School Reformers Aim at Creativity

Finding a "state of desolation" in the schools, Japanese leaders plan a sweeping revision of the educational system

Tokyo

AFTER 40 years of spectacular achievement, Japan's school system has come under attack. With the prime minister taking the lead, the government is asking for a sweeping national reform.

One outspoken reformer, Naohiro Amaya, begins his description of the problem with a bitter joke about the future. "Before long," he says, "we will be able to create robots who take entrance examinations." Japan already has a factory where robots build other robots, so this seems quite plausible.

"These robots will compete with real boys and girls, and they will score higher." Colleges in Japan are obsessed with tests that measure memory and math skills. In choosing new students, they do not look for special talents, only for high scores. Secondary schools cater to this obsession, cramming children full of facts. "This means," Amaya concludes, "that we are educating people to be inferior to machines."

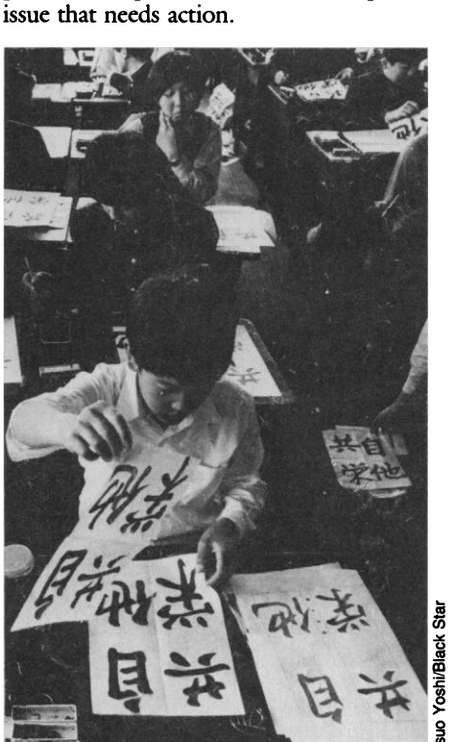
Amaya is a senior adviser to MITI, the Ministry of International Trade and Industry, which he ran as its vice-minister several years ago. Now, in addition to consulting for MITI and running the Japan Economic Foundation, he sits on a provocative group known as "The Prime Minister's Ad Hoc Commission on Education Reform," the brainchild of Yasuhiro Nakasone, the prime minister and leader of the (conservative) Liberal Democratic Party. The panel is headed by Michio Okamoto, former president of Kyoto University. It includes university presidents, industrialists, the head of the Olympic Games committee, a high school principal, a publisher listed as "critic," an essayist, several journalists, and a variety of others involved with youth and the schools.

By Nakasone's order in 1984, this band of generalists replaced an expert group that had been called together for roughly the same purpose by the Ministry of Education. The group then set out, with great fanfare, to review the entire educational system, which it described as being in a "state of desolation." According to its agenda, the panel will propose "a comprehensive reorganization of the system" in a series of reports issued through August 1987. Two have come out thus far, one in June 1985 and another in April 1986. They are controversial but not very specific.

"Desolation" is a subjective matter, and many Japanese say that their elementary and secondary schools are the best in the world and should not be changed. Thus, the main goal of the commission now seems to be to persuade the public that this is an important issue that needs action.

Science in Japan

In the news articles that follow,* Science *examines the inventiveness and rote in education; Japanese R&D in the U.S.; and the use of Japanese management techniques in U.S. factories.



Tatsuo Yoshi/Black Star

Writing Kanji: *Learning Chinese characters is one of the oldest traditions in Japanese education.*

Amaya's point in talking about robots is that Japan's methodical approach to schooling, with its stress on rote learning, may be smothering creativity and independent thought. Since World War II, Japanese schools, guided by General Douglas MacArthur's policy during the Occupation, have aimed at promoting literacy. The system has achieved a 99% literacy rate, and more. Ninety-four percent of Japanese children go to high school, and 37% go to college. Secondary school children consistently score higher on standardized math and science tests than any other children in the world.

While Japan takes pride in this record, many leaders have become dissatisfied and argue that it is time to move in a new direction. Today it may not be important to have "mass-produced education," as Amaya calls it. This system was important to the Occupation reformers as a way of guaranteeing democracy. It later became important to the nation as a way of supplying highly skilled labor for rapid industrialization. But now Japan may need highly developed special skills rather than a high availability of average skills. "What we need for the 21st century," according to Amaya, is not robot-learning, but "the human capabilities that can command and control robots. The present educational system is not responding to that need."

