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An Evaluation of Three Chinese CS&T Curricula

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ABSTRACT

This paper describes the undergraduate computer science and technology (CS&T) curriculum at three Chinese universities - one national and two regional. On the basis of admission criteria, curriculum content, and internships these curricula are compared with equivalent US universities. The purpose of this analysis is to help American educators and IT professionals understand what CS&T product is produced by their Chinese counterpart. With offshore outsourcing going to China, this information will be useful to decision makers who wish to know the quality of the potential IT labor force in the Chinese market.

Keywords

Computer Science Curriculum, Information Technology Curriculum, Chinese Universities

FRAMEWORK

Definition of a Curriculum

Since this paper reports on the evaluation and comparisons of several curricula a definition of a curriculum will be in order. For our purposes a curriculum will be defined as: a sequence of courses that are specified in such a manner that after a student has taken that sequence of courses the student can be expected to have acquired a measurable level of expertise in a particular field of study.

Method of Comparison and Evaluation

The curricula will be evaluated and compared by using the technique of juxtaposition (Bereday 1964). The data to be evaluated and compared will be juxtaposed with each other for the purpose of matching similar data items. Tabular (vertical) juxtaposition will be used for curricula evaluation and text (horizontal) juxtaposition will be used for comparison.

Method of Data Collection

The information about Chinese curricula was acquired during a May 2004 visit to these universities. Subsequent phone conversations and e-mail resulted in additional information about Chinese CS&T curricula. The majorities of the cited references are written in Chinese and are so noted in the references. As a result the information presented is a translation making it accessible to wider readership.

Information regarding US curricula was collected in a similar manner. Although in one instance the authors were in part responsible for the CS&T curricula.

BACKGROUND

The Ministry of Education of the central government accredits all schools of higher learning. Schools are divided into two broad categories: national key universities, which the Ministry funds and governs directly, and regional universities, which local governments fund and govern. The national key universities have more resources and have more prestige. They have the first selection of students based on their national college entrance exam (CEE) scores. Colleges admit students only once a year before the fall semester begins.

The CEE is an annual event. The score is good only for that year. Students must choose one of the two tracts before the exam: liberal arts (LA) and sciences and engineering (SE). The exam consists of three common subjects, i.e. English (150

points), Chinese (150 points), Math (150 points), and a comprehensive (300 points). The three common subjects are the same for all students on both tracts. But the comprehensive is different: The LA students take politics, geography and history while the SE students take politics, physics, chemistry, and biology. Students with high scores can pick and choose which schools to attend. Students with lower scores have to settle for less known schools or schools in less desirable locations. Those who fail to be admitted will have to wait for the next exam a year later.

Going to college remains a dream to most high school students in China even though there has been a steady increase in admission rate since exam-based college education was reinstated in 1977 after the Cultural Revolution (1966-1976). In 2003 17 percent of students who took the exam were admitted to the universities, which is a two percent increase over 2002 (Web Reference 2005) . The high selectivity is mainly caused by a shortage of schools. There are only about 1700 universities and colleges nationwide, among which 100 are classified as national universities (China Education and Research Network 2005) .

The academic year in China is divided into two semesters: spring, from Feb. to June, and fall, from September to January. Each semester is 20 weeks long. Each meeting period is 45 minutes. But when calculating credit hours, only 16 weeks, the instructional time, are counted; the exam and review time, the equivalent of four weeks, is excluded. Therefore, a three-hour class meeting three times a week for 16 weeks has a total of 48 instructional hours. It needs to be pointed out that the curriculum in a Chinese school used to be and still is, to a large extent, very tightly prescribed by American standards. All students are expected to finish within four years. The credit system as we know it in the US is a relatively new phenomenon but is catching on fast.

THREE CS&T PROGRAMS

The three universities examined in this paper are: Nanjin University of Science and Technology (NUST) in Nanjin, Jiangshu province, Shanghai University of Science and Technology (SUST) in Shanghai, and Zhejiang Normal University (ZNU) in Jinhua, Zhejiang province. NUST is a national key university; SUST and ZNU are regional schools. All of the three universities are located on the east coast and in economically fast growing areas. NUST has 16,599 undergraduate students (NUST Website 2005), SUST has 12,684 (SUST Website 2005), and ZNU has 19,530 (ZNU Website 2005) . The Computer Science department at NUST was founded in 1979 with 58 on the faculty and 1300 undergraduate students (NUST 2004). The Computer Science and Engineering Institute at SUST was founded in 1984, with 43 faculty and 979 undergraduates (SUST 2004). The Institute of Information Science and Engineering at ZNU was formed in 2003. There are 90 faculty and over 2000 undergraduate students (ZNU 2004). None of the department/institute has enrollment problems. They are all selective.

