A STUDY OF ELECTRICAL AND ELECTRONIC TECHNICAL EDUCATION PROGRAMS IN JAPANESE TECHNICAL COLLEGES AND JUNIOR COLLEGES

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CHAPTER I

INTRODUCTION

When Emperor Meiji of Japan ascented the throne in 1868 he set out immediately to transform Japan into a modern, industrial nation as quickly as possible. Recognizing that education would play a vital role in achieving modernization, considerable emphasis was placed on education at all levels. The results of Japan's efforts to modernize were remarkable. Her industrial and economic growth during the past century have been impressive, however development in this area since the end of World War II have been nothing less than phenomenal. The nation now enjoys a position of leadership in the industrial world.

In the last two decades technological innovations, highly automated facilities, highly productive and highly skilled workers and high quality products have permitted the Japanese to be highly competitive in the world market place. Such accomplishments would not be possible without well educated and highly skilled scientists, engineers, and technicians. There has been a great deal written about the industrial development of Japan. Her public education system and university education are also well documented, however as far as can be determined, very little research has been done in the area of technical education in Japan.

Statement of the Problem

The modern Japanese educational system was established in 1892

during the very early years of the Meiji era. The system experienced four major reorganizations prior to World War II. The present system, slightly modified, was established in 1947. The two principal modifications were the establishment of junior colleges in 1950 and technical colleges in 1962. Both of these have influenced technical education tremendously. While technical education is offered in several kinds of institutions in Japan, only two kinds of institutions will be considered in this study--the technical college and the junior college division which exists with some national universities.

Stated concisely, the problem to which this study will address itself is the lack of information about technical education as offered in technical colleges and junior colleges of engineering in Japan in the specialty areas of electricity and electronics. Of particular interest is the structure and organization of these institutions, curriculum content, funding, sources of faculty, teaching load, enrollment trends, employment opportunities for graduates, and the emphasis placed on laboratory experiences.

Purpose of the Study

The purpose of the study is to describe the development of Japanese education, with emphasis on technical education, and to investigate the technical education system which presently exists in technical colleges and junior colleges of engineering. The study was designed to answer the following questions.

1. What is the curriculum content at these institutions in terms of technical courses, related technical courses, mathematics, and support courses?

2. What is the organizational structure of these institutions?
3. What are the entrance requirements of their technical education programs?
4. How are their technical education programs funded?
5. What is the length of programs in technical education?
6. What are the sources of faculty for technical education programs?
7. Where does technical education fit into the total educational structure in Japan?
8. What are the enrollment trends in technical education?
9. What is the average faculty working load?
10. What are the employment opportunities for technical education graduates?
11. What emphasis is placed on laboratory experience?
12. What industrial experience do faculty members possess?

Significance of the Problem

Japan is unique as a nation able to develop as an economic and industrial power with virtually no natural resources. Her primary resource is her industrious people. In a period of one century, Japan has become one of the world's great economic and industrial powers. Her electrical and electronics industries are on a par with the United States. The literacy rate of Japan is among the world's highest. There was a flourishing culture in populous Kyoto, Japan when Paris and London were muddy villages and most of North America was a trackless wilderness. Well over twenty million Japanese read or speak English, while millions more have a surprising knowledge of American

and European history and literature. Yet few Americans know anything about Japan, past or present, and only a handful have any command of the Japanese language. Americans are just beginning to become aware of the significance of Japan as the first great industrial society in Asia and many are wondering what this means with regard to Japan's future relations with the United States and the world community.

This study is intended to focus attention on one small segment of Japanese society, technical education, in the hope that it might present some unique ideas and concepts for technical education in the United States and in some of the world's developing countries.

Scope of the Study

The study was limited to technical education in the specialty areas of electricity and electronics which is offered at 88 technical colleges and junior colleges of engineering which are divisions of several universities. Seventeen schools, ten technical colleges and seven junior colleges, were visited by the researcher during the Summer of 1976.

Definition of Terms

An Engineering Technician is a person who works at a job which requires applied technical knowledge and skill. His work in this respect is akin to the engineer, but is usually narrower in scope. His job also requires some manipulative skills, those necessary to handle properly the tools and instruments to perform the technical tasks. In his special field he has considerable technical knowledge of technical-industrial processes, and in the field he knows how to apply the necessary principles of the physical sciences and mathematics. In

general he uses instruments in contrast to tools. His contribution is mainly through mental effort rather than muscular exertion (3, p. 12). The engineering technician is usually employed in one of the following categories:

(1) research, design, or development,

(2) production, operation, or control, or

(3) installation, maintenance, or sales.

If working in category (1), the engineering technician usually works with an engineer or scientist. When working in category (3), he is frequently working at a job that would otherwise be performed by an engineer.

Technician Education is a planned sequence of classroom and laboratory experiences at the post-secondary level designed to prepare persons for a cluster of job opportunities in a specialized field of technology. The program of instruction normally includes the study of the underlying sciences and supporting mathematics inherent in the technology, and the methods, skills, materials, and processes commonly used in the technology. A planned sequence of study and extensive knowledge in a field of specialization is required in technician education, including competency in the basic communication skills and related general education. Technician education prepares one for the occupational area between the skilled craftsman and the professional person.

Technician education curricula are structured to prepare the graduate to enter a job and be productive with a minimum amount of additional training required after employment. Technician education provides a background of knowledge and skills which will enable one to advance as technology advances, and will enable one to advance to

positions of increased responsibility with a reasonable amount of experience and additional education (31, p. 573).

The Junior College is an institution of higher learning which offers the first two years of college instruction. The junior college generally grants an associate degree, but does not grant a baccalaureate degree. It may be either a public or non-public independently organized institution, an institution which is part of the public school system, or part of an independently organized system of junior colleges. Offerings may include college transfer courses, technical and occupational programs, continuing education programs for adults, and community services (31, pp. 92-93).

A Skilled Craftsman is an individual who possesses a high degree of manipulative skill and can perform practically all the operations of his job, is in command of the necessary scientific facts, can complete the necessary calculations essential to the performance of his work, and make judgments and decisions regarding given situations.

Engineers represent all persons actually engaged in chemical, civil, electrical, mechanical, metallurgical, or any other type of engineering work at a level which requires knowledge of engineering, physical, life, or mathematical sciences equivalent at least to that acquired through completion of a four-year college course with a major in one of these fields, regardless of whether they hold a college degree in the field.

Scientists represents all persons actually engaged in scientific work at a level which requires knowledge of the physical, life, engineering, or mathematical sciences equivalent at least to that acquired through completion of a four-year college course with a major in one

of these fields, regardless of whether they hold a college degree in the field.

Definition of Japanese Terms

Technical College -- This school is a unique Japanese institution established for the express purpose of technician education. The post-war technical colleges, or special higher schools, offer a continuous five year program at grade levels 10 through 14. The first post-war technical colleges were established in 1962. A certificate is awarded upon successful completion of a program.

Junior Colleges of Engineering -- These are divisions of national universities in Japan. Instruction is offered in from one to six areas of specialization. Programs are three years in duration and instruction is offered only in the evening. A certificate is awarded upon successful completion of a program.

Shogun -- A general. From 1192 until 1868, Japan was ruled by the Shogun, which translated means "barbarian, subduing, generalissimo," while the Emperor was only a figurehead.

Shinto -- The native religion of Japan, which translated means literally "the way of the gods." Shinto has no ethical teachings of its own. Its sacred book contains legends about the gods.

Prefecture -- At the start of the Meiji era in 1886 the government of Japan replaced the feudal domains with centralized administrative subdivisions called "prefectures" which are similar to states in the United States.

Chu-gakko -- Middle school for boys in the pre-World War II multiple track educational system. Five years in duration after six years of

elementary school thus providing 11 years of education.

Daigaku -- University for men in pre-World War II system. Co-educational university in the post-war system.

Gakko -- An institution of learning including a public or private school, college, university, and seminary.

Jitsugyo-gakko -- Boys vocational school, middle school level in the pre-World War II system.

Koto-senmon-gakko -- Higher special school for men in the pre-World War II system. Five years in duration from grades 12 through grade 16. Technical college in the post-war system. Five years in duration from grade 10 through grade 14.

Seinen-gakko -- Youth school which provided segregated education for both boys and girls in the pre-World War II system. Seven years in duration extending from grade 7 through grade 13.

Kyoin-yosei-jo -- Technical teacher training institute in the pre-World War II system. Three years in duration from grade 12 through grade 14.

Hanko -- School established during the Tokugawa era to teach primarily the samaria class Confucian virtues and to a lesser degree, history, calligraphy, composition and etiquette.

Shijuku -- Private academies during the Tokugawa era. Although most offered higher education to the samurai class, some offered very elementary education and some offered education for commoners as well as to the samurai class.

Terakoya -- Temple schools which were organized and run by Buddhist priests during the Muromachi and Tokugawa era to provide a basic education for commoners.

Oraimono -- Basic reader used as the text for reading and writing practice in many of the Terakoya.

Tendai -- A name given an apprentice learning a vocational skill within the family unit. The name signified a sort of half-maturity.

Shugi-gakusha -- A technical training school established during the first two decades of the Meiji era.

Denshu-sho -- A vocational school established during the first two decades of the Meiji era.

Han -- A part of Japan during the Tokugawa era. The country was divided into 280 hans with each ruled by a feudal lord.

Daimyo -- A fuedal lord or mobleman who ruled over the inhabitants of a large area of land called a fief during the Tokugawa era.

Samurai -- The warrior class in fuedal Japan. A code of unquestioning obedience and loyality bound the samurai warriors to their lords. The samurai prized honor above wealth, or even life itself, and atoned for dishonor by committing suicide.

CHAPTER II

REVIEW OF LITERATURE

This chapter is primarily concerned with a review of literature of technical education in Japan. However, any study related to Japan would surely be amiss to overlook the total development of this absolutely fascinating country.

