Japanese Education: Its Implications For Economic Competition in the 1980s

by Michael W. Kirst

Japanese schools are better equipped than their U.S. counterparts to prepare the workers of the future, says Mr. Kirst, who cautions that Japan's success has been purchased at a high price.

The growth of the Japanese economy and its competitive edge over the U.S. in several industrial sectors is causing increasing alarm in the U.S. Japan's astounding economic growth since World War II has been supported largely by the steel and auto industries. More recently, however, the Japanese have challenged U.S. leadership in such high-technology industries as computers and electronics. Although a great many factors will affect the ability of U.S. high technology to compete with Japan, economic competition relies in a major way on the availability and skills of the technological work force. In the 1980s the Japanese educational system is much better equipped than its U.S. counterpart to produce workers with the high levels of skill in math, science, and engineering that the economy of the future will require.

The U.S. is experiencing serious shortages of workers in engineering and technology. A 1980 Presidential Commission report concluded that "more students than ever are dropping out of science and mathematics courses, and this trend shows no signs of abating."* This report claimed that only one-sixth of U.S. secondary school students take science and math courses beyond the 10th grade. The amount of time spent on specific instructional tasks is directly related to the level of student achievement. If Group A spends twice as much time studying algebra as Group B, in most cases Group A will have higher math achievement. Japanese schools spend much more time on academic tasks than do their U.S. counterparts. Japanese children attend school about 225 days each year, while U.S. children typically are in school 180 days. Some 90% of all Japanese children graduate from the 12th grade, as compared with 75%-80% of American children. All Japan's high school graduates must complete at least two years of math, two years of science, and three years of social studies, whereas U.S. school districts (with some variation) typically require only one year of math, one year of science, and two years of social studies. In preparation for college, Japanese students generally take physics, chemistry, biology, and earth sciences. Many college-bound students in the U.S. assiduously avoid such an array of science courses.

Japanese students know their chances for economic success depend on being accepted at a good college. Few Japanese ever change employers after college, and the best jobs with the best companies go to graduates of the most competitive colleges. Universities in Japan select students according to high school grades and results of rigorous college entrance exams. Japanese education officials are worried about the extent of psychological stress associated with these exams and about the consequent neglect of physical fitness. By contrast, state universities in California, for example, require no exam if a student's high school grades are satisfactory.

College-bound Japanese students study math every year in high school and attain a level of sophistication beyond trigonometry. Only 5% of high school students in California reach trigonometry. Moreover, the University of California requires only one year of science and two years of math for admission, a standard not even close to entrance requirements at comparable Japanese universities. Since competition for space in the better Japanese universities is so keen, some 45% of Japanese high school students attend after-school cramming sessions for college entrance exams. Thirty-nine percent of Japanese high school graduates go on to postsecondary education soon after high school, compared with 44% in the U.S.

Japan's math and science curriculum makes widespread use of instructional materials developed in the U.S. It is ironic that the U.S. National Science Foundation developed the new physics, chemistry, and biology materials that the Japanese have adopted. The key to Japan's use of the most modern curriculum is their enormous investment in keeping science teachers up-to-date. The U.S. does very little by comparison and is experiencing shortages of math and science teachers.

Japan graduates more engineers from undergraduate college programs than the U.S., despite the fact that their population is only half the size. Their overall achievement scores in math and science are the highest in the non-Communist world. The Japanese are setting standards of scientific literacy for their entire school population, and they are developing an intensive science and math track for their ablest students. The U.S. is producing Ph.D. researchers in numbers large enough to compete with Japan, but production of technicians in Japan outstrips that of the U.S. by a considerable margin.

Japan requires all of its high school students to take an extensive language and social studies curriculum including ethics, civics, history, political science, and economics. While Japan was increasing its social studies enrollments in the 1970s, the percentage of California high school students taking a social studies course in grades 7-12 declined from 71% to 45% — a loss of 575,000 students in one state alone. Japanese high schools offer only a fraction of the nonacademic electives that clutter the U.S. curriculum. Japanese high school students also report spending nearly twice as many hours on homework as their California counterparts.

My observations of classroom teaching techniques in Japan reveal some weaknesses that the U.S. may be able to avoid. A persistent Japanese teaching strategy is the use of imitation and rote learning — methods considered outmoded by most U.S. educators. In art classes, for example, students laboriously copy ancient ceramic treasures. Japanese high school students rarely question their teachers' viewpoints and are judged on standardized tests by their memorization of facts and concepts. They do not use the school library creatively to weave together

*"Science and Engineering Education in the 1980s and Beyond: A Report to the President," cited in *Science*, 7 November 1980.

