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Sorobon (Abacus) to Silicon Chip

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SOROBAN (ABACUS) TO SILICON CHIP

By

Floyd T. Waterman

Professor of Education

November, 1984

UNIVERSITY OF NEBRASKA AT OMAHA

CENTER FOR APPLIED URBAN RESEARCH

The University of Nebraska—An Equal Opportunity/Affirmative Action Educational Institution
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The "Professor Waterman Committee" and Dr. Akira Katsui, dean of the education faculty, were very helpful in extending research assistance. The committee was headed at first by Dr. Masaharu Ishi, then by Dr. Sueo Masuda, and they translated my questionnaires into Japanese, critiqued them, and stood ready every time I needed help. Drs. Masuda and Ishi and Professors Katuya Tanahashi and Koichi Shibata accompanied me to schools and translated during most of the interviews and school visitations.

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November, 1984
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Introduction

This report covers the objectives with which the writer was guided in the planning and implementation of his faculty development leave in Japan for the academic year 1983-84. Initial objectives were to study (1) Japanese culture today, (2) Japanese language, (3) women in leadership roles, (4) characteristics of high-achieving Japanese students in the areas of mathematics and science, and (5) the reasons why Japanese students surpass their American counterparts in these areas.

These interests grew out of the fact that the writer is a teacher educator, and the 1982-83 school year was a period in which the U.S. Department of Education released the report of the President's Commission on Excellence in Education. That report concluded that American education had deteriorated until there was "A Nation at Risk."

Certainly the importance of math and science is well recognized in a highly technical society that is attempting to cope with the problems of the post-industrial era. As a teacher educator, the writer pondered: (1) Are Japanese children more intelligent than Americans? (2) Do cultural differences account for the achievement gaps? (3) What teaching strategies or methods are employed in Japanese schools, and are they vastly different from American methodologies? (4) How are science and mathematics teachers prepared in Japan? (5) What kinds of students enter the teaching field in Japan? (6) Do Japanese parents and students seem to place more emphasis or
importance on science and mathematics? (7) What are the attitudes of Japanese pupils and their parents toward schooling? (8) Do factors external to the schools influence high achievement? (9) Does the Japanese school curriculum differ vastly from that of American schools? (10) Are microcomputers an integral part of Japanese public education? (11) Are female members of the staff given equal opportunities for advancement and are they found in leadership roles? (12) Are children with special needs (handicaps) integrated into the regular classrooms in Japan?

In the discussion that follows, the writer will deal with these objectives as well as the questions associated with them. This report will not give any detailed analysis of the research conducted. The analysis process is not yet completed, but major portions of the studies are discussed in general terms in this report. Enough data are available for several articles for submission to professional journals.

Japanese Culture Today

Japan is a nation that seems to have made a conscious decision to hold tenaciously to much of its past and its most valued traditions and customs, and yet move into the 20th Century with skill and sophistication, poising itself for world leadership in years to come. The writer lays no claims to expertise on Japanese culture, for that is a task well beyond his competence and one that would take even the most skillful years to accomplish. The discussions here represent only the bare essentials of understanding, gleaned in one short year of study and observation. However primitive the analysis might be, it represents a necessary backdrop to understanding the education system the writer has been studying. The Japanese are a wonderfully fascinating people who are aggressive in business yet gracious in their life styles.
Isolation vs. internationalism. For many years Japan was very much an isolated and self-contained nation, and as a result of both physical and psychological isolation became a very insular society. The word shima means island, and the Japanese people speak of a "shima society" in which they refer to the geographic island as well as the isolated and insulated society.

Reischauer mentions the isolation so typical of ancient Japan:

Before the clear dawn of history in Japan in the sixth century, there had been large movements of people into Japan from Korea and, probably connected with this, Japanese military involvement in the peninsula. But thereafter for almost a thousand years the Japanese had only minimal contacts with outsiders. The Portuguese and other Europeans appeared in Japan as traders and Christian missionaries in the sixteenth century, but they were forced out in the seventeenth,... Japan then settled into two centuries of artificially enforced isolation, except for tiny and closely regulated trade contacts with the Chinese, Koreans, and Dutch.¹

The United States "knocked at the door of Japan" to open trade barriers, and in 1853 the U.S. Navy sent one-fourth of its strength under the command of Commodore Matthew Perry "to do the knocking." Reluctantly, the Japanese signed a trade treaty in 1854 and finally negotiated full trade treaties in 1858. This act opened the doors of Japan to the western world, and since that time Japan has struggled with the contrasting concepts of shima (isolation) vs. internationalism.

Today, Tokyo is very much an international city in one sense, yet it remains as a city that often challenges the visitor as an article in a recent travel magazine explains:

Japan is by its nature and its history a rather exclusionary society. A visitor can translate this into personal rejection and, failing to achieve even the most modest contact, can repair to the hotel and seek other similarly defeated foreigners at a bar where everyone speaks English. There they can sit around and complain about the fact that the Japanese are not American, do not speak

English, do not bend their customs, and do not even know how to number a damn street. What we too easily forget is that we, after all, have our own narrowness. And our narrowness and anxiety matched against their narrowness and anxiety is a numbing combination. We can exclude them as readily as they exclude us.

More than anywhere I know, in Japan a traveler has to work to get outside his own cultural and psychological orbit. The visitor has to bend, to surrender a part of himself and to accept ideas, practices and behaviors that are completely different in their roots and their purposes. If you do not make an effort, a genuine attempt to get outside yourself, your trip will be in vain. For Japan will resist you. 2

Large numbers of gaijins (foreigners, outsiders) are found in Japan, although Americans, and other gaijins are novelties in many Japanese communities. The writer frequently had total strangers come up to greet him, invite him to picnics, or to practice English. Children encounter foreigners and often call in chorus, "Gaijin!," then call out, "Hello" or "Goodbye." Japanese themselves are frequently seen traveling in groups (always laden with excellent camera equipment) in most of the major tourist attractions of the world. A Japanese friend who resides in Shizuoka told of his trip to London and Paris and said that he saw mostly other Japanese as tourists.

Thus, Japan is a modern study in contrasts: the shima (isolation) on one hand and great efforts on the other hand by both government and individuals to internationalize the nation.

A world class commercial giant. Anyone who has recently purchased a video cassette recorder, a stereo set, a television, an automobile, a watch, or a computer knows of the tremendous quality and price advantages to be found in products made in Japan. In 1982 Japan produced and exported 82 percent of the world's watches, 76 percent of the 35 mm cameras, 81 percent of the video

cassette recorders, 77 percent of the table type electronic calculators, 59 percent of the microwave ovens, 52 percent of the color televisions, and 50 percent of the motorcycles. While Japan imports great amounts of goods from the United States and from all of the major countries of the world, the U.S. balance of payments with Japan is very much in a deficit situation.

Competition from Korea and China as well as Hong Kong and Singapore is now starting to claim much of Japan's industrial advantage because of Asia's generally lower wage scale. Japan, therefore, is moving rapidly from an industrial economy toward high technology. Government planners as well as industrial investors are designating a number of Japanese cities as high tech development areas. Japan is racing against the United States in development of the super computer (fifth generation) as well as in the personal computer field. Some American companies have purchased stock in Japanese computer companies.

Despite the modern industrial condition of Japan, many cottage factories are still employing one or two members of a family. Some of the writer's neighbors in Shizuoka City assembled automobile parts in their homes on a piece-work basis. Still others made sandals and inexpensive shoes, the only employment for four members of the family. In the northern part of the main island (Honshu) in Hachinohe City, the writer visited a factory that employs about 20 people making souvenir wooden horses-- one of Japan's most famous toys.