As was suspected in the infancy of this study, a review of literature failed to uncover a great deal of information specifically dealing with technical education in Japan. However, the search revealed that a substantial amount of material has been written describing the beauty of the country, its historical and cultural development, its drive to become an industrial nation, its tremendous economic growth in recent years, as well as its total educational system including technical education.

Because all of these things affect the educational system of a nation, this chapter will present a brief geographical description of this picturesque country, a glimpse into the historical, cultural, and industrial development of the country, and then a review of educational developments with emphasis on technical education.

Geographic Description

Any study related to Japan must surely begin with a brief look at the physical characteristics of the country since these have had a

profound influence on the Japanese people for centuries.

Japan is an island chain, consisting of four major islands, which lies off the east coast of the Asian mainland stretching some 1,600 miles from north to south. The total land mass of the country is approximately 143,000 square miles (372,000 km^2) which is slightly less than the area of the state of California. The country is very mountainous with only about 15 percent of the land suitable for cultivation. Japan's climate resembles that of the eastern seaboard of the United States in that the northern part of the country has cool summers and very cold winters similar to the New England states, while southern Japan has hot, humid summers and mild winters similar to Florida. Abundant rainfall throughout the country provides a lush vegetation which has been the delight of poets and painters for centuries.

The forest covered mountains, picturesque rugged coastlines and island studded adjacent waters, swift clear rivers, majestic volcanoes, and a total landscape which is softened and beautified by a pervading bluish moisture haze makes Japan a country of great natural beauty; however, the tranquil beauty of the countryside gives little hint of the island chain's vulnerability to natural disasters such as earthquakes and typhoons. Throughout Japan's long history her cities have been repeatedly flattened by devastating earthquakes and frequently consumed by subsequent fires and almost annually the islands are lashed by powerful typhoons. These frequent disasters and the need to rebuild from scratch afterwards has had a profound effect on the character and values of the Japanese people. The stamina and courage needed to cope with these frequent natural disasters have helped the Japanese develop the ability to adapt to new circumstances with extraordinary ease and speed.

Japan consists of four major islands and hundreds of smaller islands. The four major islands are Honshu, which is the largest and most heavily populated, Hokkaido, second largest but least populated, Kyushu, the southernmost, and Shikoku, the smallest. Tokyo, the capital of Japan, is located on the eastern seaboard of the island of Honshu. With a population of approximately eleven million, metropolitan Tokyo ranks as one of the world's largest cities. The population of Japan is approximately 110,000,000. The area of the country is approximately 143,00 square miles which means the population density is 770 people per square mile or 290 people per kilometer squared. As a matter of comparison, Japan is approximately the size of California but has five times as many people which ranks the country as one of the most densely populated countries in the world.

Japan is divided into 47 prefectures which are shown in Figure 1. Each prefecture has its own capital and prefectural government. The country has a very limited supply of natural resources due primarily to the volcanic origin of the mountainous chain of islands. This volcanic activity caused primarily igneous rock formations rather than sedimentary formations with the end result being that there are few mineral resources of any consequence in Japan. A very high percentage of the natural resources required by Japanese industry must therefore be imported.

With only 15 percent of the total land area suitable for farming, the country is also greatly dependent on imported food to feed its people. While Japan imports a great deal of foodstuff her farmers have done tremendously well to produce the quantity of food which they produce off so little land. This is due to several factors including the use of

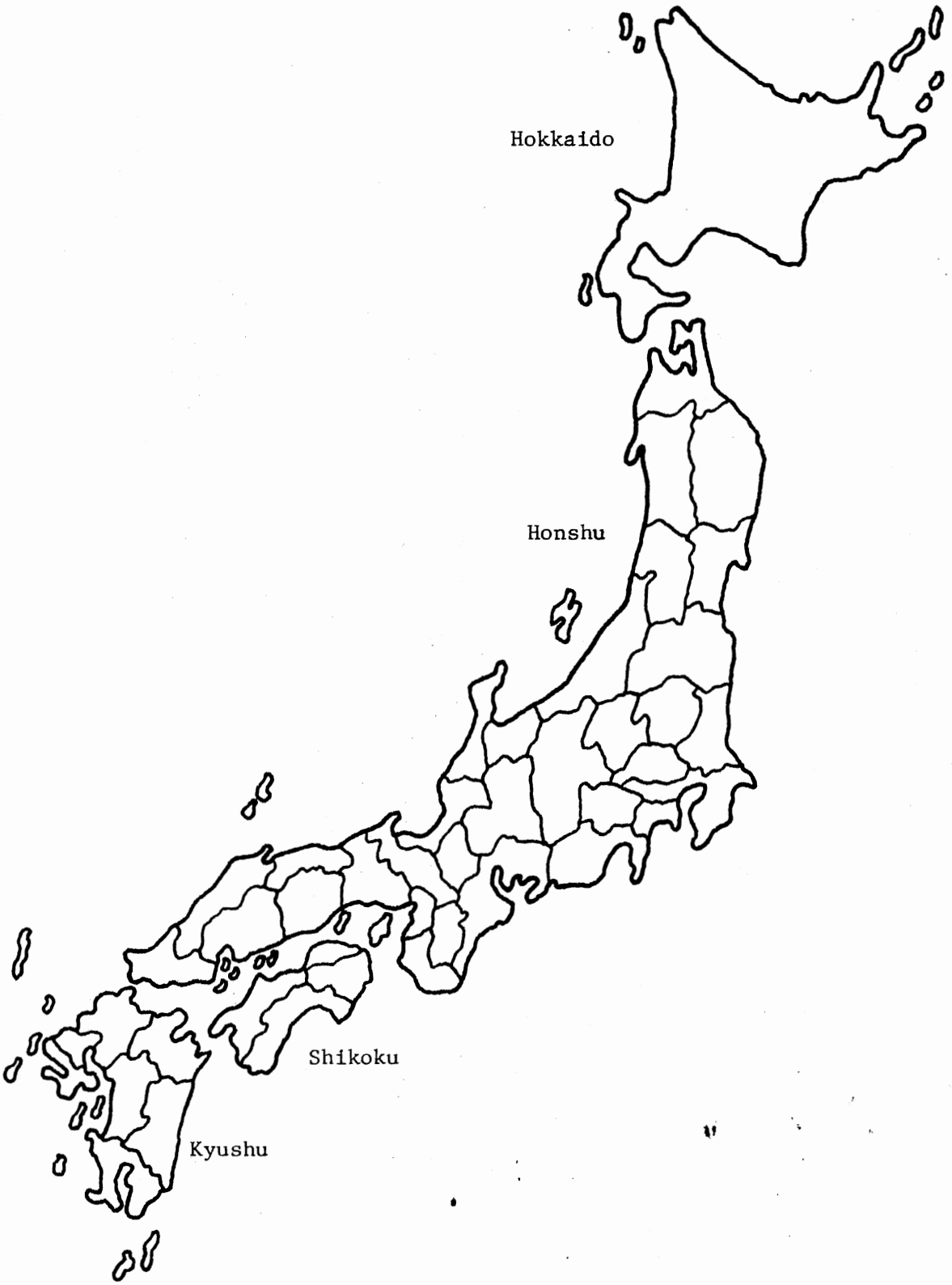


Figure 1. Map of Japan Showing Four Major Islands Divided Into 47 Prefectures

fertilizers and chemical sprays, use of modern farm machinery, and rotation of crops, as well as using every inch of available land.

Japanese Culture

For centuries ancient Japan slumbered in quiet obscurity more an amalgam of clans than a nation. Her history began to emerge from the mists of legend around 500 A.D. when Buddhism was introduced from China. Along with this gentle faith flowed the cultural riches of a magnificent China about to enter the flowering of the T'ang Dynasty.

But the legends of Old Japan, passed down by word of mouth for centuries, played an important role in shaping Japanese values and its only indigenous religion: Shinto. The most important of these myths involves Jimmu Tenno, the first Emperor of Japan who, according to legent, was a direct descendent of the Sun Goddess. Jimmu is supposed to have founded the Japanese Empire in 660 B.C., and all subsequent emperors trace their ancestry to him in an unbroken line. The myths of Jimmu Tenno's divine origin became one of the basic tenets of the Shinto religion, which means "The Way of the Gods," and is woven like a thread through Japanese history. Yale professor John Whitney Hall says, "There is no disputing the appearance of this historical figure" (10, p. 28) and modern research suggests he was a successful chieftain with a number of local tribes and clans under his sway.

Japan's discovery of China's wealth and highly developed civilization had an electrifying effect. The Japanese consciously and assiduously sought after China's learning and culture. Edwin O. Reischauer, former U. S. Ambassador to Japan, describes Japan's avid pursuit of Chinese intellectual riches as the "first organized program of foreign

study in the world" (26, p. 20). The most promising Japanese youths were sent to the magnificent Chinese capital of Ch'ang-an where they spent several years diligently studying China's arts, sciences, philosophy, laws, architecture, and governmental structure.

Of all the important things which the Japanese brought back from China, the most significant of all were the Chinese script and Buddhism. Another important adoption from China was the autocratic Chinese model of government which was adopted in 645 A.D. Using this model the country was transformed from a loose association of clans into a close-knit monarchical state.

This ushered in Japan's Imperial Age. An impressive capital was built at Nara in 710 A.D. The emperors and their courts avidly continued to import and imitate Chinese culture in their writing, poetry, arts, gardens, architecture, and sports. Though the court stayed in Nara only 84 years, this was an amiable springtime of Japanese culture. Some of the earliest gems of Japanese architecture still stand at Nara. The oldest and the largest wooden buildings in the world are there. These buildings, which are certainly among the world's foremost architectural treasures, are all the most precious because the original models in the T'ang Dynasty of China have been destroyed over the centuries. The capital was moved from Nara to Kyoto in 794 A.D. The next four centuries, which are known as the Heian period, were the golden age of the Japanese Imperial Court. Philosopher-historian Will Durant describes Japan's Golden Age in these terms:

> Wealth accumulated, and was centered in a fashionable life of luxury, refinement and culture. The court was elegant in poetry and dress, practices in manners and arts, and was setting for all the nation the standards of learning and taste. Every appetite was full and free. . . . silks of

> fine texture wavered on every sleeve. Music and dance adorned the life of temple the court, and graced aristocratic homes attractively landscaped and luxuriously furnished within (p. 835).

