*, *deep motive (DM)*, *achieving motive (AM)*, *surface strategy (SS)*, *deep strategy (DS)*, and *achieving strategy (AS)*. The original SPQ was first conducted to assess the learning approaches of Australian students and has subsequently been applied in various cross-cultural studies (e.g., Albaili, 1995; Kember and Gow, 1990; Niles, 1995; Watkins and Regmi, 1996; Zhang, 2000). It was tested and pre-/post-tested successfully for stability, reliability, and consistency (Watkins and Hattie, 1981; O'Neil and Child, 1984; Biggs 1987a, 1987b). To reduce the time required to complete the questionnaire, a modified version of Biggs' SPQ was used in the current study (refer to Biggs 1987b, 1992) that included 18 selected items over six subscales (i.e., three items on each subscale). Each item was rated on a seven-point scale ranging from rarely true (1) to always true (7).

The questionnaire survey was conducted between 2002 and 2003. A modified SPQ in English was distributed to three universities in Hong Kong (HK), and the Chinese version was sent to six universities on the mainland (ML). According to the mainland “university ranking list” (Chinese University Ranking, 2002; also see Wu *et al.*, 2002), the three mainland universities used in this study that were ranked within the top 10 were categorized as **first-class universities** (ML1). The other three mainland universities were ranked below the top 10 but within the top 100 and were categorized as **second-class universities** (ML2). A total of 1,530, 2,101, and 510 sets of questionnaires were distributed with 697, 1,434, and 233 completed questionnaires received from the first- and second-class universities on the mainland and the universities in Hong Kong respectively. This is a respective response rate of 46%, 68%, and 45%. All respondents were studying in construction-related programs at these universities. The samples from the three groups of respondents are shown in Table 4.

Table 4 Distribution and Collection of the Questionnaire

Student Groups	Distributed ^	Effectively returned ^	Response rate (%)
First-class universities on the mainland (ML1)	1,530	697	45.55
Second-class universities on the mainland (ML2)	2,101	1,434	68.25
Universities in Hong Kong (HK)	510	233	45.68
TOTAL	4,141	2,364	57.08

Note: ^ - number of construction students

In order to increase the response rate in the study, the questionnaire was distributed to the students at the end of a class rather than being sent to them by post. Responses involving any doubt and uncertainty, such as giving equal marks for all questions or missing a section of the questionnaire, were deleted from further data analysis.

Results

The reliability coefficient alphas of all SPQ’s questions for the students studying in HK, ML1, and ML2 were 0.707, 0.474, and 0.461 respectively. The alpha coefficient for the Hong Kong samples clearly indicates a high internal consistency for the modified SPQ (English version) subscales. Although there are English and Chinese versions of the SPQ (Biggs, 1992), the special terms as well as the language structures would have had different meanings in Hong Kong and on the mainland. The alpha coefficients for the mainland samples were found to be on the low side in the study, but they were still close to 0.50. Therefore, the results of the study could be considered reliable based on the broad samples collected. Mean scores were calculated and a one-way ANOVA was applied in this study to compare the differences in the learning approaches (learning motives and learning strategies) of the Hong Kong and mainland students.

Learning Motives and Learning Strategies

The mean scores of the three student groups on the SM, DM, and AM subscales and on the SS, DS, and AS subscales are listed in Table 5. The deep motive and deep strategy respectively were the most popular learning motive (mean = 13.46 and 12.96 for ML1 and ML2 respectively) and learning strategy (mean = 13.71 and 13.61) for the construction engineering students on the mainland. The results reveal that the students studying at the universities in Hong Kong have a different popular learning motive from that of the students studying in mainland universities. Hong Kong students are more aggressive (AM = 13.40), but spend less time and effort on studying (SS = 12.78) and have less interest in (SM = 13.01) or limited involvement with the contents learned (DS = 12.64 and AS = 11.48).