A journey to Hamamatsu in Shizuoka Prefecture provided an interesting contrast in Japan's factories. One tour was of the Honda factory where 3,000

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persons were engaged in the manufacture of medium sized motorcycles. This factory had computerized robots that were doing routine jobs like spot welding while in other sections of the assembly line men were operating machines that were partly programmed. In a Yamaha grand piano factory, the work was all by hand except for modern electronic equipment used for tuning the instruments during the testing phase.

Japan has an enormous appetite for electrical energy with a very modern transportation system of electric railways. In order to operate the transportation system and all of the factories, Japan has developed countless power plants to produce the required electricity. Hydro-electric power plants are found in great numbers, but steam-driven oil- and coal-fired plants are the mainstay of Japan's electric power sources although atomic plants are found in almost every section of the country. In spite of the loud public outcries about atomic weapons and the presence of atomic powered U. S. naval ships, the public does not seem to object to the many electric plants powered by the force of atoms.

Fishing, agriculture, and forestry are also an important part of Japan's economy, but none of these industries is capable of meeting the nation's demands. Japan imports great quantities of lumber, fish, and all types of agricultural products. For all of her efficiency and supremacy in industry, Japan's agriculture is hopelessly inefficient and inadequate. Nevertheless, rice growers have one of the nation's most powerful lobbies, and the average Japanese person is very sympathetic to the farmer. The consumer pays an extraordinarily high price for vegetables and all foodstuffs.

**Music and the arts.** Radio and television are very much a part of the Japanese society. For the young people, rock and roll music is readily available on both television and radio. The Japanese FM radio stations seem
evenly divided between classical music, modern jazz, and rock and roll. Perhaps the best financed television network in the world is Japan's quasi-governmental NHK which taxes every TV set owner about $40.00 per year and with that strong financial backing, it provides an outstanding fare of educational and cultural programming. Commercial TV stations are financed by sale of advertising. Ballet, symphony, modern jazz, and other types of classical western music are sponsored by TV and the general public. Every major city has a symphony orchestra and ballet groups. Orchestras and choral groups from the U.S. and from Europe tour Japan regularly and enjoy high attendance. Because of its close proximity to Australia, Japan has many cultural exchanges with that country, and orchestras and other performing groups travel back and forth frequently.

Both radio and TV also stress traditional oriental music, and Japan's traditional folk songs and music are preserved and promoted by community groups as well as the media. Special schools teach the koto and samisen, two of the ancient instruments that remain part of the arts scene today. Festivals held in many cities and within neighborhoods often feature the traditional instruments and music as well as folk songs. Japanese people make singing a great part of their leisure lives. Karaoke bars that feature music only orchestral recordings with accompanying song sheets are very popular night spots throughout Japan.

Museums featuring all types of art media are to be found in every city of medium size, and some of the art and sculpture collections far surpass that available in smaller American cities. The government has designated many shrines, temples, and pieces of art work as national treasures. Pottery-making is a part of the arts dating from ancient times. Block prints, woodcuts, and textile dying are also part of the modern arts structure in Japan.
In the field of drama a full range of modern stage productions in the western style are available, but the Japanese traditional dramatic arts include the kyogen (old-fashioned comic plays), bunraku (puppet plays), kabuki plays, and noa (a chanting-type production). While they are not dramatic events, the tea ceremony (a gesture of friendship) and flower arrangements are certainly part of the traditional Japanese arts.

Japanese movies tend to depict modern situational events, but foreign movies, especially American, are available throughout Japan. Thus, plenty of choices are available for varied cultural tastes.

Books are an important part of Japan's cultural heritage. Bookstores are found in all sections of the cities, and they tend to stay open late at night and are always well attended. Libraries are not so common, but the Japanese buy great numbers of books and magazines and are avid readers. The literature of Japan, like its music, features a wide variety of both old and modern topics. A strange paradox is that Japanese are avid TV watchers, but they are also wildly enthusiastic about reading.

Education yesterday and today. Of necessity, this section will provide only a brief description of the influences on education in Japanese society. Japan is a nation with a passion for learning—learning of all kinds and descriptions from formal schooling to general education and pursuit of hobbies and special interests. Herbert Passin has described Japan's shift from "arms to learning" as one of the products of Ieyasu Tokugawa's shogunate in 1615:

Whether by "learning" Ieyasu meant something more than the Confucian virtues needed for the proper governance of the state is not certain. Nevertheless the shift from bu (arms) to bun (learning) was a fundamental one, and the consequences in the long run far exceeded anything that could have been imagined in 1615....

Educational institutions and with them literacy, expanded slowly throughout the seventeenth century. But from the end of the
eighteenth century growth was rapid in all types of schools in Japan...\textsuperscript{4}

In the formal educational structure, compulsory education includes grades 1 through 6 at the elementary level and grades 1 through 3 (7, 8, 9 in American terminology) in the lower secondary level. While the elementary schools and lower secondary schools are governed by municipal boards of education and city administration, they are financed mostly by the national government through Mombusho (Ministry of Education, Science, and Culture). High school grades 1, 2, and 3 (10, 11, 12 in the U. S.) are not compulsory although 94.3 percent of the junior high graduates attend. High schools are financed and administered by each prefecture, and entrance examinations are required. Mombusho prescribes the curriculum for the entire 6-3-3 school system.

Sometimes cities finance additional buildings, equipment, or curricula in their elementary and junior high schools. Shizuoka City, for example, financed a few public kindergartens attended by those who could not afford the private kindergartens. Gotemba City in Shizuoka Prefecture has financed elaborate computer/language laboratory rooms in its two junior high schools. All English and mathematics classes are taught by minicomputer there, but the regularly prescribed Mombusho curriculum is followed.

About 95 percent of the entering first graders have attended kindergarten and for an average of two years. Kindergartens are mostly privately financed and offer a three-year course for 3-, 4-, and 5-year-olds. Some of the kindergartens teach arithmetic, nature, and kanji (Chinese writing characters). Formal English grammar instruction begins in junior high school

where it is required in all three grades as is the case in the three years of high school.

While most descriptions of Japanese schools list a 6-3-3 or 12-year program, it really is a 14- or 15-year program because of the three-year kindergarten structure. Most individuals (including educational officials) describe the kindergarten as only preparatory and pre-learning, and some tend to say, "Well, they don't teach any subjects in kindergarten." However, the writer found that kindergarten classes are very much into subject matter although perhaps the methods are more informal than in elementary grades. This is especially true of the areas of natural science, writing, and arithmetic. The writer personally observed kindergartens in which very difficult kanji were taught in connection with haiku (three line unrhymed verse) poems the children had learned. Gardens in which children plant vegetables are very common in both kindergartens and lower elementary grades. Television and video cassettes are used extensively in teaching about nature, insects, weather, and natural science in the kindergartens. The writer observed three-year-olds in a private kindergarten receiving "concentration training" in which children observed and recalled the sequence of 12 items placed in various locations around the room.

Both commercial and government operated (NHK) television stations have feature stories during prime time about nature, fishes, insects, plants, earthquakes, geological features, etc. Magazines and newspapers also have frequent articles on natural science. Adult newspaper editors assume general knowledge of chemical formuli and frequently discuss matters of interest by including references with formula and mathematical equations. Museums and zoos are well attended and often have special exhibits explaining scientific matters with graphic charts, diagrams, and audio and visual explanations that
children can easily understand. The media are very much a part of the informal educative influences in the country.