The first Japanese educational institutions were established in Kyoto about 900 A.D. By 1000 A.D., wealthy Kyoto had a population of half a million, greater than any European city of the period except Moslem Cordoba and Byzantine Constantinople--which today are silent reminders of two vanished civilizations.

Love of poetry runs deep throughout Japanese history, and even today the ability to write an evocative poem in symbolistic style is considered a normal attribute of an educated Japanese, whether doctor, businessman, or factory worker. So popular was poetry during the Heian period that poetry tournaments were held with as many as 1,500 amateur poets competing. The Heian period also produced some of Japan's finest prose. The best known is the Tale of Genji, written, significantly, by a woman, Lady Murasaki, about 1000 A.D. Societies which produce exceptional women writers are, almost by definition, highly cultivated. Reischauer says of Tale of Genji: "It is not only the earliest forerunner of a major genre of world literature, it constitutes one of the greatest literary achievements of mankind" (26, p. 35). It was the first great novel in history and, while profoundly Japanese, now belongs in the front ranks of world literature. Some physical evidence of imperial Kyoto can still be seen in some of the magnificent temples, shrines, and gardens in and around present day Kyoto.

As with other over-refined courts, notably the courts of Louis XVI and of 18th century Versailles, Kyoto became effete and ostentatious in time. But while the grandeur of other courts and cultures faded into the utter silence of history, Kyoto and its culture and literature have

survived the centuries and remain a part of the tradition and legacy of Japan.

Historical Development of Japan

Japanese history can be roughly divided into three principal phases. The first phase which covers the period from about 500 A.D. to 1200 A.D. saw the flowering of Japan's "Golden Age" reaching a peak of wealth and culture about 1000 A.D. in the imperial capital of Kyoto.

A great deal of Japan's cultural development took place during the golden Age of the Imperial Court. As the wealth, prestige and power of the Imperial Court began to decline during the later years of the twelfth century, a warrior class called the Samurai came to power and for the next 700 years Japan was ruled by these warrior aristocrats under a feudal system of government. However, the long feudal period was by no means synonymous with "dark ages." Indeed, culture and education often thrived, though they were firmly subordinated to more martial virtues and to a political structure in which loyalty to one's daimyo, or feudal lord, was the ultimate virtue and obligation.

The second period was feudal and covers the period from about 1200 A.D. to 1867 A.D. This period reached its apex during its final two and one half centuries under the rule of the peaceful Tokugawa Shogunate. During this period, known as the Tokugawa Era, Japan withdrew into self-imposed isolation from the rest of the world. While the primary occupation was farming, philosophy and art flourished among the ruling class.

Whatever the merits or shortcomings of several centuries of feudalism, there is little doubt that the valor exhibited by the samurai

during the massive Mongol invasion in 1274 had incalculable results for Japanese and world history. The decisive defeat of the armies of Kublai Khan meant that Japan was destined to develop the most homogenous race and culture of all the world's major nations, undiluted by foreign invasion until 1945. During this dramatic period in Japanese history three remarkable figures emerged. The first was a feudal lord, or daimyo, named Nobunaga Oda from central Japan, who crushed most of the warring feudal barons in that area and began the work of reunifying the country. He was succeeded by his own military leader, Hideyoshi Toyotomi, an authentic genius whose military skill was comparable to that of Napoleon. The distinguished British historian, James Murdoch, states that "though the 16th century was extraordinarily rich in great men, he was the greatest statesman of his century, whether in Japan or in Europe" (22, p. 711).

Toyotomi gained control over the feuding daimo, set up an efficient system of central administration and stimulated commerce. The third great figure was Ieyasu Tokugawa, who consolidated the work of Oda and Toyotomi to found the Tokugawa Shogunate. According to Durant, the Tokugawa period which extended from 1573 to 1868 was "one of the longest periods of peace and one of the richest epochs of art in human history" (7, p. 891). He describes the period in these terms:

> The very life of the people was instinct with art--in the neatness of their homes, the beauty of their clothing, the refinement of their ornaments, and their spontaneous addiction to song and dance . . . artists labored with self-effacing devotion only the artist-artisans of ancient Egypt and Greece, or of medieval China, could rival their industry, taste, and skill (p. 892).

The third phase is the period from the end of the Tokugawa Era to the present. It was just over a century ago, in 1868, that the

period known as the Meiji Restoration opened in Japan. This period is one of the most remarkable eras in the history of any nation. During the first four decades of the Meiji Era, under one of Japan's greatest emperors, the country studied and adapted to its own culture the tools of technology and government of Western civilization to become the first Asian nation to create a modern industrial society. These four decades were followed by the initially promising period after World War I to the ultimate tragedy of World War II.

After the imperial court was moved to Tokyo in 1869, a tremendous political, social, economic, military, and education revolution followed with astounding speed. The Emperor, himself a man of outstanding ability, surrounded himself with an extraordinary group of men composed largely of youthful but aristocratic samurai who assumed roles of leadership in the new imperial government. Professor John Hall of Yale University states:

> Japan has rarely, if ever, produced a larger number of able leaders than during the period from the 1850's through the 1880's. . . . They were as a group remarkably young . . . (with a) uniformly high level of education and specialized training (10, p. 267).

In a very few years the young samurai had undertaken a truly revolutionary restructuring of Japan's government, economy and social institutions. They worked feverishly to make up the lost time of centuries in a few decades. The most capable young Japanese were sent to England, France, Germany, and the United States to learn all they could of Western methods and technology. Reischauer described the efforts in the following way:

> The world was one vast school house to them. . . . Students were carefully chosen on the basis of their knowledge and capabilities, and the countries to which they went to study

> were chosen with equal care. The Japanese determined to learn from each Western country that in which it particularly excelled (26, p. 135).

At the same time many foreign technicians were brought to Japan to assist the Japanese in a "crash" program of modernization. From the United States came postal, agricultural and education advisors. France sent experts in law while Germany supplied doctors and technicians from the military. Since the British Empire was at its pinnacle she was chosen to supply advisors for creating Japan's navy, merchant marine, railroads, telegraph system, and for banking and engineering. Japan's quest for modernization was underway with this astounding tour de force.

A constitutional monarchy under which Japan was to govern itself for the next 55 years was inaugurated in 1889. By present day standards it was extremely authoritarian in that it gave the Emperor almost absolute power with Ministers responsible only to the throne. When compared to Japan's present constitution, its precedessor of 1889 was extremely conservative, however, according to Reischauer, "it is doubtful if Japan could have successfully governed herself at that time by a much more fully democratic system" (26, p. 143). Whatever its shortcomings, states John Hall, the Meiji Constitution "proved to be a remarkable combination of western political technology and traditional Japanese political ideas and placed Japan among the 'civilized nations' in the eyes of Western political writers" (10, p. 299). When Emperor Meiji died in 1912, the changes which had taken place in Japan in barely four decades were almost incredible. From a small, isolated feudal state, Japan had become a military and industrial power of consequence.

Economically, Japan was radically transformed by World War I. Its industrial products were in great demand by the embattled Allies in

Europe as well as in much of Asia where war-torn Europe could no longer provide goods. By the end of the war Japan had been transformed from a debtor nation to a creditor; however, the economic boom was short lived. The worldwide depression of the 1930's dealt Japan a tremendous two-fold blow. Several countries, and in particular the United States, erected high tariff barriers against Japanese goods partially strangling Japan's economy. This, along with the recently enacted American Immigration Law, which dealt specifically with the Japanese, caused a great wave of nationalism and militarism to sweep over the island nation. Misunderstanding between the two world powers increased. In his Pulitzer Prize-winning history of Japanese-American relations, John Toland cites some of the reasons for the communications breakdown between Japan and the United States which eventually led to war. They included:

> . . . mutual misunderstanding, language difficulties and mistranslations, as well as Japanese opportunism, gekokujo, irrationality, honor, price, and fear--and American racial prejudice, distrust, ignorance of the Orient, rigidity, self-righteousness, honor, national pride and fear (28, p. 147).

By 1930 the Japanese army had become quite defiant of the civilian government and by 1936 the army completely dominated Japan's foreign policy. After overrunning most of Manchuria in 1931, Japanese troops plunged into China in a vast military operation in 1937. By 1938, most of China's major cities, all its leading ports, most of its railroads, as well as the most populous and productive areas of the vast country were in Japanese hands.

When Japanese troops occupied the southern half of Indo-China in July 1941, the United States, Britain, and Holland proclaimed an embargo on all shipments of oil, scrap iron, steel, and other raw materials to

Japan. The country, which faced economic strangulation, was faced with two choices. The first was to withdraw her troops from China as the United States demanded, settle back and reap the economic benefits of the war in Europe. Her second choice was to break the economic blockade by seizing the natural resources of Southeast Asia, particularly the oil of the Dutch East Indies.

Japan's decision is now history. On the morning of December 7, 1941, Japanese bombers devastated the United States naval base at Pearl Harbor. Following the destruction of the American battle fleet at Pearl Harbor, the well-trained and extremely dedicated Japanese troops overran Malaysia, Singapore, Burma, and Indonesia with its precious oil. After heavy fighting with American troops the Philippines finally fell to Japan. Impressive early Japanese victories gave way to four years of savage fighting across the South Pacific. Epic battles, with countless sagas of heroism on both sides, were fought at such places as Guadalcanal, Tarawa, Saipan, Iwo Jima and Okinawa; however, the eventual outcome was strategically inevitable from the beginning. The war finally came to an end on September 14, 1945.

