Southern exposure. The lagoon at Discovery Bay, Jamaica, is an idyllic setting for students working at the nearby marine lab.

CREDITS: (TOP TO BOTTOM) MARK WILSON; JAMES ZENGHUANG/*CHINA FEATURES*

came up with mixed findings. A June 2000 report to NSF on its 15-year-old Research Experiences for Undergraduates (REU) program found a lack of consensus on goals and how to measure them. "It means different things to different people," says the principal author, Chip Story of SRI International, a research and consulting firm in Menlo Park, California. Visiting 12 of the more than 500 schools that had received NSF grants during the last decade to host students, Story found great variations in how the programs were carried out, who they served, and why institutions and students participated. At one site, Story says, students did no research at all; instead, they listened to speakers and planned visits to professional meetings and conferences. Many students see it as a way to bolster their résumés, he says, while some schools use it mainly as a recruiting device. At the same time, he noted that every school judged its program to be "successful" and that panels of outside NSF reviewers have repeatedly called for an expansion of the REU program.

Administrators at St. Mary's College of Maryland, a small state school in Southern Maryland, recently did their own cost-benefit analysis of the value of undergraduate research. In 1996 faculty members voted to require a research-based project of all seniors starting with the class of 2002 and began sponsoring them on a voluntary basis. But last year they changed their minds, modifying the rule to leave the choice up to individual departments. Ten chose to keep the requirement, including all the natural science programs, while 10 made it optional. "They didn't realize that it would take up so much time and be so difficult," says Lorraine Glidden, associate provost and a professor of psychology, explaining the vote, "or that some students would not be well prepared."

Even with an incentive—faculty members receive a one-course credit for every six projects that they supervise—many faculty members seem to view it as more of a burden than a benefit. Asked on a survey to rate its value to their professional development, faculty members gave the projects a 3.6 on a scale of 1 to 9. The mean score for all questions on the survey was 7.1. At the same time, students felt very positive about the experience, giving it a near-perfect 8.5 when asked how much they had learned. An internal evaluation concluded that "faculty assess it as a very positive experience for their students but mixed for themselves. They value the mentoring relationships but recognize that there is some trade-off in their own scholarship and creative work."

Doing the unexpected

Wilson has a much more positive view of his own experiences with undergraduate research. He says Wooster has prescribed an IS project for so long—since 1948—that the concept is ingrained in everything he does. "When I look at my research, I think first of how students can connect to it," says Wilson, who has published on evolutionary paleoecology in leading journals. "And when we are teaching, and students ask questions, the tag line is often, 'That would make a good IS project.' I think that people who wonder what a student can do are missing a big opportunity. They can do extraordinary things."

The IS project prepared him well for graduate school, says Wilson, who earned a Ph.D. in 1981 from the University of California, Berkeley. But he doesn't favor making it a requirement at all undergraduate institutions. "It's a huge investment in time and money," he says. "And faculty have to be active researchers for it to be of value. I think it would be very hard [for a school] to start from scratch if it didn't already value student research."

Martin's visit to Jamaica didn't change her career intentions, as she was already hooked on paleontology before she headed south. But it may have reinforced her choice. "It's my most favorite subject," she says. "The idea of seeing the past, and then trying to piece together how everything lived back then, is just incredible. It's what I want to do with my life."

–JEFFREY MERVIS

NEWS

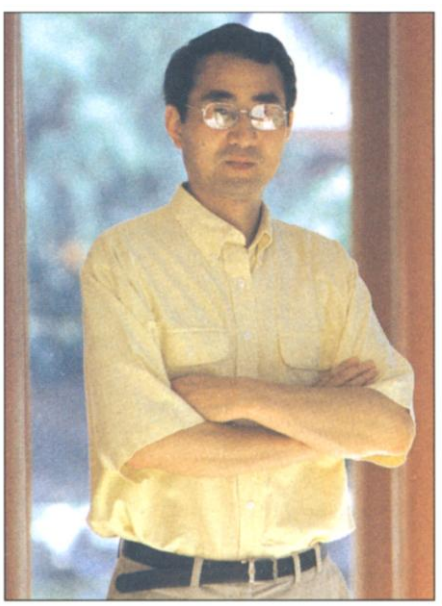
China Broadens Training For Elite Students

