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Information Systems Education in Taiwan

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While historically Taiwan has a long and rich cultural history, the country did not become a true democratic state until the early 1990s. The higher-educational infrastructure is therefore still in its nascent stages of development as the government, faculties, and students seek to become more international and engage in and strengthen its ties with other international institutions and researchers throughout the world. This article describes the current status of higher education in Taiwan and the future aspirations of government and citizens for advancing and improving higher education in Taiwan. The focus of most of the discussion is on the information systems discipline, primarily because most of the course work that is offered in the decision sciences is fragmented across a variety of curriculums, which includes information systems, business administration, and industrial management.

The main island of Taiwan, formerly known as Formosa, is located in East Asia off the coast of mainland China, southwest of the main islands of Japan. The island is 394 kilometers (245 miles) long and 144 kilometers (89 miles) wide and consists of steep mountains covered by tropical and subtropical vegetation. Taiwan's population is over 23 million and the country is most recognized for its semiconductor device fabrication industry. Nearly 80 percent of the notebook computers worldwide are produced through the well-developed supply chains of the manufacturing sector that link them to other firms in China, Vietnam, and distributors in the U.S. and Europe. The strong high-tech industry provides a good job market for students who major in information systems (IS) and the decision sciences (DS).

Historical Background

In 1949, during the Chinese Civil War, the Kuomintang (KMT), led by Chiang Kai-shek, retreated from Mainland China and moved the Republic of China (ROC) government from Nanjing to Taipei. From this period through the 1980s, Taiwan was governed by a party-state dictatorship, with the KMT as the ruling party.

After 1988, President Lee Teng-hui relinquished more governmental authority to the native Taiwanese and sought to democratize the government. Lee's reforms included printing banknotes from the Central Bank rather than the Provincial Bank of Taiwan, and disbanding the Taiwan Provincial Government. Under Lee, the original members of the Legislative Yuan and National Assembly, elected in 1947 to represent mainland constituencies and having taken the seats without re-election for more than four decades, were forced to resign in 1991.

In the 1990s, the ROC transformed into a true democratic country as President Lee Teng-hui was elected by the first popular vote held in Taiwan during the 1996 presidential election. In 2000, Chen Shui-bian of the Democratic People's Party (DPP) was elected as the first non-KMT president and was re-elected to serve his second and last term. During this time political parties emerged in Taiwan with the formation of the Pan-Blue Coalition of parties led by the KMT, which favored eventual Chinese reunification, and the Pan-Green Coalition of parties led by the DPP, which favored an eventual and official declaration of Taiwan independence. The Chen administration pushed for referendums on national defense and UN entry in the 2004 and 2008 elections; however, this



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failed due to voter turnout which was below the required legal threshold of 50 percent of all registered voters. The Chen administration was blamed for slow economic growth, legislative gridlock due to a Pan-Blue controlled Legislative Yuan, and alleged corruption scandals involving the first family. The KMT increased its majority in the Legislative Yuan in the January 2008 legislative elections; its nominee Ma Ying-jeou, who campaigned on a platform of increased economic growth and better ties with mainland China, went on to win the presidency in March of the same year.

Structure of the University System

The first universities were established after the KMT party moved to Taiwan in 1949. Government policies and initiatives that began in the 1980s to increase the number of universities from 60 to the approximately 145 that exist at this time were designed to make higher education available to all high school graduates. Most of the increase was accomplished by upgrading junior colleges to four-year colleges and technological universities. Of the 145 degree-granting higher education institutions, 75 are public and 70 are private universities. The government closely controls higher education policies and university funding, and the degree programs they offer dictate the prestige of the university. In general, public universities are more prestigious than private universities, and comprehensive universities are more prestigious than technological universities. Foreign universities are not allowed to operate in Taiwan, although the government is considering changing this policy.

Among the public universities, a small group of elite universities are designated as research universities that provide doctoral, master's, and undergraduate programs. These universities are the recipients of most of the research support from the Ministry of Education (MOE) and the National Science Council (NSC). From 1995 the top three business schools (National Taiwan University, National ChengChi University, and National Sun Yat-Sen University) received 23 percent of the available research grants.

All universities and colleges undergo tri-annual program reviews by the MOE. A high-performance rating generates more government funding, and poor performance ratings results in a reduction of student quotas. The reviews, which are conducted at the departmental level, are similar to the AACSB accreditation process. National Sun Yat-Sen University and National ChengChi University have AACSB accreditation, and other research oriented institutions are in the process of applying for AACSB accreditation.

The quality and prestige of the universities can be determined by their position in a three-tiered system. The first tier, which includes nine "elite" universities, offers the majority of the master's and doctorate programs and is given the highest priority for government grants. There are four universities in this category that offer degrees in information systems: National Taiwan University in Taipei City, National ChengChi University in Taipei City, National Sun Yat-Sen University in Kaohsiung City, and National Central University in Taoyuan County. The second tier is largely comprised of public universities, and the third tier is populated by the private universities.