Table 5 Mean Scores of the Three Sample Groups

Learning Motives/Strategies	ML1		ML2		HK		Descending Order
Surface motive (SM)	9.93	(3.367)	10.67	(3.565)	13.01	(2.568)	HK>ML2>ML1
Deep motive (DM)	13.46	(3.653)	12.96	(3.531)	12.61	(2.508)	ML1>ML2>HK
Achieving motive (AM)	12.71	(3.283)	12.46	(3.215)	13.40	(2.747)	HK>ML1>ML2
Surface strategy (SS)	11.78	(3.502)	12.49	(3.492)	12.78	(2.238)	HK>ML2>ML1
Deep strategy (DS)	13.71	(3.277)	13.61	(3.369)	12.64	(2.530)	ML1>ML2>HK
Achieving strategy (AS)	10.67	(3.597)	10.93	(3.431)	11.48	(2.796)	HK>ML2>ML1

Notes: Three items with a seven-point scale correspond to each learning motive /learning strategy.

Figures in brackets are the standard deviations.

ML1 – Students studying in the first-class universities on the mainland.

ML2 – Students studying in the second-class universities on the mainland.

HK – Students studying in the universities in Hong Kong.

Interestingly, a similar pattern existed for using SM/SS and AM/AS among the three sample groups: (SM/SS: HK>ML2>ML1; and AM/AS: HK>ML1/ML2). The Hong Kong students had the highest scores on the SM/SS and the AM/AS subscales among the three sample groups, while the students in the first-class university group on the mainland had the highest scores on both the DM and the DS subscales (DM/DS: ML1>ML2>HK).

An ANOVA with Tamhane's T2 method was used to compare the means among the three groups on each subscale (dependent variable) in the study (see Table 6). With the exception of the ML2 and the HK student groups on the DM and SS subscales, and the ML1 and the ML2 groups on the AM, DS, and AS subscales, significant differences were found to exist between any two of the three student groups (see Table 6).

Table 6 Multiple Comparisons (Tamhane's T2) among the Three Sample Groups

Dependent Variable	Student Group (I)	Student Group (J)	Mean Difference (Δ_m : I-J)	Sig. (<i>p</i>)
Surface Motive (SM)	ML1	ML2	-0.74***	.000
		HK	-3.08***	.000
	ML2	ML1	0.74***	.000
		HK	-2.34***	.000
	HK	ML1	3.08***	.000
		ML2	2.34***	.000
Deep Motive (DM)	ML1	ML2	0.50**	.009
		HK	0.85***	.000
	ML2	ML1	-0.50**	.009
		HK	0.35	.175
	HK	ML1	-0.85***	.000
		ML2	-0.35	.175
Achieving Motive (AM)	ML1	ML2	0.24	.281
		HK	-0.70**	.005
	ML2	ML1	-0.24	.281
		HK	-0.94***	.000
	HK	ML1	0.70**	.005
		ML2	0.94***	.000
Surface Strategy (SS)	ML1	ML2	-0.71***	.000
		HK	-1.00***	.000
	ML2	ML1	0.71***	.000
		HK	-0.29	.266
	HK	ML1	1.00***	.000
		ML2	0.29	.266
Deep Strategy (DS)	ML1	ML2	0.10	.884
		HK	1.07***	.000
	ML2	ML1	-0.10	.884
		HK	0.97***	.000
	HK	ML1	-1.07***	.000
		ML2	-0.97***	.000
Achieving Strategy (AS)	ML1	ML2	-0.26	.302
		HK	-0.81**	.001
	ML2	ML1	0.26	.302
		HK	-0.55*	.023
	HK	ML1	0.81***	.001
		ML2	0.55*	.023

Notes: ML1 – Construction students studying in the first-class universities on the mainland.

ML2 – Construction students studying in the second-class universities on the mainland.

HK – Construction students studying in Hong Kong.

* /** /*** – The mean difference is significant at the .05 / .01 / 0.001 level respectively.

^ – The most popular learning motives or learning strategies.

↔ – Non-significant difference in the mean score between the student groups.