NUST offers a PhD program in computer science. SUST and ZNU have master level graduate programs. None of the schools uses teaching assistants. All teaching is handled by full time faculty. Graduate students are mainly utilized as research assistants. PhDs are slowly becoming more common but are still rare among faculty due to historical reasons. Only eight out of the 90 faculty at ZNU have PhD degrees. Because of this, faculty rankings are largely determined by their research capabilities. For example, the nine faculty members at NUST who are "PhD mentors" (PhD student advisors) all have received numerous prestigious national or international research awards

Three mechanisms are utilized to provide feedback and improve teaching. One is the mentor program (MP) in which senior and junior members are paired up. They sit in each other's classes, identify and work on areas that need improvement. Second is the teaching monitoring program (TMP) which is organized by the university and consists of teams of retired faculty. Each team has two retired faculty who make unannounced class visits. After each visit a written report is prepared and submitted to the college dean. The third channel is student feedback (SF). Like what is done at US schools, at the end of the semester, students fill out perception forms on paper or online. Faculty members who receive excellent peer review and student evaluation are awarded orally or sometimes financially. Since all the schools emphasize research and other scholarly activities, rarely is anyone let go due to poor teaching evaluation. (Wenning Jin 2005)

All three universities offer several degree programs from their Computer Science department/institute. The focus of this paper is their Computer Science & Technology (CS&T) program, which is most similar to the US Computer Science program.

Three tables are used to illustrate the requirements of the CS&T program at the universities. Table 1 shows information pertaining to NUST, table 2 is the curriculum at SUST, and table 3 is about ZNU. Column 1 contains category information; column 2 indicates the credit hours required by that category; column 3 is the percentage of the credit hours in that category over total credit hours, column 4 lists classes in the category.

Category	Credit Hours	%	Classes
General Ed	62	35.1%	Ideology & Morals (1), Computer Literacy (2), Programming in Visual C++ (4), Fundamentals of Marxist Political Economy (2), College Physics & Lab (10), College Math (11), Linear Algebra (2.5), College English (14), Introduction to Deng Xiaoping Theory (3), Law Fundamentals (2), Marxist Philosophy (3), Introduction to Mao Zedong Theory (2), Introduction to New Material Technology (2), Physical Education (3), Education of National Defense (0.5)
Subject Foundation	45.5	25.8%	Digital Logic Circuit (4), Analog Electronics (4), Signal System (2), Engineering Charting (2), Introduction to Computer Organization (4.5), Microcomputer & Interface Techniques (4), Operating System (3), Discrete Math (4), Data Structure (3), Database Management Systems (2.5), Numerical Logic (2), Electronic Circuit (4.5), Probability & Statistics (3), Compiler Method (3)
Major Electives	13	7.4%	Multimedia Technology (2), Distributed Systems (2), Computer Networks (3), Programming in Java (2), Software Engineering & Methodology (2.5), Applied Software Development Techniques (2), Computer Graphics (2), Network Security (2), Kernel of the Windows Operating Systems (2), Embedded System Theory (2), Computer Hardware Design Language (2), Algorithm Analysis & Design (2), Internet Technology (2), TCP/IP Fundamentals & Application (2.5), Microprocessor & Application (2), Computer Organization (3), Computer Science & Technology Seminar (1)
Subject Electives	12	6.8%	Sensor Technology (2), Television Theory (2), Photoelectric Detecting Techniques (2), Laser Technology (2), Digital Signal Processing (2), Phase Locking & Frequency Synthetic Technology (2), Communication Fundamentals (2), Electronic Technology (2), Display Technology (2), Application of DSP Technology(3), Modern Communication Technology (2), Fundamentals of Fiber Communication (2), Electromagnetic Fundamentals (2), Applied Information Management (2), Computer Simulation (2), Artificial Intelligence & Robotics (2), Virtual Reality Technology (2), Electronic Commerce (2), Operational Research (2), Applied Electrical Safety Techniques (2), PLC Technology (2), Microprocessor Application Techniques (3), Electrical & Electronic Technology (2), Electrical Engineering (2), Electrical Detecting Techniques (2), Network Technology of Industrial Automation (3), Digital Picture Processing (3), Theoretical Foundation of Modern Control (3),