Student Enrollments

Commensurate with the growth of the number of higher-education institutions, student enrollments have tripled during the past 15 years. There are now more than 1 million students whose enrollments at most Taiwanese universities vary from 8,000 to 30,000, with an average of around 12,000. There are now more than 40,000 IS majors in 120 IS programs in management or commerce faculties, with program sizes ranging from 100 to 3,000 students. More than 10,000 students graduate annually from all the IS programs, with most receiving multiple job offers from firms that are most often in the banking and manufacturing sectors.

All degree programs must obtain official permission from the MOE before they can recruit students. Undergraduate student admission is processed by the College Entrance Examination Center through administration of the college

entrance examination, which is similar to the SAT. The examination scores dictate which tier students can apply to. They are subsequently assigned to their preferred departments, with the size of the departmental enrollments being regulated by the MOE. Primarily because of the presence of a strong job market, the Taiwanese IS departments have not experienced the decrease in enrollments that have been troubling IS departments in the U.S. during the early part of this decade.

The graduate programs, which began at National Sun Yat-Sen University and National ChengChi University in 1989, are experiencing the largest growth rates. There are now more than 40 graduate IS programs that offer master's degrees. Since their inception, enrollments in all master's programs have increased by 410 percent and in the doctoral programs by 275 percent. Before 1996, top students went abroad (especially the U.S.) for their graduate studies. Now, over 80 percent of the students seek their graduate degrees in Taiwan with the goal of securing employment in the high-tech industry. In addition to standard MBA programs, most of the first tier business schools offer International MBA (IMBA) and Executive MBA (EMBA) programs. In order to attract as many international students as possible, the IMBA programs offer their courses in English. Students apply to individual programs and are admitted by program admission committees, and demand for these programs has remained strong, resulting in an average acceptance rate of full-time master's programs that is below 10 percent. Because of the success of the high-tech manufacturing industry, most IS master's students can find good jobs that pay much higher salaries than those students who elect to acquire doctoral degrees and work in academia. The starting salary for new assistant professors is approximately \$30,000 per year, whereas an IS engineer with a master's degree and a few years of experience can earn twice as much. Master's studies are two-year programs with 30-42 credit hours and require a master's thesis.

The first doctoral programs were offered by National Sun Yat-Sen University, National Chiao Tung University (in Hsinchu City), and National Central University. There are 12 IS doctoral programs that admit as many as 17 doctoral students every year, and overall grant more than 30 doctorate degrees each year. Because of the higher salaries that are available in industry, there is less demand for the doctoral programs, and the average acceptance rate is therefore usually higher than 30 percent. The typical length of study for doctoral students is five years. While the number of required courses may vary, the numbers of elective courses that are offered predominate and thus offer flexibility in designing customized plans of study. Doctoral students are required to publish at least one paper in a Web of Science (SCI or SSCI) journal before their graduation. While it is relatively easy for graduates to find employment in the third tier, or teaching schools, finding positions in the research schools is very competitive.

Information Systems Curriculums

The first IS department was established in 1981, and since then the number of IS departments has increased to 120. The role of information systems and information management in Taiwan is different from the typical IS programs in the U.S. The composition of the IS curriculums reflect the nature of the IS job market, where students need to acquire both technical and managerial skills. In addition to course work in strategic and organizational aspects of information systems, students are required to incorporate principles of design science in their programming and systems development projects and take courses in computer algorithms, data mining, computer security, and computer graphics. The curriculum design for teaching-oriented technological universities is often more technically oriented. While the number of technical courses outnumber the IS courses at the undergraduate level, IS courses that focus on strategic and managerial issues are more dominant at the master's level. Therefore, most IS departments have an

eclectic mix of faculty whose expertise includes management information systems (MIS), computer science (CS), and the decision sciences.

Faculty Profiles

In order to accommodate the rapid growth in the number of universities, the number of full-time faculty increased by 150 percent, from the 18,020 in 1995 to the over 45,000 that is currently employed. More than 90 percent of the faculty have doctoral degrees from the U.S. or European universities. In addition to those with degrees in MIS, CS, and DS, some have degrees in production and operations management, industrial engineering, and other quantitative-oriented disciplines. Faculty who are employed in the first-tier universities are expected to conduct research, which is measured by the number of funded projects and journal publications. The major source of funding is through the National Science Council (NSC). Active researchers can receive up to two grants, where a total amount of \$30,000 each year can be used to support graduate research assistants and cover other expenses. Most of the IS research areas are congruent with contemporary trends, such as e-commerce (with some emphasis on m-commerce), DSS, technology adoption issues, and knowledge management. The popularity of e-commerce and m-commerce is due in part to NSC grants that are targeted to these areas and large government investments in the telecommunications infrastructure and its promotion of both on-line and mobile services. Most academics in the research universities are required to publish in international journals, with a major emphasis on Web of Science journals. In order to encourage research publications, some universities provide monetary rewards, which can be substantial for articles that are accepted to the *Financial Times 100* or other top-tier journals. In addition to international journals, there are a few local Chinese journals that include the *Journal of Information Management* and *Systems and Management*. A citation database, the *Taiwan Social Science Citation*

Index (TSSCI), is managed by the Social Science Research Center at the NSC and includes about eight journals in business and management.