The "examination hell" through which Japanese children pass on their way to college is a legendary part of the system. It consists of a battery of multiple-choice questions covering a multitude of details. As described by Thomas Rohlen of Stanford, who spent a year in Kobe's high schools, the questions focus on the fine print, demanding a close reading of textbooks that are densely packed with dates and facts. Secondary school curricula are uniform, so that children all over Japan march through the same passages at the same time.

High school teachers and a flourishing private tutor business—including cram schools known as *juku*—devote an enormous effort to boosting exam scores. The incentive is great. The best universities screen applicants by scores, and acceptance to a top university promises a good job after

graduation in a system where lifetime employment is the norm.

In Japanese fashion, the whole process is becoming more efficient each year. Before a real exam is taken, students pretest themselves, so as to have a true estimate of their ability in each of five areas. The results, known as *hensachi* or "deviation values," are calculated by testing companies and portend a bright or dim future. These *hensachi* become more and more accurate, because the companies reward their clients for sending back results on the actual tests and their college acceptance records.

So accurate is the system's predictive power that students waste no time applying to schools whose *hensachi* "price" seems too high. They sort themselves into the leagues in which they are most likely to succeed, based on the testing companies' past records. One cannot afford to waste chances, because one has few. Students must travel to the major universities to take their "second-stage" exams on their own grounds, on one of two days in February. The national test, which comes earlier and is run by the government, is more important. It is so critical that in 1984, 204,000 students (called *ronin*, a term for roving scholars of another era) had spent at least a year preparing for it. They were making their second, third, or fourth try, hoping for a better score.

The nation has become disenchanted with this and other aspects of what Rohlen calls the "dark engine" of Japan's postwar achievement. Understandably, parents are upset by the competitive strain on their children. But business and political leaders have a pragmatic concern.

They have begun to worry about Japan's dependence on foreign research. They take to heart the criticism that Japan is a "science eater" more than a science producer. As Nakasone has said, Japan would like to make its own contribution to the world's stock of knowledge, and he claims it is ready to do so. This eagerness is the positive side of an issue that also has a negative aspect: the fear that Western nations deliberately or through lassitude will stop supplying the basic research that Japan needs. It is time to develop domestic sources of new ideas in science and technology, they say.

In addition, MITI worries about another problem, the rapidly developing nations of Asia. They will soon catch up with Japan in manufacturing power and compete in the export of high-quality, cheap consumer products. This process has already begun. Japan's only recourse, MITI officials have said, is to stay in the lead by increasing the nation's investment in research and development, with an emphasis on basic science.

For these reasons and for prestige, Japan began to promote a new research policy in the 1970's, according to one executive at the Nippon Electric Company. The policy became public in 1980 and 1981. Over the last few years, the government has commissioned a variety of new institutes for what it labels "basic science" and has relaxed some of the rules that interfere with free communication among universities, government laboratories, and private industry. All of this is being done in the hope that it will stimulate inventiveness.

Paula Wright/Black Star

Record of success: *Ninety-four percent of Japanese children enter high school and 37% enter college.*

As part of this self-reform, the Nakasone administration took a critical look at the school system and found it wanting. In particular, to quote the Education Commission's second report, it found "rigidity, uniformity, and closedness . . . a tendency to impose excessive controls on students" and "frustration." The result, according to the commission, is that the system has "made wastelands of children's minds." Students are not taught to think independently; they are not allowed to develop "distinctive personalities or the ability to govern themselves"; and they are not encouraged to be creative. Without creativity, the investment in new research centers may never pay off.

It is only recently, one observer says, that creativity has become an official concern of the business world. A more traditional worry—a second important theme in education reform—is the perceived need for "moral education." Nakasone himself adopted this as a rallying cry when he first proposed overhauling the schools in 1983. At that time, the newspapers had recently carried stories on two sensational crimes. In the first case, a teacher who was hemmed in by hostile students attacked one of them with a knife. In the second, a group of teenagers killed a beggar in a park. The crimes disturbed the national psyche because they came shortly after the police had announced that juvenile violence was on the decline. Nakasone cast these crimes into the broad category that includes other problems known as "student riots" and "bullying," all of which are treated as evidence of the moral bankruptcy of the schools.