Japan is less advanced in its provision for children with handicaps, and special education is a fairly new field. By law, special education children are in separate classes and are not mainstreamed in the general schools. The writer observed several special education children on public buses going to school and had a number of conversations with a university professor who teaches methods for special education teachers; however, the writer did not personally observe any special education classes or schools. While elevators and public buildings have Braille characters and sound signals for traffic lights, blind children do not attend the public schools. Japanese society is not well adapted to attending to differences of any sort. Instead it stresses conformity and togetherness and sameness, therefore explaining the reason for Japan's late start in attending to special education problems or indeed to individual differences of any type.

Mombusho reports that as of 1980, 56.1 percent of the elementary teachers were female and 43.9 percent were male. However, in the lower secondary schools (junior high), males occupied 68.5 percent and females 31.5 percent of the teaching positions. In high schools, 19.7 percent of the teachers were women and 82.3 percent men.\(^5\) At the compulsory education level, 99.3 percent of all elementary schools and 84.9 percent of the junior high schools are public (national and local). The majority (58.9 percent) of kindergartens, 87.2 percent of the special training schools, and 97.0 percent of the miscellaneous schools are private. In higher education, 84.9 percent of the

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junior colleges and 72.3 percent of the universities are private schools.\(^6\)

Only 20 percent of the college students attend public universities, and competition for positions is keen. Japan has built almost all of its colleges and universities since World War II. Prior to that time, the Imperial University (Tokyo University) and Kyoto University were the only two national universities. Today, a national university is located in each of the 43 prefectures, but the backbone of the higher education system is the private college or university.

In Japan's high schools, the mix between males and females is approximately equal. In junior colleges women account for close to 90 percent of total enrollment while four-year university enrollment is only 20 percent women.\(^7\) In 1981 total university (four-year courses) enrollment was 2,093,276, which represents approximately 39 percent of the high school graduates. Table 1 shows the percentage of university students enrolled in the various fields of study.

All universities require a very stringent examination for admission. National universities have a common test administered by Mambusho plus their own additional tests. Private universities and private elementary and secondary schools also require examinations for entrance.

While exceptions do occur, most university students do not appear to take their college studies too seriously. Students often say they work so hard in junior high and high school and study so long in order to pass the entrance examinations that they relax and consider college a "play time." This attitude is exhibited by poor attendance at college classes and a high degree

\(^6\)Ibid., p. 22.

\(^7\)Ibid., p. 26.
of participation in clubs and social activities. Secondary school students, on the other hand, seem to have almost no social life and are involved seven days a week in their school studies and clubs that are sponsored by the schools.

TABLE 1

FIELDS OF STUDY FOR UNIVERSITY STUDENTS, 1981

<table>
<thead>
<tr>
<th>Field of Study</th>
<th>Percentage Enrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humanities</td>
<td>15.3</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>34.7</td>
</tr>
<tr>
<td>Natural Sciences</td>
<td>2.6</td>
</tr>
<tr>
<td>Engineering</td>
<td>16.8</td>
</tr>
<tr>
<td>Agriculture</td>
<td>3.0</td>
</tr>
<tr>
<td>Medical Sciences and Related Fields</td>
<td>6.2</td>
</tr>
<tr>
<td>Home Economics</td>
<td>6.2</td>
</tr>
<tr>
<td>Education and Teacher Training</td>
<td>10.7</td>
</tr>
<tr>
<td>Fine Arts</td>
<td>3.0</td>
</tr>
<tr>
<td>Others</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>


Japan's post-war educational system has certainly changed the society in a variety of ways. More educational equity is found between the sexes now, more people are educated, and employment qualifications have risen constantly. After examination of statistics concerning increase in school enrollment, Passin comments on the societal impact:

So radical a change in the educational system has profound implications for Japanese life and society. One obvious effect is to keep young people out of the labor force for a prolonged period, which means that they must be supported during that time by their parents and that they very likely entertain higher expectations than
early labor-force entrants before the war. The level of qualification requirements constantly rises, so that jobs that formerly required only an elementary certificate now require lower secondary, or even upper secondary, education; white-collar positions formerly available to middle school or semmongakkoo graduates, now increasingly require a university degree.\footnote{Passin, p. 111.}

Aside from all of the formal school system and university education, countless private schools are found for every conceivable subject, hobby, or special interest of the child, youth, or adult. These schools have classes for boys who wish to learn the martial arts; they have swimming classes for children starting when they enter kindergarten. There are cooking schools (French, Italian, Chinese) and sewing schools as well as kimono-making classes for women who are not in the workforce. There are dancing classes, typing classes, bridge classes, art classes, Japanese writing, foreign language classes, and driving classes. Two of the most lucrative business opportunities in Japan today are the driving schools, which attract youth and adults alike, as nobody teaches a child or spouse how to drive. English classes are to be found everywhere. Television and radio stations offer conversational English, and countless \textit{Eigo juku} (English schools) are found around the country. Native English speakers are constantly in demand to help teach conversational English. Books and cassettes (both video and audio) on English are very popular items in bookstores. The Japanese people have all been exposed to six years of English composition and reading in the secondary schools, but little or no emphasis is placed upon conversational English. Thus, most Japanese have a very difficult struggle with this \textit{musakashi} (difficult) \textit{gaijin} (foreign) language.
Most American cities offer the same variety and type of "adult education" or community college type courses, but in America the drive and energy to learn is not so pronounced as in Japan. The Japanese people indeed have a passion for learning. Reischauer describes it in these terms:

The close link between academic achievement and success in life is taken for granted by everyone in Japan. Families undergo economic privations in order to have their children receive the advantage of kindergarten training or later tutoring. Despite household crowding, children are given adequate space for their school homework, and the mother rides herd on them to see that they perform it and live up to their other scholastic tasks. This special role of the mother is recognized by the common term kyoiku mama, or "education mom." It is sometimes thought that the drive for education has been a contributing factor to birth control in Japan, since people, especially in the cities, believe they should have few enough children to be able to afford higher education for all of them.9

The Japanese mind. Three expressions or sayings seem best to characterize Japanese society and the attitude of the typical Japanese: (1) wa, (2) gambate!, and (3) ganman suru.

Wa, a kanji character, symbolizes harmony and peacefulness. Wa suggests to the Japanese the importance of togetherness, of avoiding confrontation. One does not create disharmony and discord in a family, in a business organization, in a school, in a class, or in one's own life. Japanese workers need very little corrective supervision because they know that the company is "all of one family," and the actions of every member reflect upon the family (or company or school), so doing the best possible job is important. There is a national pride in the language, in the culture, and in the nation—thus, wa or harmony.

Gambate! is heard as a fellow teacher leaves the common room to go to class. When a student in class is struggling to recall an answer or becomes

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confused, the teacher encourages with gambate kudasai (please continue, keep at it, work hard, hang in there). As the athlete goes off to the game, the well-wishers shout, "Gambate kudasai!"

Ganman suru is a verb that means bear it, persevere, endure it. When the weather seems too hot or too cold to endure, parents suggest that children ganman suru. Sometimes it is shortened in conversation to ganman! No matter how hungry, cold, tired, or bored a person may be, this philosophy suggests that one does not complain, one keeps on enduring or ganman.