When General Douglas MacArthur and the American troops disembarked in Japan on September 2, 1945, the country lay in ruins. Some 2 million people had died in the war, 40 percent of the total area of all the cities was destroyed and industry was at a standstill. The Japanese people were physically and spiritually exhausted with many in rags and half-starved. The situation looked bleak to the point of hopelessness.

The nearly seven years of American occupation following the war proved to be a unique experience not only for Japan, but in world history. Never in history had a military occupation of one world power

by another proved so satisfactory to both the victor and the vanquished. The occupation turned out to be a far less unpleasant experience than the Japanese had anticipated; in fact, in retrospect the period of occupation can be seen as an important, constructive phase of Japanese history. In summing up the period of occupation, Hall states:

> The occupation years and the years of adjustment immediately following constitute a major watershed in Japan's history. Ranking next to the Meiji Restoration as a time of drastic change and modernization, it has been looked upon by some as marking Japan's final break with tradition and acceptance of institutions and values uncolored by feudal or Confucian ideas . . . the combined force of wartime suffering, defeat, disillusion, and occupation . . . pushed Japan over its second major watershed in the course of modernization, creating a mass participation society with sovereignty invested in the people, a mass consumption society with one of the most remarkable growth rates of any society in modern times (10, pp. 354-355).

The three decades which have elapsed since the end of World War II have witnessed an "economic miracle" in Japan. Faced with a do-or-die challenge after the destruction of war, the Japanese responded with a prodigious effort, saving as much as 20 percent of their modest salaries to provide capital for new industries, working six days per week while often refusing to take vacations, and frequently giving their evening hours to study or specialized training. The results were astounding! Japan's GNP soared from $10 billion in 1950 to over $300 billion in 1973. This rate of economic growth has never been exceeded by any major nation and was described by the British Weekly Economist as one of the most exciting and the most extraordinary forward leaps in the history of world economics. In an amazingly short time the economic production of Japan passed that of France, then Great Britain, and finally West Germany to become the world's third greatest power after the United States and Russia.

However, both the U. S. and Russia are favored by large area, a wealth of raw materials, and large population. Japan has few natural resources and can survive only as a processing nation--importing raw materials and exporting finished products. To accomplish this, Japan has built a steel industry nearly as large as that of the United States, created a shipbuilding industry which builds half the world's tonnage, and has become the world's largest producer of transistor radios, electron microscopes, cameras, sewing machines, motorcycles, and bicycles. Japan ranks second as a producer of automobiles, electronic computers, television sets, watches and textiles.

The rapid industrial growth and urbanization have had profound social and cultural effects. Perhaps the most important effect has been the growth of a very large, well-educated middle class which is precisely the group with the strongest interest in developing and defending democracy. This large middle class in modern Japanese society has given Japan extraordinary political stability which is essential to its economic development. Although post-war Japan's primary concern has been economic survival its cultural life has been very active. Japan has the world's highest literacy rate. Despite a complex written language the Japanese are voracious readers and this passion for reading and learning is by no means limited to a small elite group. Robert Guillain, the Far East correspondent of the leading newspaper in France, Le Monde, states:

> One has to have lived in Japan to appreciate the way 'culture goes deep,' penetrating all social levels right down to the humblest with a greater intensity than it does even in our most cultivated Western countries . . . when one lives side by side with the Japanese, one finds on a whole that they possess not only a delicacy in feeling and action that is not often seen among our ordinary people, but also artistic literary and intellectual taste and knowledge--in short, a

> cultivation, and openness of mind, and an interest in the outer world that is rarely found in the West among what are conventionally called the common people (8, p. 92).

If there is one word which describes modern Japan, it is "dynamic." The Japanese people work hard, study hard, and play hard. The Japanese are a complex people with many seeming contradictions; in sum, a people not easy to know but well worth knowing. Japan is a country with a history and culture fascinating to explore.

Educational Development

Economically Japan has emerged in less than a century from its feudal heritage to become one of the three top industrial nations of the world. The transformation is no less incredible in other less measurable but equally important areas: population control, personal health, low mortality, and education.

Education in the Tokugawa Period

No matter which country or culture one may choose, education is an integral and inextricable part of that culture. Brameld stated the case well in saying "culture remains education's senior partner and this partnership has long been recognized as an indubitable fact of human evolution" (5, p. 16). While modern Japanese education dates from the late Tokugawa period or the early Meiji era this close culture-education link certainly suggests some educational activity in pre-Tokugawa period Japan. The idea of education in a special building with specialized teachers was, in fact, introduced in Japan during the Heian period several centuries before the Tokugawa period by the Imperial court; however, the Tokugawa schools were new in kind and unprecedented in the scale of their diffusion (6, p. 68).

Early in the Tokugawa period, Ieyasu Tokugawa who was the founder of the Tokugawa regime issued instructions for the regulation of military houses (Buke Shohatto) which called upon the samurai class to devote themselves to both learning and the military arts. The injunction was piously repeated over the next two and one half centuries by later Shoguns and Daimyo. Whether by "learning" Shogun Ieyasu meant something more than Confucian virtues needed for the proper governance of the state is not certain, nevertheless the shift in direction from arms to learning was a fundamental one with the consequences over the centuries far exceeding anything that could have been imagined at that time. The early Tokugawa schools were primarily Confucian academies intended for character education because it was believed that study would improve the morals of the samurai.

The underlying concept of Tokugawa education was essentially a class one. Higher education was required by the samurai to maintain their position and efficiency as a governing class. By the end of the Tokugawa period there were 27 Shogunal schools for samurai, many of them among the most important institutions in the country. Not all of them were orthodox Confucianist as the Shogunate took a place of leadership in some areas of Western studies. Some of the more significant schools were a medical college established in 1756, the Institute for the Investigation of Writings established in 1856, and a Western-style military school started in 1854.

Tokugawa Japan was divided into approximately 280 feudal domains or fiefs (han) each fuled by a feudal lord (daimyo). Almost every fief had at least one school (hanko) which was generally modeled after the Shogunal schools, therefore it would not be unreasonable to assume that

there was some 300 schools operating primarily for the education of the samurai class. Although there was considerable diversity, these schools were, in general, based on a classical Confucian curriculum to which was added, in differing degrees, such subjects as Japanese and/or Chinese history, calligraphy, composition, etiquette, and "national learning." Toward the end of the Tokugawa period a substantial number of fief schools offered such courses as Chinese medicine, Western medicine, Western studies, and English. The study of English was not only language, but also included such things as military science, ordnance, geography, and astronomy (25, p. 19).

As with the Shogunal schools, the fief schools maintained strict class divisions with many schools prividing separate curricula for the various ranks. Samurai education was considered education for character rather than for specialized training. The specialist was looked upon as a mere technician rather than a person of general culture, therefore although Western studies were included in the curricula they were generally for only the lower samurai ranks. The orthodox view was that Western learning was quite appropriate for practical matters but was entirely unsuitable for the realm of wisdom and virtue and therefore not suitable for the governing classes.

Alongside the officially supported Shogunal and fief schools, a wide variety of private academies, or shijuku, grew up. Although most of them can be described as institutions of higher education for the samuari, they covered the full range from elementary schools offering the bare rudiments of literacy up to and including advanced institutions of learning which functioned much on the order of colleges and research institutes. Many of these private academies opened their doors to commoners

as well as to the samurai class; in fact it was in the shijuku that the modern principles of merit and achievement first came into conflict with class ranking. With students living together in dormitories, as was often the case in the shijuku, the idea that students of upper-class origin were inherently superior to commoners was severely tested. Examinations, grades, and individual recitations stressed the individual rather than class. The concept of class superiority was further eroded by Shogunal and fief authorities who showed a growing interest in the cultivation of individual talent and human resources.

The most important and widespread institution for the education of commoners during the Tokugawa Era was the terakoya, or "temple school." The first terakoya were organized and run by priests in the Buddhist temples during the Muromachi Era (1392-1573); however by the Tokugawa Era the terakoya was a purely secular institution for the common people with no particular ties with the temple, therefore its name was somewhat misleading.

Throughout most of the Tokugawa Era, primary emphasis was placed on education for the samurai, with the commoners left to their own devices, therefore it is all the more remarkable that education among the commoner enjoyed rapid growth. Terakoya were established in shrines, temples, vacant buildings, or in private homes by public-spirited, concerned citizens as an expression of their concern and conviction of the need for public education. The most rapid development of the terakoya came during the 1800's. By 1850 there were some 6,000 terakoya around the country. The demand for education in the cities and towns was very high and it is a reasonable assumption that a majority of young people, at least the boys, attended school for some period of time. The

demand for education in the rural areas came primarily from the village leaders who needed the basic educational skills in their administrative work.

Conditions were obviously very diverse among the terakoya. Some of the schools were outstanding while others were very poor. In general, they averaged between 30 and 60 pupils per school, usually with one teacher. Although the schools were coeducational, there were far more boys than girls and the two groups were rigidly divided in seating arrangements. The children were not divided into grades unless it was on the basis of the teacher's intuition. The length of the school day was between three and four hours. The teacher would instruct each student in turn. Between individual instruction the students practiced reading and writing which were the heart of the curriculum. To this basic core curriculum some schools added arithmetic and vocational and moral subjects such as etiquette, morals, and accounting. Some schools added more composition, and occassionally such Western subjects as science, military arts, and English.

Teaching methods were unstandardized. Pupils studied and made their recitations individually rather than as a group. In most schools the basic subjects were taught either from texts prepared by the teacher or from simple primers called Oraimono. These primers were usually closely linked to the daily life and occupational aspirations of the students.

While many of the terakoya did little more than provide the bare rudiments of literacy, others, particularly those in the larger cities, attained rather high standards of primary education. Some schools were quite thorough in what might be called prevocational preparation.

However, some, particularly those in the merchant class that had begun to accumulate wealth desired more than a primary education for their sons and daughters. As a result, some of the schools began to provide instruction in such areas of culture as flower arranging, poetry, and the koto, which is a Japanese musical instrument.