			Automatic Testing Systems (2), Movement Control System (3)	Data Collection & Interface Technology Practicum (2),
Non-major Electives	10	5.7%	Any non-major electives	
Practicum	33	18.7%	Electronic Practicum (2), Programming in Visual C++ (1), Capstone (14), Software Design (5), Military Training (2)	Electrical & Electronic Lab (2), Internship (3), Hardware Design (2), Network Design (2),
Total	176.5	100%		

Table 1 – (NUST 2004)

Category	Credit Hours	%	Classes	
Required				
General Ed	58		Ideology & Morals (2), Deng Xiaoping Theory (3), Fundamentals of Marxist Philosophy (2), Fundamentals of Marxist Political Economy (2), College English (16), Calculus II (5), College Physics I (3), Probability & Statistics (3)	Introduction to Mao Zedong Theory (1.5), Law Fundamentals (1.5), Physical Education (16), Calculus I (6), Linear Algebra (3), College Physics II (3),
Subject Foundation	60		Advanced Programming in C (3), Digital Logic Design (5), Assembler Language (4), Computer Organization (5), Operating System (4), Software Engineering (3), Interface & Communication Technology (4), Computer Networking (4),	Fundamentals of Electrical Technology (3), Discrete Math (4), Data Structure (4), Object-Oriented Programming Design (3), Database Theory (4), Computer Essentials (3), Computer Graphics (3), Compiler Theory (4)
Emphases	9		There are three emphases:	
			Application ISP Online Programming Techniques (2), Application of Embedded & Distributed Systems (4), Design & Implementation of Computer Networks (3)	
			Software Development Algorithm Analysis & Design (3), Management Information Systems (3)	Programming in Java (3),
			Control Automatic Control Theory (3), Digital Picture Processing (3)	Computer Control Technology (3),
Subtotal	127	64%		

Electives			
Liberal Arts	4		From non-major electives
Economics & Management	4		From non-major electives
Major Electives	14		Multimedia Technology (3), Distributed Systems (2), Fault Tolerant Computer Systems (3), Modern Control Theory (3), Programmable Control Techniques (2), Programming in Java (3), Artificial Intelligence (3), Programming Design of Device Drivers (3), Applied Interface Technology (2), Pattern Recognition (2), Intelligence Control (2)
Cross Discipline Electives	8		From non-major electives
Subtotal	30	15%	
Practicum	43	22%	Mechanical Practicum (2), Internship (1), Computer Lab (2), Mechanical Chart Reading (2), College Physics Lab I (1), College Physics Lab II (1), Electrical & Electronic Lab (1), Digital Logic Lab (1), Computer Organization Lab (1), Data Structure Lab (2), Programming in Windows (4), Applied Software Development Lab (4), Microcomputer & Interface Lab (4), Practicum (2), Capstone (15)
Total	200	100 %	

Table 2 – (SUST 2004)

Category	Credit Hours	%	Classes
Gen Ed 1	28	16.5%	Fundamentals of Marxist Philosophy (2), Fundamentals of Marxist Political Economy (2), Introduction to Deng Xiaoping Theory (3), Introduction to Mao Zedong Theory (2), Ideology & Morals (2), Circumstances & Policies (1), College English (12), Physical Education (4)
Gen Ed 2	6	3.5%	Any non-major electives
Major Foundation	70	41.2%	Electronic Technology – Digital (2), Electronic Technology - Analog (2) Electronic Circuit Lab – Digital (1), Electronic Circuit Lab – Analog (1) Computer Organization & Lab (5), Computer Networks (4), Advanced Programming & Lab (4), Software Engineering & Lab (5), Data Structure & Lab (4), Operating System (4), Microcomputer Fundamentals & Assembler Language (4), Introduction to Computer Science (2), College Math (10), Linear Algebra (3), Discrete Math (4), Physics (4), Introduction to Database Theory & Lab (4), Object-Oriented Analysis & Design (3),