Although the surface motive is not the most popular learning motive among Hong Kong students, the results clearly show that there were significant differences between the mean scores of the three student groups on the learning motives subscale. Most of the Hong Kong students, unlike the mainland students, rated their learning approaches as being influenced by the surface motive (SM: $\Delta m = 3.08$ and 2.34 , p -value = 0.000), the achieving motive (AM: $\Delta m = 0.70/0.94$, p -value = 0.005/0.000), and the achieving strategy (AS: $\Delta m = 0.81/0.55$, p -value = 0.001/0.023). They seem less interested in seeking meaning in their studies or searching for analogies (DS: $\Delta m = -1.07/0.97$, p -value = 0.000) in the learning process.

The students in the second-class mainland universities were classified as deep learners who exhibited deep motive and used the deep strategy learning approach (see Table 5), but it was also found that they had learning characteristics similar to those of Hong Kong students on the DM ($\Delta m = 0.35$, p -value = 0.175) and SS ($\Delta m = 0.29$, p -value = 0.266) subscales (see Table 6). The students in the first-class mainland universities were interested in the construction programs (DM: $\Delta m = 0.50/0.85$, p -value = 0.009/0.000), and were the least likely group to apply rote-learning methods in their studies (SS: $\Delta m = -0.71/-0.29$, p -value = 0.000), in comparison with the Hong Kong students.

Learning Approaches

Based on the Matrix Profile of Learning Approaches shown in Table 3, the learning approach of each student was identified. A summary is given in Table 7.

Table 7 Learning Approaches of the Three Samples

Learning Approaches (see Table 3)	ML1		ML2		HK	
	N	%	N	%	N	%
SA	43	6.21	122	8.48	35	15.13
ECA	36	5.20	110	7.64	23	9.98
FFA	9	1.29	43	3.01	17	7.08
DCA	71	10.22	176	12.27	21	8.91
DA	234	33.61	386	26.90	27	11.48
HWA	60	8.61	121	8.41	12	4.94
AFA	92	13.20	194	13.56	39	16.74
ASA	112	16.07	215	15.01	38	16.31
AA	39	5.60	68	4.72	22	9.44
Total	697	100.00	1,434	100.00	233	100.00

Notes: For details of the nine learning approaches, see Table 3.

ML1 – Construction students studying in the first-class universities on the mainland.

ML2 – Construction students studying in the second-class universities on the mainland.

HK – Construction students studying in Hong Kong.

N – Number of students.

Figure 1 illustrates the percentage distribution amongst the nine learning approaches for the three groups of students. Although the percentage of students in the second-class mainland universities that used the deep strategy learning approach was lower than that of students in the first-class universities that used the same approach, the results indicate that more mainland students applied the deep strategy than did Hong Kong students (34% and 27% respectively). The Hong Kong students generally applied the avoid failure approach, the achieve success approach, and the surface approach in the learning process (a total of 48% (17% + 16% + 15%)). The analysis of the learning approaches among the three sample groups clearly indicates that students in Mainland China are deep learners, have strong academic interests, and pursue their goals in their own way. In general, they do well academically. In contrast, students in Hong Kong are afraid of failure but simultaneously want to complete tasks with a high success rate in order to gain feelings of accomplishment (i.e. SM and AS; refer to Table 3).

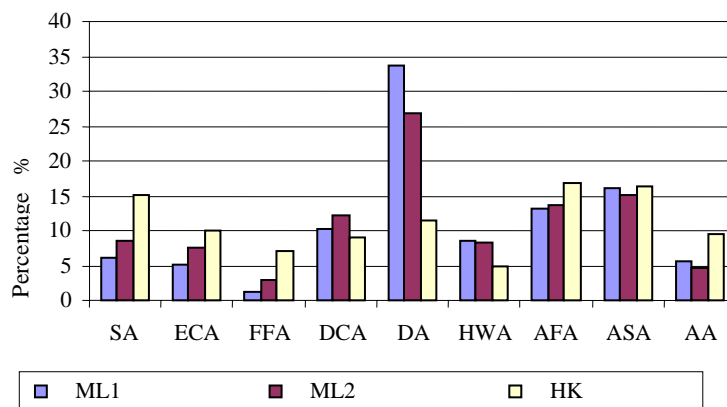


Figure 1 Percentages of Learning Approaches for the Three Samples

Notes: For details of the nine learning approaches, see Table 3.