There appears to be little doubt that toward the end of the Tokugawa Era many of the terakoya were sufficiently effective to make their pupils aware of the political problems of their times. At the very least the terakoya prepared the Japanese for the modern school system which was established very early in the Meiji Era.

Vocational Training During the Tokugawa Period

Frequently the terakoya provided prevocational schooling for those who entered a highly developed apprenticeship system. As might be expected, much of the vocational training during the Tokugawa period took place within the family unit, however apprenticeship systems outside the family unit were extremely important. For example, in some of the large commercial houses, boys spent years in service and training. The boys usually started their apprenticeship training at about the age of ten with sons other than the eldest son preferred. This was because the first son generally carried on his own family's occupation.

For the first few years of his apprenticeship the young man was assigned chores around the home or shop. Later he would be given occasional errands and tasks outside the home or shop. At the age of fifteen or sixteen he was given enlarged responsibilities and a new name which symbolized his relationship to his master's house. His personal life

was regulated down to the smallest detail. Absolute obedience was required of him and discipline and punishment were very severe.

If a young man managed to survive the years of harsh discipline, he became a tedai by the age of eighteen or nineteen. This signified a sort of half-maturity. At maturity, which was generally a year or two later, he was finally accepted as part of the family and was put in charge of some entire operation in a shop. If all went well he might look forward to a business of his own, perhaps as a branch of the main firm or as a retailer for the main firm.

Educational Development During the Meiji Era

When Japan entered the Meiji era in 1868, she was by no means an undeveloped nor illiterate nation. The population was ethnically homogeneous, she was culturally advanced with a common language, value system, and historical tradition, and there was a remarkable unity of purpose. Although her educational system was not organized as a national system at the end of the Tokugawa era there were thousands of schools and a sophisticated philosophy of education. With these resources Japan was ready to make a relatively smooth transition into the modern world.

The education system established in Japan during the early years of the Meiji era was patterned after the European system of the time. The system had a threefold purpose as follows:

1. To provide education for the enriching and strengthening of the state.
2. Education for enlightenment designed to alter the old consciousness.

3. Education for maintenance of Japan's traditional national policy of loyalty and allegiance.

The system was designed to serve the dual purposes of education of the masses and academic pursuit for the elite. The single track elementary school branched into a dual track system at the secondary level to serve these dual purposes. Elementary school served to educate the masses. Secondary education and beyond was for the intellectually elite who were to become the leaders of government and industry and contribute to the prosperity and strength of the nation.

In order to formalize a nationalist educational philosophy to conform with the interests of the state, Emperor Meiji issued a short document in 1890 called "The Imperial Rescript on Education." The Rescript, which was destined to influence Japan's history, stated the objectives of education in terms of Shinto-Confucianist values. The brief document which was to serve as a guide for the nation's schools read as follows:

Imperial Rescript on Education

Know ye, Our subjects:

> Our Imperial Ancestors have founded Our Empire on a basis broad and everlasting and have deeply and firmly implanted virtue; Our subjects ever united in loyalty and filial piety have from generation to generation illustrated the beauty thereof. This is the glory of the fundamental character of Our Empire, and herein also lies the source of Our education. Ye, Our subjects, be filial to your parents affectionate to your brothers and sisters; as husbands and wives be harmonious, as friends true; bear yourselves in modesty and moderation; extend your benevolence to all; pursue learning and cultivate arts, and thereby develop intellectual faculties and perfect moral powers; furthermore advance public good and promote common interest; always respect the Constitution and observe the laws; should emergency arise, offer yourselves corageously to the State; and thus guard and maintain the prosperity of Our Imperial Throne coeval with heaven and earth. So shall

> ye not only be Our good and faithful subjects, but render illustrious the best traditions of your forefathers.
>
> The Way here set forth is indeed the teaching bequeathed by Our Imperial Ancestors, to be observed alike by Their Descendants and the subjects, infallible for all ages and true in all places. It is Our wish to lay it to heart in all reverence, in common with you, Our subjects, that we may all thus attain to the same virtue.
>
> The 30th day of the 10th month
> of the 23rd year of Meiji
> (Imperial Sign Manual. Imperial Seal) (30, p. 215).

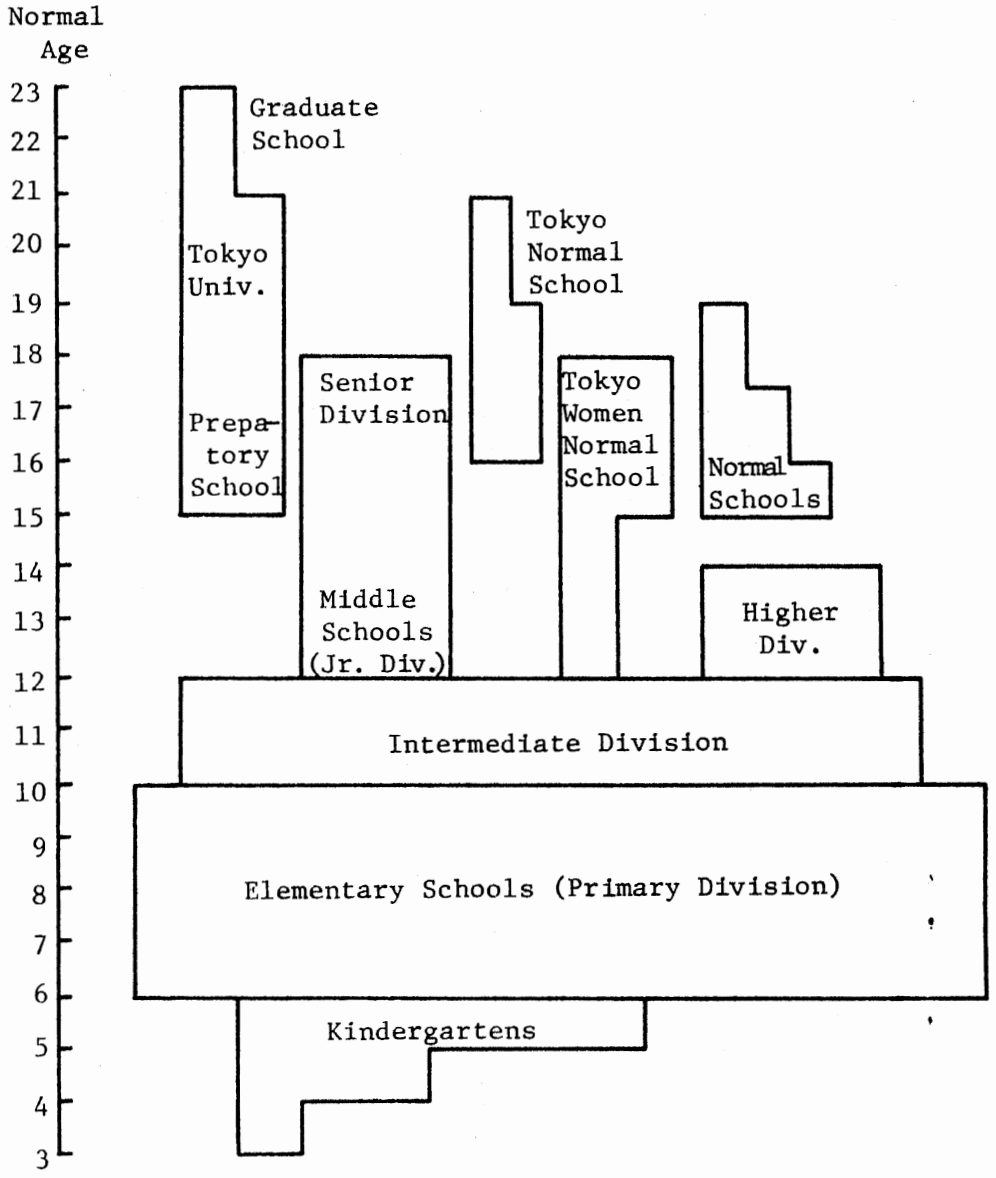
The Rescript combined the Shinto ideology of Emperor worship with the Confucian ethical concepts of loyalty, filial piety, and obedience to superiors. The philosophy of education in the Rescript was interpreted as a statement of moral standards for the Japanese people.

For the first two decades of the Meiji Era, the Department of Industry was responsible for vocational and technical education. Shortly after the department was established in 1870, a total of ten schools of two types were founded. The two types of schools were a technical training school called a "Shugi-Gakusha" and a vocational school called a "Denshu-Sho." Most of the teachers in these schools were foreigners. Japan desperately needed to train her own people for positions of leadership and responsibility in newly formed industries, thus in 1871 a school of technology was established which absorbed all or most of the ten schools established only a year earlier. The new school was divided into seven programs as follows; civil engineering, machinery, architecture, tele-communications, chemistry, metallurgy, and mining. Each program was divided into three parts which were a preliminary study, a specialized study, and a practical study. Each part was two years in duration for a total of six years. An examination was given after the two years of preliminary studies and those who failed to meet the minimum

standards of achievement were not permitted to advance into the specialized studies. Another examination was given after the two years of specialized studies. Those who passed the examination were given a certificate of completion of the technological studies and were appointed assistants in some technical work to further develop their skills. At the end of the sixth school year a third examination was given which covered both theoretical topics as well as practical techniques. Those who passed the examination were given a certificate of completion of the technical studies which signified that they possessed the necessary skills for doing practical work for the Department of Industry. The jobs to which graduating students were assigned were in accordance with examination scores; those who scored lower were given less technical assignments.

The educational system was reorganized in 1879 and again in 1880 with the enactment of the Education Act and the Revised Education Act respectively, however, vocational and technical education was barely mentioned and such education and training as existed remained under the wing of the Department of Industry. The revised educational system of 1881 is shown in Figure 2. The vocational and technical schools in existence at that time are not shown because they were under the jurisdiction of the Department of Industry.