			Specialty English (2)
Major Electives (Emphases)	36	21.2%	There are three emphases:
			Computer Application & Software Theory
			EDA Technology & VHDL, Microcomputer and Interface Technology & Lab (6), Computer Platform Design (3), Network Engineering (3), Computer Security Techniques (2), Computer Assisted CAD (3), Compiler Theory (4), Database Management Systems (2), Internet Programming Techniques (3), Multimedia Technology & Application (4), Probability Statistics (3), Software Certificate Test Preparation (2), Numerical Analysis (3), Computer Graphics (4), Algorithm Analysis (2), Structure of Software Systems (3), Linux Operating System (3), Computer Seminar (3), Artificial Intelligence (3), Bibliographic Search (2), Data Storage & Data Mining (2)
			Data Communication
			Communication Fundamentals (3), Modern Communication Systems (4), Modern Swapping Techniques (4), Fiber Communication (2), Network Security Techniques (3), Network Engineering (3), Mobil Communication (2), Bibliographic Search (2)
			Electronic Commerce
			International Trade (2), Finance (3), Accounting (3), Commercial Organization & Management (3), Introduction to E-Commerce (3), E-Commerce & Logistics Management (3), E-Commerce Development Techniques (4), Bibliographic Search (2), Internet Business Administration (3)
Practicum	30	17.6%	Practicum (12), Capstone (8), Lab Reporting (4), Comprehensive Hardware Lab (3), Computer Skills Training (2), Internship (2)
Total	170	100%	

Table 3 – (ZNU 2004)

COMPARISON OF THE THREE CURRICULA

Differences and similarities exist among the CS&T programs the three universities offer.

The differences are:

The grouping/categories of courses are different among the three schools. There are three general categories at SUST: required (127 hours), electives (30), and practice (43), with 200 total credit hours. There are four at NUST: general education (62, mandated and correlated), subject foundation classes (45), electives (35), practice 33, with total of 176. At ZNU there are 5 areas: general education 1 (28, mandated), general education 2 (12, non-major electives), major required (70), major electives (36), practice (30), 170 credit hours in total.

The minimum credit hours required to graduate from the universities vary from 170 to 200. Two factors contribute to that. One, some universities require more credit hours on the same classes. For example, the Capstone class varies from 8 at ZNU to 15 hours at SUST. Two, some are a lot heavier on correlated courses than others. For example, SUST requires more classes in electricity, electronics, and their related labs.

Not all three universities offer emphasis from the CS&T program. SUST and ZNU provide three emphases in the program, but the methods applied to accomplish it are different. At SUST, this is accomplished through a group of mandated classes. At ZNU, it is done through the selection of electives. The emphases at ZNU are Computer Application and Software Theory, Networking, and E-Commerce. Computer Application, Software Development, and Control are the three emphases at SUST.

The first computer class the students are required to take at the three universities is different. This could be a small window through which one can see different expectation of the freshmen students at the three universities and what the faculties believe is most fundamental in their curriculum. At SUST, the first one is Advanced Programming in C, 3 credit hours. At ZNU it is Computer Skills Training, 2 credit hours. At NUST, it is Theoretical Foundation of Computers. This information is not included in the three tables. It is obtained from their suggested course sequence diagrams.

In spite of the differences, there are commonalities in the three curricula. The commonalities are:

All curricula are credit hour based. Students enjoy higher degree of freedom than their peers in other institutes. They can choose classes and may finish the program according to their own pace.

All programs require more credit hours than US programs. A US credit hour is 50 minutes per week for 15 weeks, and in China a credit hour is 45 minutes per week for 16 weeks of instruction time. For example, ZNU requires 170 credit hours, which is the least among the three but is still more than US universities. General education is geared towards government mandated subjects. Little can be done to change it. All three programs emphasize both hardware and software skills, and are extremely heavy on math, physics, English, but nothing on chemistry and biology, unless picked from non-major electives. There are many hours in the Practice category. Capstone, internship, and practicum are essential in each curriculum. The credit hours required in those classes range from 17 to 22.

Even though the grouping of classes and the terminology vary from school to school, the curricula can be easily analyzed and reorganized into the following five broad categories.