Whether in business, education, or in skill acquisition, the Japanese philosophy of these three concepts of wa, ganman suru, and gambate becomes the very fabric of the Japanese mind. Small wonder that against all odds, they will continue to study hard, work for the company, or strive to win the race. The national honor, the family honor, or the team honor is involved. Perhaps for this reason, failure to pass an examination to get into the proper school is a source of great disgrace and sometimes, unfortunately, results in suicide or severe mental problems. Yet despite the problems and pressures created by such a philosophy, it accounts for the industrious nature of the Japanese people and for their drive toward success. When one considers these three concepts plus one additional word, ichiban (number one!), the importance of effort rather than ability is evident as the watchword of Japan.

The Japanese Language

One of the writer's objectives was to learn conversational Japanese and to understand the basics of the kana or writing systems. Learning kanji is an extremely difficult task and would take a minimum of several years. The writer took a conversational class of intensive Japanese, but he feels at least one more year would be required in order to be conversant with spoken Japanese and several more years for the written portion.
The written language is based upon the Chinese characters or kanji, but the Japanese often assign as many as three different meanings to a particular character. Thus they speak of the on (Chinese meanings) and kun (Japanese meanings). The total number of kanji characters is unknown, but basic dictionaries usually list 2,000 to 3,000. Through combinations many thousands of additional characters are possible. Some kanji characters may have a hiragana explanation written above them. The kanji character is a conveyor of meaning only and not of sound. The context of the character determines its pronunciation or sound and whether the on or kun meaning applies.

The Japanese found that they needed a system of sound and a way of showing grammatical functions, so they invented a set of symbols (taken from the shape of the kanji characters) to make the characters more functional. Children in school learn to write the hiragana symbols before they learn kanji, but the process of learning the latter starts in the first grade, or as stated earlier, in some kindergartens. The same symbols are used in katakana to write out foreign words and names; thus McDonald's becomes, Makudonorudo, and Robert, Robato. Finally, the Japanese use romanized letters to spell out Japanese words as a teaching device for foreigners in learning the conversational language. Romanized letters are also used to designate names of products and companies, thus IBM is written in that way with romanized letters, and Xerox or even Sony or Honda are written in romanized letters.

In summary, writing in Japan may be in one of four ways: kanji, hiragana, katakana, or romanji. Spoken Japanese is unlike any other language in the world; word order differences, use of articles, and conjugation of adjectives as well as verbs make it an extremely difficult language to learn. However, the writer has found it both an interesting and challenging experience although often very frustrating.
Women in Leadership Roles

Given the changing status of women in America, the writer was interested in knowing whether women would be found in leadership roles in Japan, especially in the schools. While improvement in the status of women is evident, the traditional roles have persisted and not as much progress has been made in this area as one might expect in view of the extreme westernization of Japan. More than half of the teachers in elementary school are women and a decreasing number in secondary schools, yet women are not given opportunities for leadership as principals or school superintendents. In all of the classrooms visited by the writer, only one female mathematics teacher in the upper elementary grades was observed; all of the principals, assistant principals, and prefectural education officials were male.

Passin summarizes the progress thusly:

Although we cannot disentangle the specific effects of coeducation from all the other postwar changes affecting women, certainly they are considerable. Not only have women entered the labor force in much larger numbers and at much higher levels of skill and pay than ever before, but they are rapidly moving from an automatic acceptance of the traditional role of Japanese women. A woman who has gone through higher education in competition with boys and who has come to associate with them daily has a different outlook on such matters as dating, absolute obedience to husbands, companionship in marriage, and inherent inferiority of women from that of her mother—whose schooling and school life were entirely different. 10

Some of Reischauer's observations provide a perspective:

... While women in Japan enjoy a position more comparable to that of women in the West than to the severely restricted position of women in most Islamic countries, still, attitudes of male chauvinism are blatantly evident in Japan. There is job discrimination against women.... In Western eyes, husbands frequently treat their wives coldly and even with disdain. 11

10 Passin, p. 111.

11 Reischauer, op. cit., p. 204.
Social relations between co-workers are usually limited to the persons who work together (both men and women) and rarely involve the spouses. Again Reischauer describes the modern situation.

Except for a very few at the top of society, who may participate stiffly and unhappily in formal banquets, usually those include foreigners, married women do not go out with their husbands to dinners and parties or entertain outsiders in their homes, which are usually so small as to preclude this sort of entertainment. Their life is likely to be limited to husband, children, a few close relatives, some old schoolday girl friends, and possibly the activities of the P.T.A.12

National universities do not discriminate in pay for women, but some companies still do. While the writer was living in Japan, he read newspaper accounts printed in the English papers about women who had won class action suits against large companies for unequal pay. Many women are doctors and a few are judges who tend to be assigned to juvenile courts. The Diet has fewer than a dozen female members in its two houses, about the same as the U.S. Congress. Current laws protect women against discrimination and provide for ownership of land and the right to sue for divorce.

Characteristics of High Achieving Students

Since mathematics and science are two areas in which Japanese students consistently score higher than Americans on international comparisons, the writer wanted to see if he could determine the characteristics of those high achieving math and science students in Japanese schools. He developed sets of questionnaires for students in elementary, junior high, and high schools. Parents, principals, and teachers were also questioned. The students were asked to list favorite subjects, whether they achieved well in them, and whether they were receiving any outside tutoring and in which subject areas.

12 Ibid., p. 207.
They were asked to indicate whether they had health, vision, or hearing problems, how much time they viewed TV, how much sleep they got, what clubs or activities they enjoyed, and to what extent they participated. Parents were asked to respond to some of the same questions and to indicate whether they were high achievers in math or science and to what extent they become involved in supervising their child's homework. Teachers were asked why they thought Japanese children achieved well in mathematics and in science and whether they felt their college training had prepared them sufficiently for their teaching roles, and principals were asked similar questions. Parents were asked to indicate the amount of money they spent on tutoring or juku (cram schools). All groups were asked to list what they felt were the four most important problems in Japanese schools.

The questionnaires were translated into Japanese and distributed to fifth and sixth grade students at the elementary level and to seventh, eighth, or ninth graders in the junior high and to general science classes in the tenth grade and math classes in the twelfth grade. Public as well as private schools were surveyed. In each of the schools surveyed, at least two classes were also observed. In all, about 700 parents, students, and their teachers as well as principals were surveyed.

In addition, the writer interviewed in English (with a translator present) each of the teachers and the principals, some school authorities at city boards of education and at the prefecture boards of education, inservice training leaders in two prefectures, and a mathematics educator at the National Institute for Educational Research in Tokyo. Observations and interviews were made in three different prefectures with the majority in Shizuoka Prefecture.
In all schools, teachers were asked to rank the students by achievement into three groups so the high-achieving, middle, and the low-achieving students could be compared. Urban schools as well as suburban were included in the sample.

The analysis of questionnaires has just begun at this point, and final results on this study will not be available for several months. Before leaving Japan, the writer was able to examine only a portion of the data comparing two elementary schools. Some preliminary data are available to help reach some tentative conclusions. But inasmuch as these are only partial, final results might change.

Generally speaking, students who were in the low-achieving group had fathers and mothers who indicated that they too had difficulty with mathematics and science. Possibly, therefore, parents who did not do well in mathematics themselves might be saying, in effect, "That's OK, I was never any good at math either." Or they may be feeling inadequate to supervise their children's homework properly or to give them the encouragement to achieve.

Students in the high group tended to spend the greatest amount of time in doing homework while those at the bottom of the scale spent the next highest amount of time, and the middle group spent the least. A very high percentage of students received tutoring in mathematics and an even higher percentage attended Eigo juku (English conversation and cram schools). Outside tutoring is not limited to those who are having difficulty in mathematics; some of the top students take sugaku juku (mathematics cram school). Children usually start juku about the fifth grade although many enter earlier.