Hiroshi Kida, director-general of the Japan Society for the Promotion of Science and an expert on education policy, said that many who demand "moral education" mourn the passing of traditional social patterns. "Because mothers have become so busy, caring for young children may not be done so well now as compared with before the war." Parents and teachers complain about disobedience. Although Kida sees it as unrealistic, he says that many people want the schools to restore values that families no longer seem able to maintain.

Michio Okamoto, chairman of the education reform panel, stressed another aspect of moral education, based on the complaint that the new generation has lost touch with old values. Young people seem to lack "the ability to endure difficulties and the feeling of respect toward nature," Okamoto said, adding, "I don't know whether this exists in the West." He was speaking of profound cultural values that are hard to describe through an interpreter. But they undoubtedly bear some relation to the Confucian ethics that were included in every boy's education before World War II.

As part of the remaking of Japanese society under the Occupation, MacArthur's experts banned the chauvinistic Shinto version of "moral education" for subjects of the emperor. Instead, the schools now give classes in personal and civic responsibility, a neutral kind of moralizing that older Japanese may regard as neutered. Thus, one strong undercurrent in the push for education reform may be the desire to make the values that are taught at school more distinctly Japanese and to step back from some of the bland Americanisms installed 40 years ago.

There are contradictions in the reform agenda. One of the more striking is the contrast between this call for moralism and the simultaneous pleas for greater individual freedom and more openness toward foreigners and foreign ideas.

In this area of debate, the voice of the elementary and secondary school teachers' union, *Nikkyo-so*, is important. *Nikkyo-so* is avowedly socialist and firmly against the reform proposals. It finds itself in the odd position of demanding a revolution but standing for the status quo. *Nikkyo-so* fears that the government's reform campaign is directed at crushing the union, which had considerable strength in the 1970's, but is now losing membership. Experienced observers say the union's fear is justified.

A spokesman for *Nikkyo-so*, Tadashi Yaguchi, said that he found "some nice sentiments" in the reports of the prime minister's panel, but that the actions of the Ministry of Education (known as *Monbusho*) stand in contradiction. While the panel was voicing its support for "broad-minded" education, *Monbusho* put out a new rule that teachers would have to stand and sing the national anthem when the flag is raised. Then it dismissed a group of teachers who refused to comply. Yaguchi said: "A broad mind would not insist on this flag waving."

Yaguchi cited several other complaints, arguing, for example, that the reformers have a hidden agenda to classify students into fast and slow tracks according to ability. (One academic scientist and one industrial research leader said in private interviews that they fervently hoped the reform would permit schools to be more selective in promoting students, for they said this would encourage "diversity.") Yaguchi dismissed the reform plan as something forced "from the top down" by businessmen who want changes in the labor force favoring technology-based and defense industries.

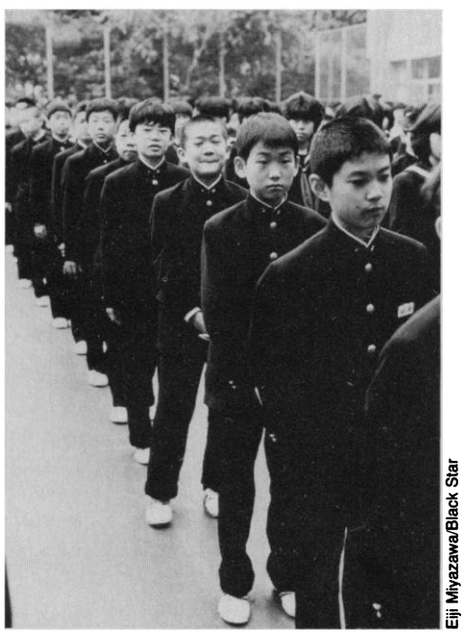
The battle between *Monbusho* and *Nikkyo-so*, which began at the union's birth after World War II, is now deeply entrenched. Observers in Japan and the United States say it could cause a political stalemate over the reform plan. Asked whether this might not frustrate his work, Okamoto referred to the union's recent membership losses and said: "They aren't strong enough."

There is another major theme in education reform, less celebrated in the press but important for any change in Japanese science. This is the widely conceded weakness of the universities, particularly the graduate schools. In this area there are striking differences between Japan and the United States.

The qualitative difference, in brief, is that many Japanese universities are isolated from the dynamic mainstream of R&D, whereas American schools are not. This does not apply to some outstanding state institutions. But these are a handful of the 455 universities in Japan, and 80% of the students in higher education attend private schools, most of which are not as well endowed.