- *General education requirement.* There are two components: one is mandated by the Central Government and covers subjects such as Mao's theory, Deng's theory, Politics, etc, and the other is mandated by the university.
- *Major correlated classes*. These classes prepare students to be successful in the major subject. The classes in this category include College English, College Physics I & II & Labs, College Math such as Calculus I & II, Linear Algebra, Discrete Math, and Electricity & Electronics. In the case of College English, there are national proficiency tests. Students are required to pass at least the Level IV test.
- *Major required.* These classes include Programming, Object-Oriented Analysis & Design, Operating Systems, Database Management Systems, Software Engineering, and Networking.
- *Major electives*. They are extremely broad. Some common electives across the three universities are: Network Security, Computer Graphics, Artificial Intelligence & Robotics, and Data Mining.
- *Practicum*. All programs require extensive hands-on labs, practicum, internship, and capstone experience.

Based on the program requirements, a graduate from any of the three programs should possess the following common qualities:

- Good foundation on computer theory and application
- Knowledge of hardware and software development
- Extensive hands-on experience
- Good at math, physics, and English (reading & writing at least, not sure about listening and speaking).
- Well prepared to move on to science related subjects at graduate school.

Chinese universities do not track how their graduates do after graduation. No data are readily available to find out whether the students are involved in IT outsourcing projects after graduation, and if they are, how satisfactory their performance is. Based on the curriculum content and one author's personal experience, the speculation is that the Chinese students will have a better chance succeeding in technical-oriented projects such as developing a component of an operating system than business information systems such as developing a banking system. This is due to the heavy technical emphasis in the curricula, their limited English language skills and lack of exposure to capitalism. To correct this type of imbalance or inadequacy, business domain knowledge and communication skills need to be greatly enhanced so the students can be

equipped to handle key causes of software project failures such as vague requirements, poor user input, and stakeholder conflicts (Boncella, Reed, and Sun 2003).

US IT PROGRAMS AND CURRICULA

In general, in the US there are two types of degree programs that offer an emphasis in IT. These are the Bachelor of Science and Bachelor of Arts degree. These differ on the amount of course work a student completes in science courses and liberal arts courses respectively. Each degree type has a major area of study that generally qualifies the major area to be "IT". Research by Landry, et al. have identified five types of programs that have an IT emphasis. These types are Computer Science, Information Technology, Information Systems, Information Science, and Computer Engineering. Based on their research these five programs can be divided into two distinct clusters. One cluster is made up of IT, Information System, and Information Science programs where the common emphasis is information and knowledge, managerial issues, and business applications. Computer Science and Computer Engineering programs place more emphasis on algorithm development, computer architecture, and operating systems. However both clusters did agree on the importance of system development tools and techniques, interpersonal skills, systems implementation and testing, systems development methodologies, and management of systems development. See (Landry, Pardue, Longnecker, and Feinstein 2003) for more.

Specific Programs

Kansas State University (KSU), Wichita State University (WSU), and Washburn University (WU) are chosen to be the equivalent US universities for NUST, SUST, and ZNU, respectively. The choice is based on equivalent ranking in their respective countries, student demographics, and degree programs offered.

KSU and NUST are ranked as third-tier national comprehensive universities known especially for their engineering programs. About 10 percent of their students are from out of state. Both offers PhD, graduate and undergraduate programs in computer. WSU is a fourth-tier US national university. SUST is a regional university, but due to its location (Shanghai, the largest city in China), it always has a sufficient pool of faculty and students to choose from. Both WSU and SUST are comprehensive and engineering focused and have master level graduate programs in computer. A small percentage of students at both universities are from out of state. WU and ZNU are regional liberal art universities. Almost all students are local. Even though WU does not have graduate programs in computer like ZNU, WU does offer a few graduate programs in other areas.

Even though the grouping of classes and the terminology for these US schools vary, the Computer Science curricula can be easily analyzed and reorganized into the following five broad categories. This reorganization is done in order to have the same basis for comparison to Chinese curricula..