Why Japanese Students Surpass Americans

A second major thrust of the writer's study and year's residence in Japan was directed to the question of why Japanese students surpass their American
counters in the areas of mathematics and science. In order to obtain information for this part of the study, the writer interviewed science and mathematics teachers and principals in public as well as private schools. The interviews were in English with Japanese professors from Shizuoka University translating. The following is a list of the types of persons interviewed:

- An official of the Ministry of Education, Science, and Culture
- Officials in the Shizuoka City Board of Education
- Officials in the Shizuoka Prefecture Office of Education
- Principals in public and private schools
- Math and science teachers in public and private schools
- Professors of Shizuoka University
- A professor from the Shizuoka Women's University
- Mathematics and science inservice educators at the Shizuoka Prefecture Inservice Training Center
- Mathematics and science inservice educators at the Osaka Inservice Training Center
- Parents of pupils in the Fujieta Elementary School
- Parents of pupils in Minami High School, Shizuoka
- Teachers and administrators in private schools in Matsumoto

The writer has identified six reasons why Japanese students achieve so well: (1) value placed on science and mathematics, (2) entrance examination influences, (3) excellence of Japanese teachers, (4) inservice program, (5) the national passion for learning, and (6) tutoring and juku. Each of these reasons will be discussed in the section that follows.

Value placed on science and mathematics. Several of the teachers indicated that they received the distinct impression that parents felt that mathematics and science were much more important than other subjects. Students with the very highest scores on the college entrance examinations are given an opportunity to be admitted to medical curricula, and this, too, may be a factor in the high value that society assigns to these two subject areas.

As indicated earlier, Japanese have a natural curiosity about nature, and thus public media (TV, magazines, radio, newspapers) often report feature stories about nature, plants, animals, and scientific topics. Passin discusses some of Japan's ancient philosophers and teachers. Itoo Kinsai, in 1666 commented:
In science, one should look for living principles and not cling to dead ones. Withered plants and dried roots, bronzes, stones, and potteries are called dead things because they have a fixed form and change no longer. But man is not like that. When he does not advance, he recedes; not to recede, he must advance; there is not a moment's halt, for man is not like a dead thing. Therefore the superior man values not the fact that he does not err, but that he can improve.13

Although such a conclusion has great subjectivity, the writer feels that a very definite attitude about sciences and mathematics is everywhere present. Parents usually list mathematics and reading as their highest priorities when the question of their children's learning is concerned.

The examinations for both high schools and the universities place great emphasis upon both the sciences and mathematics. Since entrance into the proper high school and college is of the highest priority with parents, of course math and science are highly valued.

Entrance examination influences. Students who do not pass the entrance examination for college are called ronin which means "masterless samurai; an unemployed man." It essentially means they have not been "employed" or accepted by the the university to which they applied. They spend the year in special cram schools doing studying and reviewing in order to take the examination again the following year. The cram school curriculum places great emphasis upon sciences and mathematics.

The scores of university entrance examinations are published in the newspapers listing the students who passed and for which university they applied. High schools also have entrance examinations, and since the highest scoring students may be attending a particular high school, attendance at those schools places one in a better position to do well on tests for college.

13 Passin, op. cit., p. 171.
Japanese society is so structured and employment patterns are such that they reinforce the system of selecting persons on the basis of the graduation (not grade performance during college) from particular universities.

Students learn very early in life that performance in school is important in order to pass the examinations for secondary schools and for college. Private schools also have entrance examinations for their elementary schools, some of which are attached to secondary schools and colleges, and their own graduates have a better chance of admission to those colleges.

Much discussion takes place in Japan today about the "evils of the examination" because of the pressure it puts on students. Some students drop out of junior high or do not go on to high school after grade three of the middle school, and occasionally suicides after failing an examination are reported. Hence, "examination hell" is frequently discussed. Despite these evils, the writer feels that the system has a definite positive aspect and has a direct bearing on why the students tend to do better on international tests than American students.

Excellence of Japanese teachers. Teaching in Japan is regarded as a very honorable profession, and respect for teachers dates back to early history. In the days of the early samurai, most schools were reserved for their sons, and females and children of commoners were not permitted to attend. Modern Japan has extended education to all classes of people, and since World War II co-education is mandated by law for the public schools. Japan has a very high literacy rate, its people are readers, and, well versed in all of the elements of general education. Between 1965 and 1979, the number of employed persons with college educations increased from 12 percent to 38 percent (including those who attended two-year colleges).14

14 Japan 1983: An International Comparison, p. 68.
Jinsai (1666) stated a regard for teachers that is still largely present in Japan:

...To honor the teacher is a means of honoring the Way. Therefore the teacher shall possess the justice which reigns between ruler and subject and the parental love of a father for his child. The teacher who rejoices when he is excelled by his pupil is a true teacher. He who hates to be excelled is a bad teacher.\textsuperscript{15}

Today the honorific, sensei (master, teacher, professor), is used to show deference to a professor, a doctor, member of the Diet, or a teacher. Kyoshi is the term for teacher and is used as a self-reference by teachers, but students, parents, and the media afford the honorific, sensei, to the teacher at almost any level.

Because of the respect accorded to teachers and because salaries are at least as high or slightly higher than those of other beginning college graduates, attracting teachers into the field is not difficult. On the other hand, a person who graduates from college as a humanities or science major, for example, and obtains a degree in chemistry may join a firm as a "freshman" and be referred to as merely kaishain (member of the firm or company).

\textbf{Inservice program}. The Mombusho description of inservice education is rather bland, and reading the description almost misses the depth of quality that is apparent when it is observed first hand. Had the writer not personally visited two of the prefectural inservice centers and personally observed classes, the full depth of the quality of the inservice would have escaped him.

The ministry yearly holds the Central Workshops for intensive inservice training of principals, vice-principals, and experienced

\textsuperscript{15}Passin, op. cit., p. 171.
teachers... who are selected and sent by every prefectural board of education.

Prefectural boards of education also make programs for inservice training and carry them out. The prefectural education center, which has lodging facilities, educational equipment and apparatus, and professional staff, takes an important role in inservice training...

During their first five years, at least, all teachers frequently observe other teachers in order to gain ideas and as a means of self-improvement. In one high school visited by the writer, the principal required all teachers to visit in at least one classroom once a month. In an elementary school fifth grade science class, the writer observed three other teachers observing plus five parents. In that school parents visited each week. When the writer asked teachers about having so many of their colleagues visit, he was told that teachers enjoyed visiting and critiquing each other regularly. Many of the city school boards also provide resource teachers who observe and assist teachers in special areas, and science and mathematics are usually included.

Each prefecture has a very well-equipped inservice training center, and some teachers are selected each year to spend the entire year on salary doing research and additional study in their curriculum areas. In the Osaka Prefectural Inservice and Training Center, the writer met science and math teachers who were engaged in research and individual study with the objective of returning to their own schools at the close of the year to help other teachers.

On a similar visit to the Shizuoka Prefectural Institute for Educational Research and Inservice Training Center in Mishima City, the writer commented on the excellent laboratories in the science department and learned that they

16Education in Japan 1982, p. 86.
were paid for by funds from the Science Education Promotion Act. This act was passed by the Japanese Diet in 1953 and provides that each public school shall have at least one science laboratory and the every principal submit a special budget request each year for supplies and materials as well as funds for equipment replacement. This act was passed prior to the U. S. National Defense Act and, in the opinion of this writer, is a major contributing cause for the excellence of science teaching. Most elementary schools and many of the junior highs in America are not so well equipped for science instruction.