For comparison among ML1, ML2, and HK, see Tables 6 and 7

Observation

Since the students in the top universities on the mainland are normally selected from among the elite graduates of high schools through the College Entrance Examinations, their personal abilities and basic knowledge levels are normally higher than those of students in second-class universities. Moreover, they are allowed to select their favourite subjects for further study at university. Therefore, in this study, the percentage of students adopting the deep learning approach in the first-class university group on the mainland (34%) was slightly higher than that adopting the same approach in the second-class university group (27%).

The results show that Hong Kong students tend to demonstrate avoid failure, achieve success, and surface learning approaches, with the achieve motive (AM) and surface strategy (SS); and that mainland students tend to have the deep learning approach with the deep motive (DM) and deep strategy (DS). Many studies have been undertaken to investigate the cultural factors influencing the learning approaches of students (Biggs, 1989a, 1989b, 1990, 1991; Kember and Gow, 1990, 1991; Watkins *et al.*, 1991; Watkins and Biggs,

1996). In fact, Hong Kong and Mainland China share an obvious Confucian tradition that places a high importance on education (Ho, 1986; Yang, 1986; Lee, 1996). Traditional cultural influences, therefore, may not be the major reason for the differences found in this study.

Some argue that Hong Kong society is too pragmatic and overly appreciative of achievement and high status (Zhang, 2001). This inevitably has an affect on students' learning approaches. Hong Kong university students are also very concerned with fashion and spend a lot of their time playing computer games and working at part-time jobs (Wang, B.C., 2002). In contrast, students on the mainland understand that their current status lags behind that of students in the developed world, such as those in Hong Kong and in Western countries, and appreciate how difficult it is to enter higher education. Twelve point five percent of full-time university students applied for the State Loan Aiding Poor Students in Mainland China in 2002, but less than one-third of the applications were approved by banks due to limited financial resources (Wang, S.J., 2002). Higher education provides youths with opportunities to improve their lives in the future. Students on the mainland want to be valuable members of society, show their gratitude to their parents, and gain more knowledge about the world (Liu, 2002). In order to uphold their personal values (belief), they need to spend extra time reading study materials, to seek meaning, and to apply analytical thinking. Hence, the study revealed that students on the mainland tend to focus on the learning process (deep motive), while Hong Kong students tend to focus on the final results (achieving motive).

Recommendations

Educational implications

As mentioned previously, construction students in Mainland China spend one more year on campus than construction students in Hong Kong (refer to Table 1). The longer education period offers a relatively peaceful environment as well as a conducive atmosphere for learning and understanding the contents of construction programs. At the same time, instruction in public policy and basic values (e.g., Marxism, personality cultivation, and civilization), and four weeks of military training make up more than 30% of the total teaching hours for all first-year students. Perhaps this also encourages students on the mainland to work hard, using initiative-based learning approaches when at university and helps them to develop a positive working attitude when they enter industry (Yuan, 2001; Zhou, 2001; Liu and Xiong, 2003). The first-year courses in basic values, behaviour, and ethics can encourage new construction students to pursue knowledge actively, seeking to discover not just the "what," but also the "why". Individual educators may not have ability or power to change or control the macro-education system or policy in Hong Kong's universities, but courses teaching some basic values and study techniques could be introduced into higher education in order to cultivate a positive learning attitude among students.

Furthermore, student counsellors are employed by each university department in Mainland China to service the needs of students (see Table 1). Students can talk about their feelings, pleasures, difficulties, activities, friendships, and studies with the counsellors, while

simultaneously, the counsellors can recount their experiences and offer their opinions to assist the students. Their role in the department can be considered as a bridge between the educators (knowledge sources) and the students (knowledge learners), as well as a source of support for the students during the learning process. Students in higher education are normally around 20 years old, but they may still encounter various problems while at university. With a fixed course arrangement (a four-year construction program with sufficient time for learning and understanding their professional roles in the industry in the future) and support (from student counsellors who can guide students' learning approaches), either the deep motive or the deep strategy learning approach can gradually be cultivated among construction students in Mainland China. In comparison, the student development service arranged at universities in Hong Kong may not be sufficient to develop or stimulate deep learning motive and strategy.