During the first two decades of the Meiji Era light industry, such as textiles, made remarkable progress. As industry developed several firms established training courses. The best known and most successful of them were the following: The Ashikaga Institute of Spinning and Dyeing, The Kyoto Institute of Dyeing, the Hachioji Institute of Spinning and Dyeing, The Isezaki Institute of Spinning, and The Kanazawa



Source: (4).

Figure 2. Japan's Educational System of 1881

Technical School. Each of these schools was established at the initiative of various industries and trade associations. As an example, consider the development of the Ashikaga Institute of Spinning and Dyeing which eventually became Tochigi Prefectural School:

1877 - The Dyeing Study Society was established to study dyeing techniques of Western nations.

1879 - The dyeing society was expanded into the Ashikaga Fabric Handling Office.

1882 - The Ashikaga Commerce and Industry Association was established.

1885 - The Dyeing Experimental Station went into operation. This represented the origin of the Ashikaga Weaving and Dyeing Training Institute.

1894 - A proposal was submitted for the establishment of a prefectural technical school. The Minister of Education approved the establishment of Tochigi Prefectural Technical School, whereupon the Ashikaga Weaver's Association donated all the buildings and equipment of the Ashikaga Weaving and Dyeing Training Institute for use by the new school (21, p. 146).

The years from 1886 to 1900 saw several very significant events regarding vocational and technical education. The following is a paraphrased summary of an article written in 1886 by Mr. Seiichi Tezuka, a pioneer in vocational and technical education in Japan.

The Encouragement of Technical Education
(from the "Review of Education," August 1886)

> One of the things which lead to the prosperity of Western countries is the development of industrial techniques. This development depended to a great extent on technical education, therefore we must not neglect such education. However, our education system is doing very little with it and it represents the weakest point in our system.

> Technical education is entirely different than ordinary class-room education. Classroom education is old fashioned and can't be made directly practical. In the technical school students will learn the theory and at the same time its applications. All western countries have technical schools or institutions. In recent years these schools have made remarkable developments. The kinds of technical schools are the following:
>
> (1) Higher technical schools
> (2) Middle technical schools
> (3) Apprentice schools
> (4) Night school
> (5) Girls' industrial school
>
> In Asia the land and population are twice as large as those in Europe, nevertheless the necessities of life are supplied by western countries. This is why we must develop our industry, and in order to do so we must promote technical education (13, p. 148).

As the need for vocational and technical education continued to become more obvious the Ministry of Education began to take an active role due in part to the philosophy of Japan's second Minister of Education who took office in 1893. He expressed the belief that people's vocational knowledge and skills constituted intangible capital for enriching and strengthening the nation and that to foster such knowledge and skill forms the bulwark for maintaining the independence of the nation.

In 1893 and 1894 several regulations concerning vocational and technical education were established. These regulations were to define the aims of technical schools and to establish curriculum patterns to develop some standardization in vocational and technical education throughout the nation. The Government Subsidy Act for Vocational and Technical Education went into effect in 1894. This Act, which was to encourage vocational and technical education, made an appropriation of one hundred and fifty thousand yen a year for such education.

In 1897 the Ministry of Education assumed responsibility for vocational and technical education. During the same year a teachers' training system for vocational and technical education, called a Normal School, was established, and in 1899 the Vocational and Technical School Ordinance was enacted. This ordinance united the various regulations concerning such education into one, therefore, vocational and technical education were regulated at the national level. The following are some of the regulations set forth to provide standardization in industrial education throughout the nation:

(1) Industrial schools shall aim at giving education needed for those who will be engaged in technology, agriculture and commerce.

(2) There shall be several kinds of industrial schools such as technical schools, agricultural schools, commercial schools, and industrial continuation schools. Apprentices' schools shall be a kind of technical school.

(3) Regulations concerning subjects and their standards shall be decided by the Minister of Education.

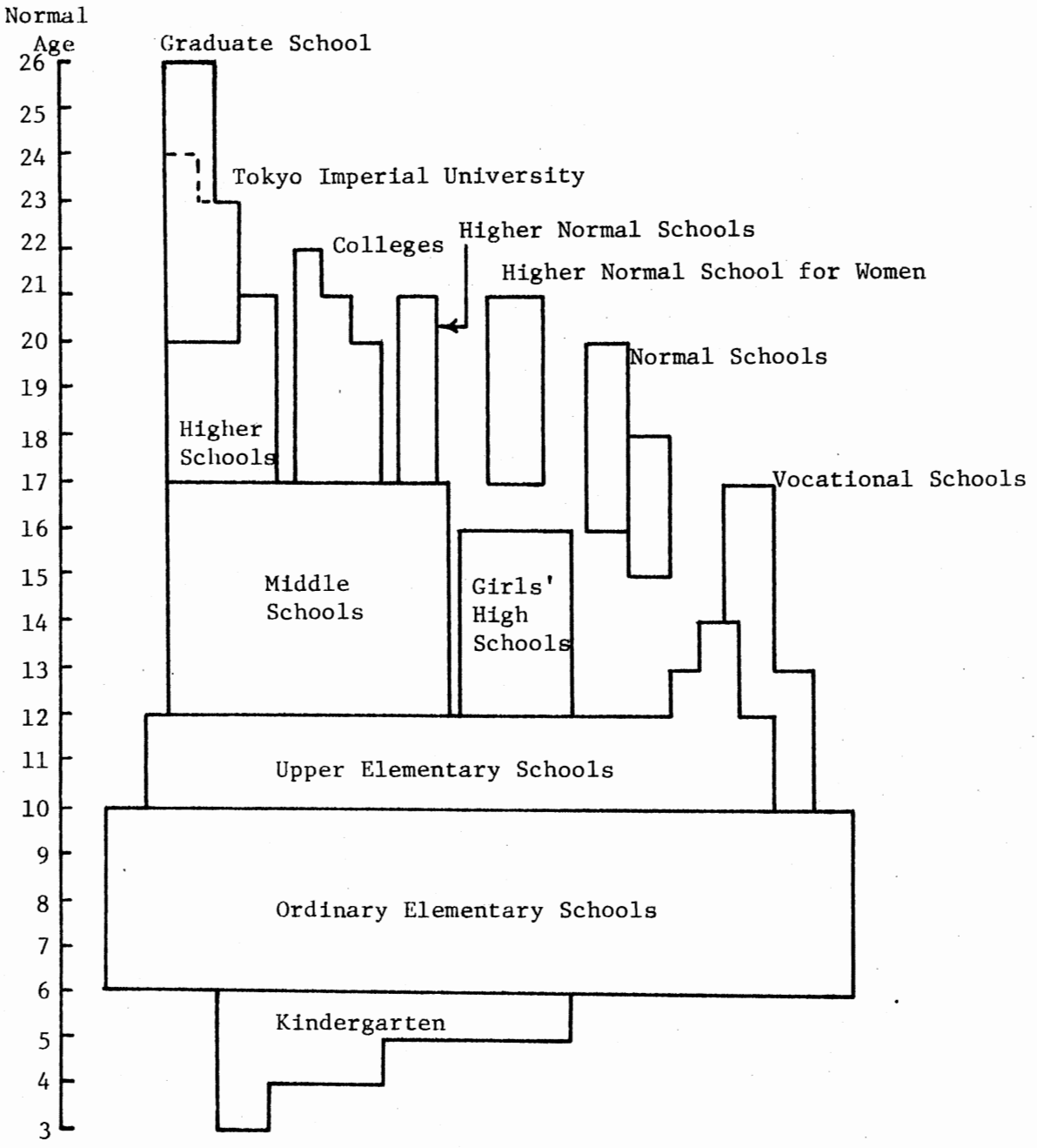
(4) Technical schools shall be 3 years in duration.

(5) Technical schools shall have school hours not exceeding 27 hours per week.

(6) The technical school may have a preparatory course which is not more than 2 years in length (13, p. 174).

The consolidation of vocational and technical education under the Minister of Education completed Japan's educational system as she prepared to move into the twentieth century. The complete educational system in effect in 1900 is shown in Figure 3.

In 1900 there were an estimated 288 schools throughout Japan engaged in vocational and technical education. In 1912, the first year of the Taisho Period in Japanese history, this number had risen to an estimated 7,900 (13, p. 187).



Source: (20).

Figure 3. Japan's Educational System of 1900

The Taisho Era

The years from 1912 to 1926 mark the Taisho Era in Japanese history. The tide of Western influence which swept over Japan during the Meiji era was still prevalent but less dominant. Nationalism was the dominant theme throughout the country, including the educational system. Japan was rapidly developing into an industrial power. Her relatively easy victory over Russia in the Russo-Japanese in 1904-1905 raised her status as a military power also. A country where less than forty years earlier men had fought in armor with swords defeated a modern European power on both land and sea. This military victory further heightened the people's sense of nationalism, and also served as a catalyst for the development of education.

While only six years of elementary education was compulsory, secondary education, an important variable in economic development, grew at a rapid rate. A chain of government "higher schools" of junior college level served many students as preparatory schools for the imperial universities. Education progressed rapidly with many students continuing to higher education. This increase in enrollment in secondary schools generated a move for reform in secondary education. In 1917 an education conference was convened to study the education system and to recommend changes. The following recommendations came out of the conference:

(1) There should be more educational options available to graduates of middle schools. These options should include such programs as liberal arts, natural science, or vocational training.

(2) The higher education system should be expanded because only a small percentage of middle school graduates were able to enter higher schools.

(3) The existing system of vocational and technical education requires no revision as a whole (4, p. 43).

The conference made a number of recommendations for the purpose of reinforcing the system including larger government subsidies, promotion of moral education, better treatment of teachers, closer cooperation with business and industry, and more emphasis on vocational and technical education. As a result of these recommendations, secondary vocational and technical schools endeavored to improve their curricula.