In the high schools an annual publication lists the names of the teachers, how many of their students applied for a particular university, and how many passed the examination. This information is given on a year-by-year comparison, and thus the teachers exert peer pressure on each other to teach sufficiently well for their students to pass college entrance examinations. Parents have access to these publications so community pressure for teachers to perform well occurs also. Students pay rapt attention to the teachers who have an established record of students who successfully passed the examinations.

The writer was visiting an advanced mathematics class in a high school in Fujieda City on a hot day in early July in such a teacher's class. Although the students were perspiring, their eyes were fixed on the instructor, and they seemed not to be distracted from their careful note taking by the weather conditions.

The inservice program of the Japanese schools deserves careful observation and might possibly be adapted and utilized by American schools. Pressures of the examination do not exist in the U. S. schools, but the idea of more peer observation and critiquing as well as better equipped laboratories and inservice centers could certainly benefit American teachers.
National passion for learning. Much has been said earlier about the thirst that Japanese people have for learning, and it need not be repeated at this point, except to make the point that the national passion for learning is one reason that the Japanese students outperform their American counterparts in the areas of mathematics and science. An American author commenting on the Japanese mentality said,

Few Americans truly understand the Japanese mentality...Japanese seem to be people of extremes; no middle-of-the-road people these. Fanatic might be a better word. We may fault them for not being more individualistic or not granting equal opportunities to women...On the other hand, when they set their collective mind on a goal, there is no stopping them. They are dedicated. They cooperate with each other—people, companies, all elements of society—far beyond anything known in the Western world. They are perfectionists—with an element of pragmatism. And they are infinitely patient, but tenaciously persistent.17

The Japanese are persistent indeed; they are persistent in learning about their own world and the world around them. They want to know and to excel, and the expressions earlier explained, ganman suru and gambate, typify that passion for learning.

Tutoring and the juku. Cram schools are a fact of life for the student in Japan. The writer visited one of the many branches of the Kumon Juku which enrolls over a million students nationally. At this branch students paid about $18.00 per month for two two-hour sessions per week to study mathematics. Kumon is known for its approach to individualized, self-paced instructional materials. Teachers check the homework of students, test them for the next level of difficulty, and then provide self-instructional materials for new content. Most juku are not so individually oriented but go

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through materials in groups and administer tests based upon the official school curriculum so students know they can be confident of passing tests in school.

The abacus is used in all post offices, banks, and stores, and most Japanese are very skillful in its use--so much so that electronic calculators are often ignored because they are too slow for addition and subtraction. Its use is introduced to the school curriculum in the second grade, but in some areas as many as 75 percent of the children have already learned to use the abacus by then because they have attend a soroban juku. Soroban juku are located throughout the city in Shizuoka, and this is typical of all Japan.

The Japan Times occasionally publishes articles about cram schools, and most of these indicated that the attendance at juku nation-wide is about 50 to 60 percent for elementary grade students, 75 percent for junior high, and 75 to 85 percent for senior high students. Many students even spend their vacation time in juku, as will be seen from this passage from an article in Creative Computing:

More than 60 percent of Japanese junior high school students attended juku last summer rather than having a good, relaxing vacation. Why?

Japan is geared to entrance examinations for kindergarten through the university level. Thus, children study day and night to enter the "right" school. Graduation from a prestigious university generally means attractive job offers from blue chip companies. 18

Despite the vast network of juku around the country and notwithstanding the high percentages of students who attend them, the government makes no effort to regulate or control these schools. Thus, the juku vary in quality,

and the students are often wasting money in juku taught by teachers who are not qualified. The writer has personally observed English juku taught by teachers who could not recognize the most basic and simple English conversation. Thus, parents must depend upon recommendations from friends because no assurances of quality come from Mombusho. Ironically, juku remain uncontrolled while private schools and universities are subject to Mombusho requirements.

Research Questions

The writer posed 12 questions that guided his studies in Japan, and although the previous sections of this report have dealt with some of them, the following paragraphs will discuss each question.

Question 1: Are Japanese children more intelligent than Americans?

No, but Japanese children work harder in school. They attend school five and one-half days each week and have an average school year of 240 days as compared with 180 in America. American parents constantly speak of a child's ability while Japanese parents speak in terms of effort and how hard the student works.

The opening ceremony held each April as the term begins is a significant part of Japanese education. All of the children, neatly dressed and often in new clothes, assemble in the elementary school. A representative of the city board of education speaks, telling the children, "You are engaged in something very important to you personally, to your families, your city, and the nation. You must do your best and hang in there" (gambate kudasai!). The children then fill their school bags with pencil boxes, rulers, special plastic sheets used under each page so the writing surface is perfect, and they equip themselves with several different colored pens so they can highlight particular important points made by the teacher.
As each class session begins, the class members stand at attention, and they shout together, "Onigaishimasu!" (We beg of you, please teach us.) As the class is concluded, the students again stand at attention and say, "Domoarigatō gozaimasu!" (Thank you very much for teaching us.)

Question 2: Do cultural differences account for the achievement gaps?

Perhaps the ancient traditions of a homogeneous society that values learning and prizes achievement are the only cultural factors that would account for the differences. Earlier the writer mentioned the concepts of gambate, ganman suru, and wa. The notion of persistent effort, avoiding confrontation, and striving for unity and harmony as well as not complaining and enduring to the end are perhaps cultural characteristics of the Japanese that would help them have an edge over the very heterogeneous and diverse people of the United States, but the writer could determine no other possible features of the culture that would account for the achievement gaps. If differences do exist, they would also surely operate for other subjects used in international comparisons, yet mathematics and science remain the two areas in which Japanese children surpass Americans. The differences are more likely to be found in the additional value parents place on mathematics and science.

Question 3: What teaching strategies or methods are employed in Japanese schools, and are they vastly different from American methodologies?

No significant differences in teaching methods were observed except perhaps for more emphasis upon lecture than would be typical of U. S. schools. Project methods, working in teams in both science and math, were fairly common in Japan. Students were called upon to discuss solutions to problems in much the manner typical of U. S. schools. Some teachers were more inclined to use "discovery" type techniques than others, but this was not universally so. Every school was well equipped with science laboratories and
materials to a greater extent than most American schools, but methodologies did not differ greatly.

Without a careful analysis, which has not yet been accomplished, curriculum differences cannot be determined. Initial reactions, however, are that most classes are about one or one and one-half years ahead of American schools in the introduction of certain subjects. The fact that all of the second graders already know how to use the soroban appears to have some advantages as well. Algebra seems to be a regular part of the curriculum for seventh graders while some American schools lean toward more general mathematics at this stage. The writer is not prepared at this point in his analysis to say that the general curriculum is more advanced in Japan.

Question 4: How are science and mathematics teachers prepared in Japan?

Teachers at the secondary level in America are generally considered to be prepared in courses taught primarily by the education faculty. Facts do not support this contention. Mathematics teachers in the U.S. take most of their curriculum in the arts and sciences colleges, and this is also true of science teachers. At the elementary level, more teachers may take a higher percentage of the total college credits in colleges of education, but secondary teachers in most states take the bulk of their course work in their respective disciplines.

In Japan the prospective mathematics or science teacher takes his or her course work from the faculty of education but from specialists in the disciplines, and almost no attention is given to teaching methods. Japanese teachers learn most of their teaching strategies by observing each other. Student teaching is usually done only in university attached schools, hardly typical of the regular public or private schools.
The question should therefore not be how the teachers are prepared but rather why American colleges are not able to attract the more able student into the teaching field as is the case in Japan. The basic answers lie in the salary structure and prestige afforded to Japanese teachers.