Basically, high-quality facilities and technologies can stimulate learning motives and create an interactive environment in which the students can participate in the learning process. On the mainland, computerized teaching materials /software is used. The quality of computerized facilities/software in the first-class universities is usually better than the second-class universities. Universities in Hong Kong also employ various innovative information technologies and teaching materials/software. It is interesting that the deep learning approach was found to be less common among Hong Kong students than among mainland students. Therefore, it is recommended that the impact of IT on education and the relationship between the application of IT and the adoption of learning approaches (motives and strategies) be the subjects of further study in order to ensure that the best value for money has been created with "IT in education".

In summary, it is recommended that the four-year construction program with basic value and study training, the support of student counsellors, and the revision of IT applications in construction engineering education be the subjects of further research for construction engineering education in China; especially in Hong Kong, where the social and economic environment cannot be controlled by university educators.

Further research

Some comments on the research method are appropriate, as the study described here has clear limitations. The self-reporting measures employed for this study may introduce the risk of potential common method variance. However, several factors reduce this concern. First, the sufficient sample size (2,364 construction engineering students) covered the construction engineering students from nine universities with the construction programs in Hong Kong and mainland China. Second, the scales used for the measurement of learning subscales have been widely used previously and have a high reliability coefficient (Biggs 1987a, 1992; Watkins and Regmi, 1996; Zhang 2000). Third, the scales used for the measurement of learning subscales were based on established Biggs' SPQ (1987b, 1992). Four, all returned questionnaires were checked systematically to avoid the intra-conflict response. Therefore, we are assured that our results are not biased by differential responses to the measured variables.

The high rate of deletion in the study reflects a serious data collection process and, simultaneously, indicates that a formal data collection session is required for further research on this topic. To ensure that the students have sufficient time to fill in the questionnaire, it is recommended that a special class of a sufficient length be arranged during which the questionnaires can be completed.

Since this study only examined the learning approaches of construction students in Hong Kong and Mainland China, it is recommended that further research be conducted to investigate the factors (e.g., teaching approaches, gender, family, study year, etc.) influencing students' particular learning approaches in order to assist construction educators in China (both in Hong Kong and on the mainland) in the future.

Conclusion

Educators have no power to affect social and economic environmental conditions, but they have the responsibility to train construction students for professional services in the industry. This study has investigated the learning approaches of construction engineering students in universities in China (Hong Kong and the mainland) through a modified SPQ survey. The results show that different learning approaches, with different learning motives and learning strategies, are adopted by the construction students in the two locations.

Universities on the mainland have room for improvement in teaching construction education, (e.g., IT facilities, and teaching materials and programs) and subsequently influence the learning approach of students. However, the results indicate that most students on the mainland adopt a deep learning approach while having a deep motive and applying a deep strategy in their four years of study. They tend to spend a lot of time and put more effort into analogical thinking (deep strategy) for subjects they are interested in (deep motive).

In comparison, construction education in Hong Kong adopts a Western approach to learning content (a credit unit system for professional construction training) and teaching methods (lectures and tutorials). The results show that, in comparison with the mainland students, Hong Kong construction students tend to adopt a surface approach, avoid failure approach, or achieve success approach, while using achieving motive and applying a surface strategy learning approach during their three-year professional training. They are somewhat pragmatic, and are eager for quick success and instant benefits. In order to improve the learning approaches of construction students in Hong Kong, it is recommended that an extension of construction programs with basic value and study techniques, a revision of the current directions of IT usage in education, and the employment of student counsellors, be the subjects of further investigation regarding construction engineering education in China as a whole. Educators need to take into account the learning phenomenon of students and ensure that the teaching method is appropriate to help students develop deep motives and strategies for their university learning.

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