One reason for academic isolation is that undergraduates feel a need to recuperate from the rigors of getting in the door; they are not ready to buckle down right away. The mood pervades the classrooms, such that Prime Minister Nakasone has talked about his memories of boring professors who put him to sleep. He would like to enliven the atmosphere. But not everyone wants colleges to intensify their academic demands. Even the chief research official of Nippon Electric Company, when asked about this, said that he would not put more pressure on undergraduates. His view is that employers will do this soon enough; young people must have some time without stress.

Few students go on to graduate school. There are few openings and scant funds to support them. Furthermore, Japanese companies are eager to sign up new employees long before graduation and have no special regard for advanced degrees. They have sworn not to formally recruit new employees before their senior undergraduate year. But this does not prevent informal recruiting before then.



Eiji Miyazawa/Black Star

Too much structure? *If school officials were open-minded, says one union official, "they wouldn't insist on flag-waving."*

Many who want an excellent university education travel to the United States to get it. According to Lawrence Grayson of the U.S. National Institute of Education, the number of Japanese receiving postsecondary education in the United States grew by 527% between 1960 and 1983, from 2,168 to 13,610. About one-third were graduate students. Meanwhile, the number of students in Japanese junior colleges and universities grew by 212%, from 710,000 to 2,213,000.

Another contributor to the isolation of academic science in Japan is the bureaucracy. The state universities, which get many of the ablest students, are essentially satellites of the education ministry, *Monbusho*. The professors are civil servants, and as such they are not allowed to receive consulting fees from industry. This reinforces a traditional view that the worlds of academe and commerce are separate and should be kept apart. *Monbusho* jealously guards its turf in intra-bureaucratic competition as well. It has discouraged exchanges not only with industry, but with laboratories backed by other ministries such as MITI and the Science and Technology Agency. *Monbusho* has said it intends to change its ways, and there are superficial signs that it is doing so.

Within the universities themselves, the lack of career flexibility also may be stifling. Most faculty members move patiently up the ladder within their chosen department, deferring to the chairman. According to an estimate by anthropologist Ronald Dore, not more than 2% of faculty taking up new posts in the national universities in 1 year had transferred from another university post. Far from rewarding originality, the system seems to smother it.

Finally, there is the problem of funding. Most R&D in Japan (79%) is paid for by industry. Companies have only a small presence on campus and actually commission more research abroad than at Japanese universities. Despite the government's avowed plans to boost basic research, its own share of national R&D spending has declined since 1978. In that year, the government paid for 28% of the total. The figure declined to 21% in 1984.

It is difficult to measure the impact of this parsimony on the quality of graduate education. But *Monbusho*'s data give a quantitative sense of where Japan stands. According to *Monbusho*, Japan had one-fifth as many undergraduates as the United States in 1982, but only one-twentieth as many graduate students. In an index of graduate students per 1000 inhabitants, Japan had the lowest number (0.5) when compared with the United States (4.9), France (2.8), and Britain (0.9).

Several Japanese officials said they hoped the government would soon begin to increase its support of academic science. But they also pointed out that Nakasone is trying to reduce a deficit as severe as the U.S. government's. There is no spending binge in the works. Most agencies are under continuing strictures to cut costs. When asked about the need for extra financing to improve academic research, Okamoto responded: "That is one of the difficult subjects we hope to take up in our next report."

The reform commission's proposals seem worthwhile to an outsider, but at the same time, unspecific. In its second report, the panel places a heavy stress on a new concept of "lifelong learning" with the goal of making it possible for adults to take advantage of universities throughout their careers, "on their own initiative and by their own methods." The basic principle, according to the report, is a "respect for individuality."

At the secondary school level, it makes particular recommendations for training

teachers and urges local authorities to be more flexible in setting school curricula. It exhorts them to stress moral values, to remove unfit teachers, to listen to parents, and to avoid emphasizing trivial rules. The recommendations seem unobjectionable. But implementation, when and if it begins, may meet some strong objections from *Nikkyo-so*.

At the university level, more tangible changes may be coming. The report urges universities to permit more faculty transfers. It seeks advice on how to make entrance exams "more liberal and flexible." It would like to permit credits to be transferred, especially from junior to regular colleges. It would shorten the master's and Ph.D. requirements, permit early entrance to graduate school for talented students, reexamine the existing system of academic degrees, expand postdoctoral programs, increase the use of outside lecturers, and permit more joint research projects with industry. A new national council is to be set up to deal with university problems, a subject normally left to *Monbusho* bureaucrats.