Question 5: What kinds of students enter the teaching field in Japan?

The high prestige of teachers in Japan plus the fact that salaries are at least as high or higher than business salaries make teaching a rather attractive career. Earlier discussions of the cultural patterns and high regard for teachers show that unlike their American counterparts, Japanese universities are able to attract the best students into teaching fields.

Question 6: Do Japanese parents and students seem to place more emphasis or importance on science and mathematics?

When asked the question directly, some parents will respond in the negative, but the fact is that the examinations are heavily weighted in these areas. Whether Japanese parents or students place more importance on these areas than do Americans is an open question. The writer has no comparative data on this, but the fact that prime TV time is often devoted to scientific topics would seem to indicate that it is true. The writer cannot imagine one of the three major TV networks in the U.S. spending so much time on similar topics. However, in terms of school subjects, Japanese parents value mathematics and science areas highly.

Question 7: What are the attitudes of the Japanese pupils and their parents toward schooling?

Countless studies show that the amount of education required for employment is constantly increasing in Japan. In 1962, 35 percent of the members of the House of Representatives in the Diet had less than a university
education, but 61.8 percent had completed a university education. Since Tokyo University and Kyoto University graduates tend to be selected for the best positions in government and business, most students prefer to attend these schools or at least attempt to gain the best possible education they can. Parents nationally devote about 2 percent of their annual incomes for juku for basic subjects, and that does not include tutoring that may be devoted more to general self-improvement (e.g., swimming or martial arts) and non-academic pursuits. In no other country in the world is found such an emphasis among the general population to learn a foreign language as the Japanese preoccupation with learning to speak English.

Question 8: Do factors external to the school influence high achievement?

The employment system (selecting graduates from better universities) and university education drive the examination system which, in turn, has a direct influence on performance by students in schools. The long cultural traditions of learning and the high regard for teachers have earlier been described, suggesting that cultural differences influence the drive for achievement in Japan.

Question 9: Does the Japanese curriculum differ vastly from that of American schools?

In lower secondary schools (junior highs) the required subjects are Japanese language, social studies, mathematics, science, music, fine arts, health and physical education, industrial arts (boys) or homemaking (girls), moral education, special activities, and elective subjects.

At the secondary level American schools have many more electives than for the compulsory education as prescribed by Mombusho.

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19 Passin, op. cit., p. 145.
Except for the moral education, the school subjects do not differ much from American schools. Table 2 shows that the second highest number of hours required is for elementary arithmetic. The electives shown on Table 3 for 105, 105, and 140 hours are usually English. Also note that arithmetic is replaced by mathematics in the middle school which includes algebra.

### TABLE 2

**PRESCRIBED CURRICULUM FOR ELEMENTARY SCHOOLS**

<table>
<thead>
<tr>
<th>Grade</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese Language</td>
<td>272</td>
<td>280</td>
<td>280</td>
<td>280</td>
<td>210</td>
<td>210</td>
</tr>
<tr>
<td>Social Studies</td>
<td>68</td>
<td>70</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>136</td>
<td>175</td>
<td>175</td>
<td>175</td>
<td>175</td>
<td>175</td>
</tr>
<tr>
<td>Science</td>
<td>68</td>
<td>70</td>
<td>105</td>
<td>105</td>
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<td>Music</td>
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<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Art, Handicraft</td>
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<td>70</td>
<td>70</td>
<td>70</td>
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<td>70</td>
</tr>
<tr>
<td>Physical Education</td>
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<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Moral Education</td>
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<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Special Activities</td>
<td>34</td>
<td>35</td>
<td>35</td>
<td>70</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Total</td>
<td>850</td>
<td>910</td>
<td>980</td>
<td>1,015</td>
<td>1,015</td>
<td>1,015</td>
</tr>
</tbody>
</table>

**Notes:**
1. One unit school hour is a class period of 45 minutes.
2. Private elementary schools can substitute religious education for a part of the school hours required for moral education.
3. The standard numbers of school hours allotted to special activities are for class assemblies, club activities, and classroom guidance, and those for other special activities may be fixed by each school.

<table>
<thead>
<tr>
<th>Grade</th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject/School Hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japanese Language</td>
<td>175</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>Social Studies</td>
<td>140</td>
<td>140</td>
<td>105</td>
</tr>
<tr>
<td>Mathematics</td>
<td>105</td>
<td>140</td>
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</tr>
<tr>
<td>Science</td>
<td>105</td>
<td>105</td>
<td>140</td>
</tr>
<tr>
<td>Music</td>
<td>70</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Fine Arts</td>
<td>70</td>
<td>70</td>
<td>35</td>
</tr>
<tr>
<td>Health, Phys. Ed.</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Ind. Arts, Homemaking</td>
<td>70</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Moral Education</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Special Activities</td>
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<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Elective Subjects</td>
<td>05</td>
<td>105</td>
<td>140</td>
</tr>
<tr>
<td>Total</td>
<td>1,050</td>
<td>1,050</td>
<td>1,050</td>
</tr>
</tbody>
</table>

Notes:
1. One unit school hour is a class period of 50 minutes.
2. School hours for the elective subjects may be allotted to one or more elective subjects and to special activities as well.
3. As for the school hours of elective subjects, the standard number of school hours allotted to music, fine arts, health and physical education, and industrial arts or homemaking in grade III is 35 hours, respectively, and in each grade 105 hours to foreign language and 35 to other necessary subjects may be allotted as the standard number of school hours.


In high school, which is financed by prefectures but according to curriculum guidelines established by the national ministry of education, students take five English classes, and mathematics has eight possible classes with six in the sciences. The high school subject areas are detailed in Table 4.
### TABLE 4

HIGH SCHOOL SUBJECT AREAS AND NUMBER OF CREDITS

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>Subject</th>
<th>Standard Number of Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Studies</td>
<td>Modern Society, Japanese History, World History, Geography, Ethics, Political Science, Economics</td>
<td>4</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Mathematics I, Mathematics II, Algebra and Geometry, Basic Analysis, Differentiation and Integration, Probability and Statistics</td>
<td>4</td>
</tr>
<tr>
<td>Science</td>
<td>Science I, Science II, Physics, Chemistry, Biology, Earth Science</td>
<td>4</td>
</tr>
<tr>
<td>Health, Phys. Ed.</td>
<td>Physical Education, Health</td>
<td>7-9</td>
</tr>
<tr>
<td>Foreign Language</td>
<td>English I, English II, English II-A, II-B, II-C</td>
<td>4, 5, 3 ea</td>
</tr>
<tr>
<td>Homemaking</td>
<td>General Homemaking</td>
<td>4</td>
</tr>
</tbody>
</table>

Notes:
1. Thirty-five units of school hours, each of which represents 50 minutes teaching, yield one credit.
2. Credit allocation to other subjects is prescribed by each establishing body of relevant upper secondary school.

Driver education, which is quite popular in the U.S. high schools, is not to be found in Japanese curricula. The driving age in Japan is 18 years, and all of the driver training is conducted by special juku that do not certify the driver until the school is confident that he or she is able to drive well. These schools are very expensive and may take from two months (minimum) to as much as six months. For one year all new drivers are required to post a special multicolored arrow on both the front and rear of the car they are operating.