In 1924 the Ministry of Education issued a statement to the effect that the scholastic level of vocational school graduates could be considered equal to or higher than that of middle school graduates, therefore, the graduates of vocational schools were highly sought after as skilled workers in industry. This great demand continued into the late 1920's and prompted the building of many private vocational and technical schools. While most of Japan was struggling at this time with the rest of the world in a worldwide economic depression, vocational and technical education was experiencing relatively good times.

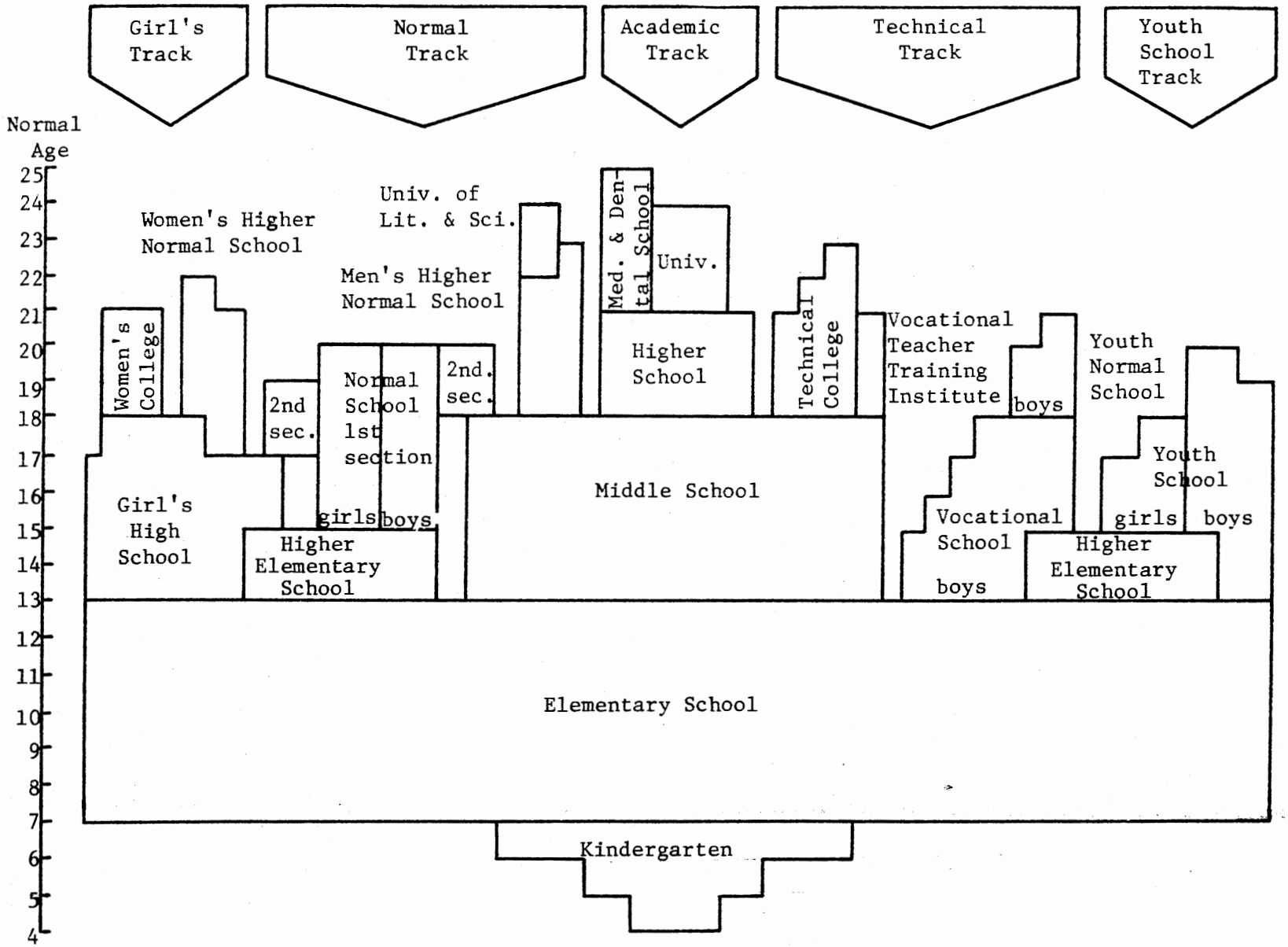
The Showa Era

The Showa Era of Japanese history began in late 1926 and extends to the present (a new era will begin when a new emperor takes the throne). The early 1930's saw a continued steep rise in the number of graduates in higher education; a trend which began around 1910. As a result of this tremendous demand for higher education, some private professional schools were allowed to call themselves "universities" although they were not allowed to confer academic degrees. At the same time the demand for vocational and technical education began to decrease. These so-called universities were unable to attract

applicants to the extent the Imperial universities were able to, therefore, a multiple track system began to emerge. This multi-track system was well defined by the mid-1930's. The educational system which existed in Japan in 1937 is shown in Figure 4.

As may be seen, there were five separate tracks, or paths, which one could follow as they progressed to higher levels of education. The academic track which was held in highest esteem by the general public was a 6-5-3-3 system leading from the regular 6-year elementary school to the preferred 5-year middle school (chu gakko), to the selective 3-year higher school (koto gakko), and finally to the 3-year university (daikaku). The quality of education, especially at the higher level, was to be maintained by restricting it to a small and selective group--an elite. In order to progress to the next level on the academic ladder all students were required to pass an entrance examination. Only about ten percent of the graduates of elementary schools were able to enter the academic track into the government controlled middle school by passing the examination.

At least one middle school was found in each prefecture. The lower middle school was preparatory for the next level which was the higher school; however, the lower middle school was a terminal course for approximately 72 percent of the students. Since the curriculum was academic it did not take this into account. There were 32 government higher schools which were preparatory to the university. These schools provided pre-professional education along with some general education, however, less than 8 percent of the middle school graduates were accepted into these higher schools. Graduates of the higher schools either attended one of the nine Imperial universities, one of



Source: (30).

Figure 4. Japan's Multiple Track Educational System of 1937

the 12 less-esteemed single faculty National universities, one of the 25 private universities or took jobs in business or industry. In 1937 only about one-half of one percent of the children who entered elementary school completed a university education. Although the universities produced research and scholarship of a high order they were frequently accused of exclusiveness, unfriendliness, and impracticality.

The normal school track was devoted to teacher training. The government relied on teachers to indoctrinate the nation's youth, therefore, particular emphasis was placed on this track of the educational system. Expenses were paid for students in teacher education in exchange for a prescribed number of years of teaching after graduation. The normal school track itself was divided into tracks, or at least different types of institutions, each with their own area of specialization as follows:

(a) Ordinary normal school (shihan gakko) for training elementary teachers. There was at least one normal school per perfecture. Students could enter a 5-year normal school after graduation from the higher elementary school or a 2-year normal track after graduating from a boys' middle school or a girls' high school.

(b) Youth normal school (seinen shinan gakko) specialized in training teachers for the youth schools, especially in vocational subjects. It was a 2-year institution and enrolled graduates of vocational, middle, girls' high, and normal schools who had completed at least 11 years of education.

(c) The higher normal school (koto shihan gakko) was a more advanced institution offering a 4-year course for normal, middle, or girls' high school graduates to prepare them to teach in ordinary normal, middle, girls' high and vocational schools. There were separate institutions for men and women.

(d) Two national universities of literature and science (bunrika daigaku) at Tokyo and Hiroshima were graduate schools affiliated with local higher normal

schools from which most of their students were drawn. Their aim was to promote research and advanced study in the arts and sciences and in education and to prepare teachers for middle schools.

(e) The specialized teacher training institute (kyoin yoseijo) offered a 3-year course for middle school graduates in technical subjects to prepare teachers primarily for vocational schools. The institutes were attached to government universities and technical colleges (30, p. 39).

Despite the fact that vocational and technical education had played a prominent role in the industrial development of the nation, the popularity of such education decreased as the popularity of higher education increased. At the secondary level vocational education consisted of a 5-year vocational school (jitsugyo gakko) for the training of middle grade technicians. These schools offered little in liberal arts and were designated as agricultural, commercial, industrial, fisheries, colonization, or miscellaneous. They accommodated about 10 percent of the elementary school graduates.

At the higher level, the technical institute (semmon gakko) was a 3- to 5-year single-department college preparing skilled technicians for business, industry, and government. They were not ranked as universities. The majority of the 300 prewar technical institutes were colleges of industry or of commerce. Others with as many as a dozen each were colleges of agriculture, fisheries, medicine, and pharmacy. There were also a few technical institutes in music, art, textiles, foreign languages, theology, and physical education. These institutions provided opportunity for higher technical and semi-professional education to 3 or 4 times the number of students who attended the universities. To many of the students in the technical institutes, the academic ladder was not readily accessible.

The youth schools (seinen gakko) were created in 1935 to serve the needs of the state. They provided a 2- to 7-year part-time or full-time continuation education for working youth who had completed school and otherwise had no opportunity to go further. In 1941, 75 percent of the young people between the ages of 13 and 15 were attending higher primary schools or youth schools. The government appropriated a considerable budget to provide youth school students with practical vocational training hoping to increase the nation's agricultural and industrial productivity and to provide pre-induction military training. Youth schools were "class schools" for the lower socioeconomic groups and they served the majority of the nation's youth.

The five tracks from the favored academic track to the youth school track offered widely differing opportunities which depended on one's sex, residence, wealth, and other factors. The system afforded an academic education for a privileged few and other types of educational opportunities for the large majority. Table I presents the school careers available to academic and technical students while Table II presents similar information on the non-academic, vocational ladder. The system shown in Figure 4 remained essentially unchanged until the end of World War II.