Since, in comparison with Western salaries, faculty compensation is low (normally 30-40K USD per year), faculty in the research universities have an opportunity to supplement their income through research grants, monetary rewards for publishing, and teaching additional courses in graduate programs such as the IMBA and EMBA. One reason for the low salaries is the government's policy to peg salaries across all disciplines according to rank and experience only. A similar scheme is used in mainland China; however, additional compensation is possible there through the establishment of multiple tiers within each rank, which are determined by the number of publications that a faculty member has. The policy in Taiwan to artificially control faculty compensation in an egalitarian way has been criticized by faculty who are in disciplines that either have a shortage or have strong market demands; however, no changes to the current salary structure is under consideration.

Strategies for Improvement

Administrators and academics in business schools that are in the top tier are interested in improving their rankings in indexes such as the *Financial Times* Top 100 MBA programs, but they have yet to gain traction in attaining this goal. While they do not have the advantages of universities in Hong Kong, which were largely influenced by the presence of the British, and Singapore, which is a small country with an influential government, there are several initiatives that need to be undertaken in order for them to improve their international stature. Taiwan can learn from the efforts in mainland China to stem the brain drain of students seeking graduate education overseas by mandating graduate and some undergraduate courses to be taught in English and by establishing strong alliances with

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ing methodologies and are important for subjects/classes where model sections or answers rely heavily on reasoning. I found that the use of clickers was very effective in breaking the initial ice, or silent period, to bring as many different viewpoints from as many students as possible. When discussions were needed in fall 2006 and spring 2007, I often made up a clicker question that had several possible answers and one open answer, "others" or "none of the above." As there was no clear correct or incorrect answers, student responses were often diversified and that created a good starting point for group discussions and debates. Once each group presented group results, students were given a second chance to respond to the same clicker question and answers; multiple answers based on different assumptions and reasoning in many cases would then be revealed. I noticed that students, especially those who were often quiet and normally would not express their opinions, were significantly more involved in discussion when clickers were used than classes without clickers. My observations are also supported by data shown in rows (d) and (e) of Table 2.

It is equally important for both instructors and students to know that students have learned knowledge and/or skills they did not have when they began the class. Although there are different means (paper quiz, online quiz, verbal description, etc.) to confirm students' understanding of materials, I found that the use of clickers was more effective than other means, especially for the new N-Geners students, as it provides immediate feedback in a game-playing setting. Like many other instructors, I often have to guess whether students understood the topic by looking at their facial expressions during a class period. I find that the clicker's instant feedback feature is invaluable as it allows me to verify whether students grasped the concepts and to adjust my lecture plan accordingly to ensure students have mastered the topic before moving on to the next one. However, as an educator, it

is most rewarding to know that students perceived the use of clickers as a means to help them confirm their understanding of materials in a timely manner and has helped them to learn better in my class instead of just adding another technology thrill to their learning process.

Conclusion

Contrary to common application in classes with large enrollment, this report presented several interesting observations of clicker applications in a small business class setting. It is observed that students are motivated to attend, prepare for, and stay focus during the class. Students also felt that the use of clickers creates higher interactivity and active learning environment, helps them to confirm their understanding of materials, and consequently help them to learn better. It is valuable to compare student academic performance with sound experiment design. It would also be invaluable to have more investigations and cases to address the effectiveness and applicability of clickers in different subject areas.

Reference

Tapscott, D. (1998). *Growing up digital—The rise of the Net generation*. New York: McGraw-Hill. ■

Call for opinions and comments

"The Classroom" column wishes to publish your comments and opinions on selected articles to facilitate more in-depth pedagogical discussion in the issue following the article's publication. The "Clickers Adoption in a Small Class Setting" is the first "call for opinions and comments" article. To ensure your comments are considered and included in the October issue, please send your comments, opinions, and/or experiences on this article to Dr. Bih-Ru Lea at leabi@mst.edu by September 19, 2008.

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Western universities. An obvious and yet important impediment to Taiwan's progress is its current practice of teaching graduate courses in the Chinese language, while yet still encouraging students to publish in English journals. A stronger effort needs to be made to imbue students with the ability to communicate in English, which should begin throughout their entire secondary school system. In order to both retain and attract quality faculty, especially in the research institutions, salaries need to be increased to near Western standards, much as they are in Hong Kong and Singapore. This would also have the benefit of creating a more talented pool of applicants to the doctoral programs. While these kinds of policy changes are often difficult and take a long time to achieve, Taiwan citizens have shown their desire to improve the economy of their country by electing a new government, which now has the authority and mandate from its constituents to improve higher education and thus advance the quality of education for all Taiwanese citizens. ■

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