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sources of information and formulate their own interpretations.

Japanese teachers dispense knowledge, and the students dutifully write it down as unchallengeable truth. This type of education is not noted for enhancing innovation or for fostering radical departures from accepted ways of thinking. Japanese children are taught that each repetition of a process always contains something new. They learn to discriminate tiny variations in routines as they are repeated. This educational style probably helps the Japanese perfect and improve new technology that other countries develop. Japanese children are exhorted to "see the form, but then see through the form to improve it." The Japanese record of innovative marketing strategies, improvement of imported technologies, and rapid deployment of new technology attests to the success of this philosophy.

Because Japan lacks mineral resources and farmland, it must export technological goods; therefore the Japanese cannot afford to rest on their recent progress. Consequently, the U.S. has had to rethink many of its national economic policies with a view to increasing productivity. While the U.S. need not emulate the rigid Japanese educational system, we must be willing to rethink our educational system — the source of a technically trained work force.

Between 1968 and 1974 the National Assessment of Educational Progress reported a considerable drop in U.S. science achievement scores that has not been reversed in the latest (1977) tests. Ralph Tyler, former director of the Center for Advanced Study in the Behavioral Sciences at Stanford University, contends that there is a correspondence between public attitudes toward science and the average level of science achievement among 17-year-olds. According to this view, negative public attitudes about science have influenced many students to avoid science. At the time of the first National Assessment in 1969 the U.S. public was enthusiastic about our space program and its technological achievements. But when scores dropped in 1974, reports of air and water pollution, of excessive exploitation of natural resources, and of the harmful effects of technology had brought about a decline in the prestige of science.

In Japan the public believes that rapid economic development is in large part the result of education in science and rapid development of technology. Without similar support from parents and the public, U.S. schools are unable to stimulate students to tackle difficult math and science courses. Moreover, science and math are among the most costly high school programs. President Reagan's austerity budget announced in March includes drastic cuts in funding for National Science Foundation programs in secondary school science education. The national interest would be better served by increasing funding for science education to meet worldwide competition in the 1980s.

Many U.S. citizens today are more than a little envious of Japanese economic success. But we need not rush to copy the Japanese education system. The educational achievements of that nation have been won at a high price. A major concern of the Japanese Ministry of Education is that academic competition is so intense that Japanese children are neglecting other aspects of their development. Getting into a good college is one of the few legitimate goals (some say the only goal) that Japanese society offers its young people. Intense academic pressure also produces negative by-products, such as nonachievers who lose all sense of meaning in their lives and turn to truancy, gangs, and even suicide, partly because nonacademic vocations command little prestige.

The weaknesses in Japanese education will not hamper that country's overall economic growth. We ignore the future economic impact of Japan upon the U.S. at our peril. Yet U.S. social studies courses currently take little note of Japan. The brief visits of small numbers of U.S. educators permit only dim perceptions of the ways in which the 2,000-year-old culture of Japan enhances educational achievement. But our economic future will be bound to that of the Japanese, and our school and college curricula should take account of that fact. □

Germany's Guest Workers

by J. Herbert Altschull

Like the U.S., Germany is finding it difficult to integrate ethnic minorities into its society. The resulting "social erosion" is most apparent in German schools.

Few problems challenge U.S. educators more than how to integrate into the social system children who are ethnically or racially outside the mainstream of the white Anglo-Saxon Protestant majority. The "melting pot" of U.S. society has seemed unique to us, a phenomenon that set us apart from the homogeneous societies of Western Europe.

Yet today, from one end of Europe to the other, "foreign" students are crowding into the schools and raising problems similar to and quite as critical as those faced by the school systems in U.S. cities. In England the minorities are from Pakistan and the West Indies; in France and Belgium they are from Morocco and Tunisia; in Luxembourg they are from Portugal. But nowhere is the problem more acute than in West Germany, where the immigrant minorities are from Greece, Yugoslavia, and Turkey. And the "melting pot" philosophy — Germanizing the new minorities — is proving as ineffective in Germany as it has lately proved in the U.S.

After World War II, when the so-called economic miracle brought a seemingly unending boom to all of the Federal Republic of Germany, a call went out for foreign workers to help fill the jobs in factories and mines. No one in Germany thought that the workers would stay. The theory in the early 1950s was that men would come to work in the mines and labor in the mills. They would send their earnings home until they had put aside enough money to enable them to return home to enjoy their new-found affluence.

Instead, the workers brought their

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