- *General education requirement.* This set of classes guarantee that the graduate has basic written and oral communication skills as well as an understanding of western culture.
- *Major correlated classes*. This set of classes varies depending on the program emphasis a student chooses. It can include math and science or basic business knowledge.
- *Major required.* These classes include Programming, Object-Oriented Analysis & Design, Operating Systems, Database Management Systems, Software Engineering, and Networking.
- *Major electives*. They are extremely broad. Some common electives across the three universities are: Network Security, Computer Graphics, Artificial Intelligence, and Data Mining.
- *Practicum*. All programs require extensive hands-on labs, but not all require a practicum, internship, or capstone experience. WU has a required capstone experience but does try to place students into an internship or cooperative experience.

The differences lie in the following areas:

Area	Chinese universities	US universities
Admission	Exam-based	60% at KSU, 63% at WSU, 100% at WU
Graduation rate	Over 95 percent	56% at KSU, 34% at WSU, 61% at WU (US News & World Report, 2005)
# of credit hours required for graduation	170-200 credit hours	124 credit hours
Social science/humanities	Not required, not emphasized to science students	Required
Foreign language requirement	All programs require extensive English language training.	Not required
Government mandated courses	All programs have government mandated courses.	None
Practicum, internship, and capstone experience	All programs require extensive hands-on labs, practicum, internship, and capstone experience.	All programs require extensive hands-on labs, but not all require a practicum, internship, or capstone experience.
Faculty qualification	Insufficient number of academically qualified faculty	Adequate number of qualified faculty

Table 4 Summary of Differences Between Chinese and US Curricula

CONCLUSION

By 2008, China is expected to become the second-largest IT service market in the Asia-Pacific region. As it matures, China could be one of the top three offshore countries in the world (Sullivan 2004). Understanding the quality of the labor force allows people/organizations to utilize Chinese talents in an educated manner, which will lead to more successful collaborations. This paper intends to shed light on what college education brings to Chinese CS&T undergraduates.

With the comparison to three similar US schools we see that on the basis of subject matter the curricula are similar. However the major differences are higher admission standard leading to higher graduation rate in Chinese schools even though Chinese schools have insufficient number of qualified faculty. The US schools lack the practicum courses required by the Chinese schools.

The limitation of the paper has to do with its scope. This is a case study. Only three universities are included in this study. More curricula need to be studied to ensure the curricula presented on this paper are representative. Also, to fully understand the substance in the curricula, one needs to get into the content of the courses: topics covered, textbooks used, assignments, exams, evaluation criteria/methods, etc. The course name translation from Chinese to English could undoubtedly be improved through this mechanism.

FUTURE WORK

A subsequent visit, scheduled for May 2005, will collect information about curricula supporting software engineering and will be reported in subsequent publications.

REFERENCES

1. Bereday, G. (1964) Comparative Method in Education, New York, Holt, Rinehart, and Winston.
2. Boncella, R., Reed, G., Sun, N. "*A Course Sequence to Address Causes of Software Project Failure*" SAIS2003 Conference Proceedings, Southern Association of Information Systems.
3. China Education and Research Network (2005) http://www.edu.cn (Chinese Language) Also see http://www.edu.cn/HomePage/english/index.shtml (English Translation) Last date of access 3/1/05.
4. Landry, J.P., Pardue, J.H, Longenecker, H.E., and Feinstein, D.F.,(2003) A Common Theme for IT Degree Programs, *Communications of the ACM*, November 2003, Vol.46 No.11, pp. 117-120.
5. NUST (2004) Nanjin University of Science and Technology Catalog 2004 (Chinese Language)
6. NUST Website (2005) http:// www.njust.edu.cn/njust3/i2xxgk1.htm (Chinese Language) Last date of access 3/1/05.
7. Sullivan L. (2004) InformationWeek, August 9, 2004 http://www.informationweek.com/showArticle.jhtml?articleID=26800067 Last date of access 3/1/05.
8. SUST (2004) Shanghai University of Science and Technology Catalog 2004 (Chinese Language)
9. www.usst.edu.cn/aboutusst/usst_gk.htm (Chinese Language)
10. Web Reference (2005) http://www.jyb.com.cn/gb/2004/05/27/zy/jryw/9.htm (Chinese Language) Last date of access 3/1/05.
11. Wenning Jin (2005) Personal Communication – April 2005.
12. ZNU Website (2005) www.zjnu.edu.cn/xxgk/xxjj.htm (Chinese Language) Last date of access 3/1/05.
13. ZNU (2004) Zhejiang Normal University Catalog 2004 (Chinese Language)