As Amaya explained, each major topic in this controversial review will require a subcommission to analyze it and recommend action. The program will forge ahead at glacial speed.

Responding to a foreigner's skepticism about the practical impact of all this, some Japanese leaders said it should be regarded as the first step in a campaign that will take more than 10 years to complete. Kida, for example, said it is important to keep in mind that this reform, unlike the others, is being made during peacetime, with no crisis looming overhead. "This time, change will develop gradually, not so drastically." He saw this gradualism as a strength. Others said privately there is more noise than substance in the whole program, and doubted that it would amount to much in the end.

Many obstacles remain in the way of educational reform. Not least is the fact that the instigator of this campaign, Nakasone, is due to leave office in October unless his party revises its rules of officeholding. That probably will not happen. Meanwhile, the teachers' union will keep up its resistance, and inertia will take its toll.

Nevertheless, it would be a mistake to underestimate Japan's willingness to change, once persuaded that change is necessary. Modern Japanese history is essentially the record of a nation remaking itself according to programs of self-reform, not once, but in several major upheavals. Based on this record, it is best to assume that Japan will accomplish exactly what it intends in the way of educational reform. At present, however, its intentions are still a bit unsettled. ■ ELIOT MARSHALL

Japan's U.S. R&D Role Widens, Begs Attention

Industry and university overtures, politics, and necessity have spurred Japan to enter into more American-based research

At Brookhaven National Laboratory on Long Island a new $1-million advanced spectrometer financed by the University of Tokyo is allowing Japanese and American scientists to peer deeper into the structure of materials. On the campus of the National Institutes of Health the number of Japanese researchers receiving federal support has grown by 65% in 5 years. And at university and industry laboratories around the United States, basic and applied research is increasingly being funded by Japanese industry.

Do these situations just reflect Japan's long-term economic strategy, which calls for bolstering that country's creative skills and basic research capabilities—or is something bigger going on? A number of Japan watchers across the United States see a growing economic interdependence that is far more significant than other global trade linkages. They argue that it is being driven by a multitude of factors, including Japan's rising direct investment in the United States, political expedience, and growing ties with multinational companies based in America.

This interdependence is reflected in everyday trade between the two countries, banking, manufacturing—and in a less tangible factor known as "technology transfer." It is defined broadly as the formal licensing, sharing, or theft of ideas, research, inventions, and know-how. But contrary to public perception, rather than being a packager of Western technology, Japan is increasingly the source of new ideas and know-how in electronics, telecommunications, materials, and biotechnology. To further this economic evolution the Japanese are overhauling their university system. They are also bolstering their ties to the American research establishment through grants, collaborations, research contracts, and independent research efforts based in the United States.

Just what Japan's growing scientific and technological prowess bodes for the U.S. economy is poorly understood. There has been little effort by Congress and the government to define and comprehend the international economic forces at work and their long-term implications. Nor has there been a thorough accounting of the growing R&D linkages between the United States and our second largest trading partner, which racked up a $49.5-billion trade surplus with the United States last year. Says Charles Morrison, a research fellow at the University of Hawaii's East-West Center, "Americans are not really aware of how dependent our economy has become on the Japanese. We don't really recognize the vast technological interdependence and how much our scientists are relying on the Japanese."

Confronted with an overall $148.5-billion trade deficit in 1985, federal officials cannot help but be concerned about Japan's expanding technology and research interchanges and their effect on American society. To an extent, they see these trends as potential threats. Comments Joseph P. Allen, an analyst with the Commerce Department's Office of Productivity, Technology, and Innovation, "it is apparent that traditional policies allowing the research results of [federal laboratories] to become freely available to our international competitors are being used against us."

Indeed, the response of Congress and the Reagan Administration is largely a firefighting action directed at the predatory information-gathering practices of industrialists in Japan and other countries. The thrust of Administration discussions centers on (i) protection of intellectual property, especially where federal government funding of research is involved; (ii) reciprocity, particularly being assured equal access to Japanese university and government research facilities; and (iii) federal laboratory management, specifically striving to better manage and transfer intellectual property to American industry.

The flow of information and benefits, however, is not all one way. Justin Bloom, a Washington, D.C., consultant who served in Japan for 6 years as the State Department's science attaché, notes that AT&T, IBM, and Burroughs have established or are building their own research facilities in Japan. DuPont is constructing a $60-million electronics research facility to support 200 research-