Frequent comments are made in the public press about the high school curriculum having too many subjects, and pressures are increasing to reduce the amount offered so students will be able to focus more on the basic five: Japanese language, science, mathematics, health and physical education, and social studies. Some parents and educators advocate elimination of the art and music programs as "unnecessary frills," and their arguments are not unlike those with similar viewpoints in the United States. However, the writer is of the opinion that the basic curriculum won't change except for the gradual introduction of microcomputers which are not now part of the curriculum. The middle schools and high schools will probably continue to have curricula that reflect the entrance examinations for college.

Question 10: Are microcomputers an integral part of Japanese public education?

This question must be answered within the context of some background on the usage of microcomputers in U.S. education. Having seen the very rapid growth of computer involvement in U.S. schools, the writer assumed that the trend would also be started in Japan. In the U.S., microcomputers are utilized in two ways: for teaching what has come to be known as "computer literacy" and use of the computer itself as a teaching tool. Over the last
five years both usages have expanded very rapidly in the U. S., but in Japan
the movement has been much slower. Probably the main reason that no Japanese
schools teach computer literacy is that it is not related to the college
entrance examinations which drive the curriculum. The mere mention of
microcomputers in the schools evoked blank stares the first part of the year
that the writer resided in Shizuoka Prefecture, but over that period press
reports indicated that probably well over half of the high schools and somewhat
fewer junior highs had at least one computer. Apparently most of them are not
used for instructional purposes, however.

The writer did observe a junior high school in Gotemba, Shizuoka
Prefecture, where microcomputers were combined with a language laboratory to
make a very powerful instructional tool. The combined computer/language
laboratory was used for English and mathematics instruction, but in both
cases, the computers and language laboratory equipment were merely used to
pace students individually on material that was taken directly from the texts
in regular use throughout the prefecture in non-computer classes. In other
words, the medium was not utilized to its potential for the subject matter.

Lack of appropriate software and instruction for teachers will remain a
serious handicap for several years to come. However, community/parent
awareness of computer usage for instruction is growing. The fact that Gotemba
City would purchase the equipment referred to above is an indication of one
city's willingness to make additions to the school when they are deemed
appropriate. Computer usage will probably expand greatly following
development of software and Mombusho funding.
Question 11: Are female members of the teaching staff given equal opportunities for advancement, and are they found in leadership roles?

All of the public schools and public universities pay men and women equally. Class action suits against large corporations charging pay discrimination against women seem to be increasing, according to press reports, so perhaps the present inequalities will gradually disappear. The writer only met one woman in a leadership role in the schools—a mathematics specialist who had come to observe teachers during the time the writer was visiting the same school. About half of the teachers in elementary schools are female, yet the writer never met a single female principal.

Japan does not have a special training curriculum for prospective principals in the U. S. tradition. Principals are selected on the basis of their seniority in the teaching field and participation in prefectural research and inservice training centers that conduct orientation sessions for those who would like to be considered for selection. Ultimately the decision about whom to select for elementary and middle school principals depends upon the city boards of education. Principals for high schools are often selected from officials who have worked at the central education office in the prefecture, but the prefectural board of education makes the selection. The city of residence within the prefecture has no bearing upon placement in a principalship in the high school. Male dominated boards are probably going to continue to select male principals.

Women are often owners of small business enterprises but are seldom in the top echelon in large corporations, but the writer suspects that this will gradually change as Japan continues its march into modern day society. Despite the lack of progress as perceived by American observers, Japan probably ranks much higher in this area than most of the Far East and other Asian countries.
Question 12: Are children with special needs (handicaps) integrated into the regular classrooms in Japan?

A simple negative response would, on the surface, suffice for this question. However, Japan has made great strides in the field of special education in the post World War II years.

One of the professors of education at Shizuoka University headed a study team that toured the United States, England, Russia, and some other parts of the world and attempted, based upon their findings, to revise the curriculum in the college. Shizuoka University offers graduate degrees for teachers who wish to work in the field of special education, and the number of children receiving special instruction is growing rapidly. Many of these children, prior to World War II, would have been placed in institutions or kept at home, receiving no education at all. Now each large city and some prefectures provide special training and teachers on a cooperative basis for children with special needs. Thus, Japan has not yet progressed to the point of integrating or mainstreaming special education children into the regular schools.

The writer never observed a single blind, retarded, or physically handicapped child in any of the classes visited, and of course the reason is that they are placed in separate schools. In terms of the dignity of children and helping others recognize and appreciate differences, this is a serious drawback, yet the progress is there, and Japan is making great strides in special education today.

Conclusions

Much of the data collected during the writer's year in Japan remain for future study and analysis. However, the present question is why Japanese children excel in the fields of mathematics and science. Certainly no evidence was found that Japanese children are math whizzes nor do they appear
to be superior in intellect. Rather, some cultural practices work to the advantage of Japanese children. They apparently take their studies more seriously than their American counterparts.

Comparative studies are always fraught with difficulties, not the least of which is a lack of fluency for interviews and for reading questionnaire responses. Even the best of translations carry some risk, and cultural differences also contribute to still more confusion. Nevertheless, the writer is confident that his personal observations, conversations, and interviews produced sufficient data to draw the conclusions outlined in this report. In comparative studies such as this, the temptation is to say, "America should..." or "Japan should...." This writer contends that such recommendations are fruitless. Each nation must decide for itself the type of education system that best serves national purposes and needs. From the perspective of this observer, Japanese schools are doing some things exceedingly well, and yet others are open to question. The same observation could be made for the American system.

Given the cultural differences and the difficulties of implementing recommendations growing out of cross-cultural studies, are some suggestions worthy of consideration? Yes, America would do well to examine some societal factors. For example, just how serious are American parents about desiring an education for their children? Do American parents value education to the extent that they are willing to monitor with a more critical eye the TV, reading, and other activities of their children? Do American parents check with children before they go to school to see that they have, at the very least, pencils, pens, notebooks, and other needed materials? How often do American parents actually observe their children's teachers working in the classroom? Is society ready to pay teachers a wage competitive with business
and industry? Or are Americans content to make feeble gestures with small amounts of merit pay that are hardly worth it? Are teachers willing to submit to more peer observation, critique, and suggestions? Are school systems willing to devote more instructional time to the learning tasks? Is 190 days of instruction sufficient today, or how can schools better utilize the time they do have? Should some areas of the curriculum that society has thrust upon the schools now be removed and made part of a "juku" for those who wish to have the less essential subjects? Why not make driver training mandatory and require that students pay for it themselves and stay in training until certified that they are competent? Are members of the family really qualified to take on a task so important to the national safety?

The examination system in Japan has its pressures and evils, and yet it is an important factor in student motivation in middle school and in high school; parents, students, and the general public are all very familiar with the curriculum. Would there not be some advantages in the American counterparts being equally familiar with school curricula? America prides itself on its educational diversity, yet some areas of the curriculum are so critical that poorly conceived local standards might be a factor in placing the nation at risk. States might want to work toward more standardization of requirements in certain curriculum areas, particularly math and science.

The writer questions many of the features of the Japanese system, and yet students certainly take schooling seriously, and so do parents who are willing to pay for it. Can America afford to do less?

Currently the United States has clear leadership in the development and sales of computer software, but Japan's national policy plus keen competition is rapidly moving that country into a position of strength. Japan's race to produce fifth generation computers might well be successful and could mean
that the United States will fall behind in computer technology. Unless Americans can successfully deal with the educational issues raised above, the educational system that has helped make America great may have failed the test. Japan might well be moving from the soroban to leadership with the silicon chip!