Beijing University is testing the idea of a Western-style liberal arts education on a select group of undergraduates. If it works, officials hope to give all students a chance to find their way before specializing

BEIJING—China's prestigious Beijing University will launch a pilot class next month to test the idea that a liberal arts education is more beneficial to students than a narrowly focused course of study. The radical approach runs counter to a half-century of specialization in Chinese higher education. If successful, it will be extended to all students—a giant step beyond concurrent reforms at some of the country's leading universities that focus only on the cream of the crop (see sidebar on p. 1616).

The pilot class at Beida, as the university is commonly known, is the latest attempt by university officials to reform a system imported from the Soviet Union in the 1950s. Based on a planned economy, the old system forced students to pick a major before taking the fiercely competitive college entrance examination, and it followed a well-defined curriculum with few, if any, electives. Upon graduation, students were then assigned jobs.

But that system is incompatible with modern China, says Zhu Qingzhi, vice director of the university's Office of Education Administration. The government can no longer provide job opportunities to all college graduates, he notes, and a market economy has given students more career options, including postgraduate studies in a field of their choice. "The pilot class project represents a new trend of the undergraduate education reform in China," he says. The new program is named



Trendsetter. Zhu Qingzhi leads undergraduate reform efforts at Beijing University.

Other Schools Go First With Narrower Approach

Beijing University's efforts to improve undergraduate science instruction borrow heavily from reforms carried out by another top-tier school, Nanjing University. Among the first group of universities to bring major changes to their education system, Nanjing formed an intensive training center in 1989 to give talented students a deeper foundation in basic research by encouraging cross-disciplinary interactions.

"We try to give students opportunities to choose," says Lu Dexin, director of the Nanjing center. "During the freshman year, they study almost the same subjects in the basic sciences [as do other students]. In their second year, they can choose courses from different areas of basic sciences. In the third year, they can decide which classes they want to take in their majors. And in the fourth year, they enter research groups and do research and study under the guidance of their advisers."

Students are also encouraged to get involved with research, including the unusual opportunity to volunteer to join a research team as first-year students. The university has also given juniors and seniors at the center the special privilege of using expensive equipment in the university's laboratory.

Tsinghua University, China's top-rated technology school, has also taken a page from Nanjing's book. In 1998 officials started a special class for talented first-year students already enrolled in the departments of physics, mathematics, and chemistry. The students follow a prescribed group of courses during the first 2 years, mainly in physics and mathematics. As sophomores they each begin to tackle a specific topic and join a research group to gain some practical experience. "We ask teachers to give students more time to raise questions in class," says Gu Binglin, director of the physics department and dean of the graduate school.

Hu Jian, a junior in the class, agrees that the pedagogy is different. "Our teachers told us that there are no dumb questions about science," he says. "They encourage us to ask about anything." **–D.Y.**

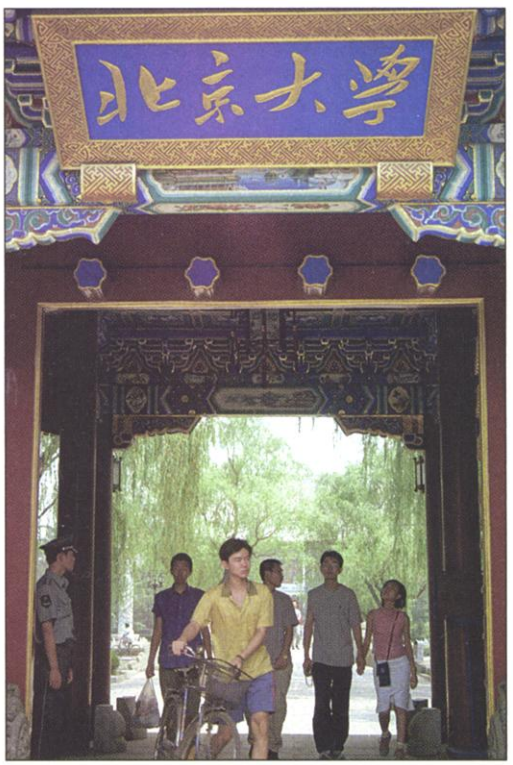
Yuanpei after Cai Yuanpei, the university's first president; the name also means "basic training" in Chinese.

The test class of 100 students was chosen from among this year's entering class at Beida and is expected to be divided equally between the natural and social sciences. The students will be allowed to register for courses from all the school's departments and will graduate when they have obtained the required number of credits. They can wait until the middle of their second year to declare a major, with help from faculty advisers—another new concept for Chinese higher education.

This is a sharp break from the path followed by the other students, who must take almost all their courses in a given field and meet rigid graduation requirements set by their departments. Zhu hopes to get permission to form a new College of Arts and Sciences to oversee this stream of students. "We want to give students more time to find out what they really want to learn and choose the specialties most interesting to them," says Zhao Dunhua, director of the philosophy department.

Students in the Yuanpei program will also be allowed to study at their own pace. Instead of the current 4-year path, students will be given from 3 to 6 years to complete their degrees. But some restrictions still apply. No student will be allowed to take more than 25 credits per semester (150 are needed to graduate), and the university will not provide housing for those who spend more than 4 years on campus.

Of course, the ability to choose is worthless unless students have viable options. That will require creating a set of core courses in all fields, says Niu Dayong, deputy dean of Beida's graduate school and head of an expert research group that developed the new strategy of undergraduate education in Beida. These courses, which would range from the natural and social sciences to literature and art, would help students develop new thinking styles. Officials at Beida began offering some core courses last year, and this fall they hope to have 100 of them. Building up the curriculum will allow them to open the gates to expanded participation. "We plan to double and triple the number of enrolled students targeted for [the] new credit system next year, and the year after next," he says.



New path. Beida students in the pilot program will have more course choices.

CREDIT: REN YUE/*CHINA FEATURES*

In creating the pilot class, Beida officials hope to avoid the mistakes of a previous experiment aimed at providing 120 natural science majors a year with a greater appreciation for related fields. Instead, departments used it as an opportunity to force-feed students more basic courses, leaving them with little time for electives or independent research. The university ended the natural sciences class in 2000, although a parallel class continues in the social sciences. "I know that I would have learned more than other students if I had continued, but it was just too much to handle," says Yang Guang, a mathematics major in the 1999 class who returned to his department after 1 year because of the burden of taking so many courses from other departments.

Zhu hopes that creating a College of Arts and Sciences will eliminate the competition among departments that doomed the special class. "The management of the pilot class is vital to the success of the whole project," he says. The college, if successful, will also take responsibility for managing a new system of awarding credit for postgraduate classes.

Indeed, the growth of postgraduate studies is a driving force behind the move to broaden the undergraduate experience. Whereas the size of the freshman class at Beida has held steady at about 2500 for the past decade, the number of postgraduates has almost quadrupled, from 852 students (721 master's and 131 doctoral) in 1990 to 3203 students (2386 master's and 817 doctoral) this year. This expansion should move China's higher education system closer to the U.S. model, with a broader education for undergraduates and professional or specialized training for postgraduates; says Zhao Kaihua, retired former director of the physics department and an advocate for undergraduate educational reform. Beida's physics department has already reduced the number of subfields, he says, to better prepare students for today's fast-changing world.

The pilot class will move this trend a step farther. "We hope that the pilot class will help Beida establish a system that can better meet the needs of economic development," says Zhao. **–DING YIMIN**

Ding Yimin writes for *China Features* in Beijing.