Postwar Educational System

The Japanese educational system experienced dramatic changes after World War II. The multiple track system of prewar years was abolished by the Allied Powers in favor of a single track 6-3-3-4 system. In March, 1947 the Fundamental Law of Education and the School Education Law were passed setting forth the basic ideas and framework for this

TABLE I

SCHOOL CAREERS AVAILABLE TO ACADEMIC AND TECHNICAL STUDENTS

Type of Track	Years in School Career	Type of Ladder	Sequence of Schools
Normal	13	6-2-5	6 year elementary 2 year higher elementary 5 year normal (1st section)
Normal	13	6-5-2	6 year elementary 5 year girls' high 2 year normal (2nd section)
Technical or Normal	14	6-5-3	6 year elementary 5 year middle or girls' high 3 year tech. or normal or youth normal
Technical or Normal	15	6-5-4	6 year elementary 5 year middle or girls' high 4 year higher tech. or higher normal
Academic	16	6-4-3-3	6 year elementary 4 year middle 3 year higher 3 year university
Academic	17	6-5-3-3	6 year elementary 5 year middle 3 year higher 3 year university
Academic	19-22	6-5-3-3 2 to 5	6 year elementary 5 year middle 3 year higher 3 year university 2 to 5 year graduate school

TABLE II

SCHOOL CAREERS AVAILABLE TO
VOCATIONAL STUDENTS

Type of Ladder	Sequence
6	6 year elementary (compulsory by law)
6 - 2	6 year elementary 2 year higher elementary
6 - 4	6 year elementary 4 year youth school
6 - 5	6 year elementary 5 year middle school for boys or 5 year girls' high school
6 - 2 - 3	6 year elementary 2 year higher elementary 3 year youth school or 3 year vocational school

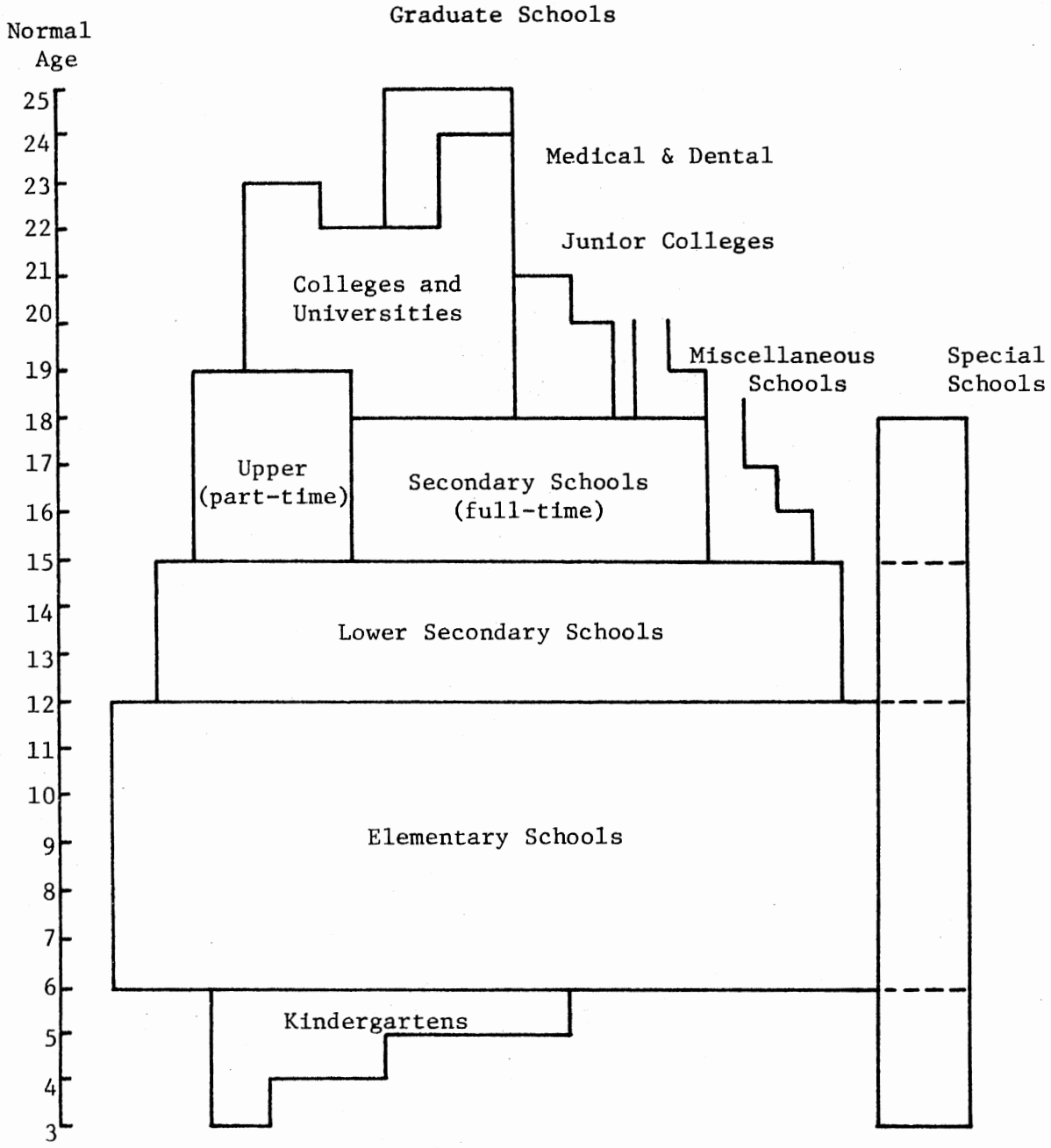
new educational system, modeled after the school system of the United States, and shown in Figure 5. The new system established compulsory 3-year lower secondary schools above the 6-year primary schools, thus establishing nine years of compulsory education. Also established were 3-year upper secondary schools above the 9-year compulsory education system. Higher education also underwent a drastic reform to eliminate the elitist principle for efficiently bringing up the bearers of Japan's modernization. This prewar system offered the "main course" for advancing from higher secondary schools to the Imperial Universities.

There was a distinct "hierarchy" for gaining admittance to the Imperial Universities. This resulted in fierce competition among the graduates of higher secondary schools wishing to take entrance examinations for the Imperial Universities. Under the new educational system such institutional discrimination was abolished and all institutions of higher education were reorganized into 4-year universities. As a result, all graduates of upper secondary schools were provided equal opportunities to enter institutions of higher education, as was considered appropriate for a democratic nation. The components of this system are described in the following paragraphs.

Kindergarten

The kindergartens aim at helping pre-school children develop mind and body by providing a sound environment for them. Kindergartens admit children aged 3, 4, or 5 provide them with one to three year courses.

Apart from kindergartens, there are day nurseries which also



Source: (30).

Figure 5. Single-Track Postwar Educational System of 1947

serve as pre-school educational institutions. While kindergartens are under the supervision of the Ministry of Education, day nurseries are within the jurisdiction of the Ministry of Health and Welfare.

Elementary Schools

All children who have attained the age of 6 are required to attend a 6-year elementary school. The elementary schools aim at giving children between the ages of 6 and 12 elementary general education adapted to the stage of their mental and physical development.

Lower Secondary Schools

All children who have completed the elementary school courses are required to go on to a 3-year lower secondary school. The lower secondary school gives children between the ages of 12 and 15 general secondary education adapted to the level of their mental and physical development, on the basis of education given in the elementary school. Education at both the elementary and secondary school levels, which is a total of nine years, is compulsory.

Upper Secondary Schools

Those who have completed the lower secondary school or who are qualified as equivalent may go on to an upper secondary school. There are three types of upper secondary programs; full-time, part-time and correspondence. The full-time program lasts three years, while both the part-time and the correspondence programs last four years or longer. The upper secondary school gives young people general or specialized education adapted to the level of their mental and physical development.

General courses provide general education along an academic track while specialized courses provide technical, vocational, or other specialized education.

Institutions of Higher Education

Universities. For admission into universities, completion of upper secondary schooling or its equivalent is required. Universities offer programs lasting a minimum of four years which lead to a bachelor's degree. Some universities have graduate schools which offer programs which lead to a master's degree or a doctorate.

Junior Colleges. Those who have completed upper secondary school and those who are qualified as equivalent may attend a junior college. Junior colleges offer programs of two or three year duration which provice students with opportunities for both academic studies in various fields and practical work aimed at developing skills and techniques which are needed in different sectors of society. A large percentage of the students in daytime junior colleges are women. Three-year junior colleges of engineering will be discussed in greater detail in subsequent paragraphs.

Special Schools

There are special schools for physically or mentally handicapped. They include schools for the deaf, schools for the blind, schools for mentally retarded, and schools for crippled. All blind or deaf children of school age who are not enrolled in an elementary or lower secondary school are required to attend a school for the deaf or for the blind.

There are a small number of elementary and lower secondary schools which have special classes for children with comparatively mild handicaps.

While the new educational system was intended to provide all young people with an equal opportunity for education, Japanese authorities maintained from the outset that an equal opportunity for education cannot be guaranteed by simply implementing a single-track educational system. They took the position that the educational system should be congenial to the historical background and social conditions of a nation.

The remarkable industrial recovery in the early postwar years created a tremendous need for technicians in Japan, however the three-year technical colleges which had enjoyed an established reputation for technician education in prewar years no longer existed in the postwar educational system. In their place, two-year junior colleges of engineering were instituted. Criticism was soon voiced that adequate technical education could not be expected in only two years in view of the tremendous scientific progress and technological developments which were occuring.

Continuing technological development and industrial growth as well as continued criticism of the educational system brought about the establishment of a new institution for technical education in 1962. This institution is called a technical college or, in Japanese, a koto-senmon-gakko which means "special higher school." With the establishment of technical colleges, the two-year junior colleges of engineering which were established in 1950 and the subject of much criticism were abolished, with the exception of those offering only evening instruction. These are still in existence and are the

Technology Division of several national universitites. With the establishment of technical colleges the educational system again offered a dual track to higher education. The educational system presently in existence in Japan is shown in Figure 6. Figures on the number of schools and the number of students in the different kinds of schools is shown in Table III.

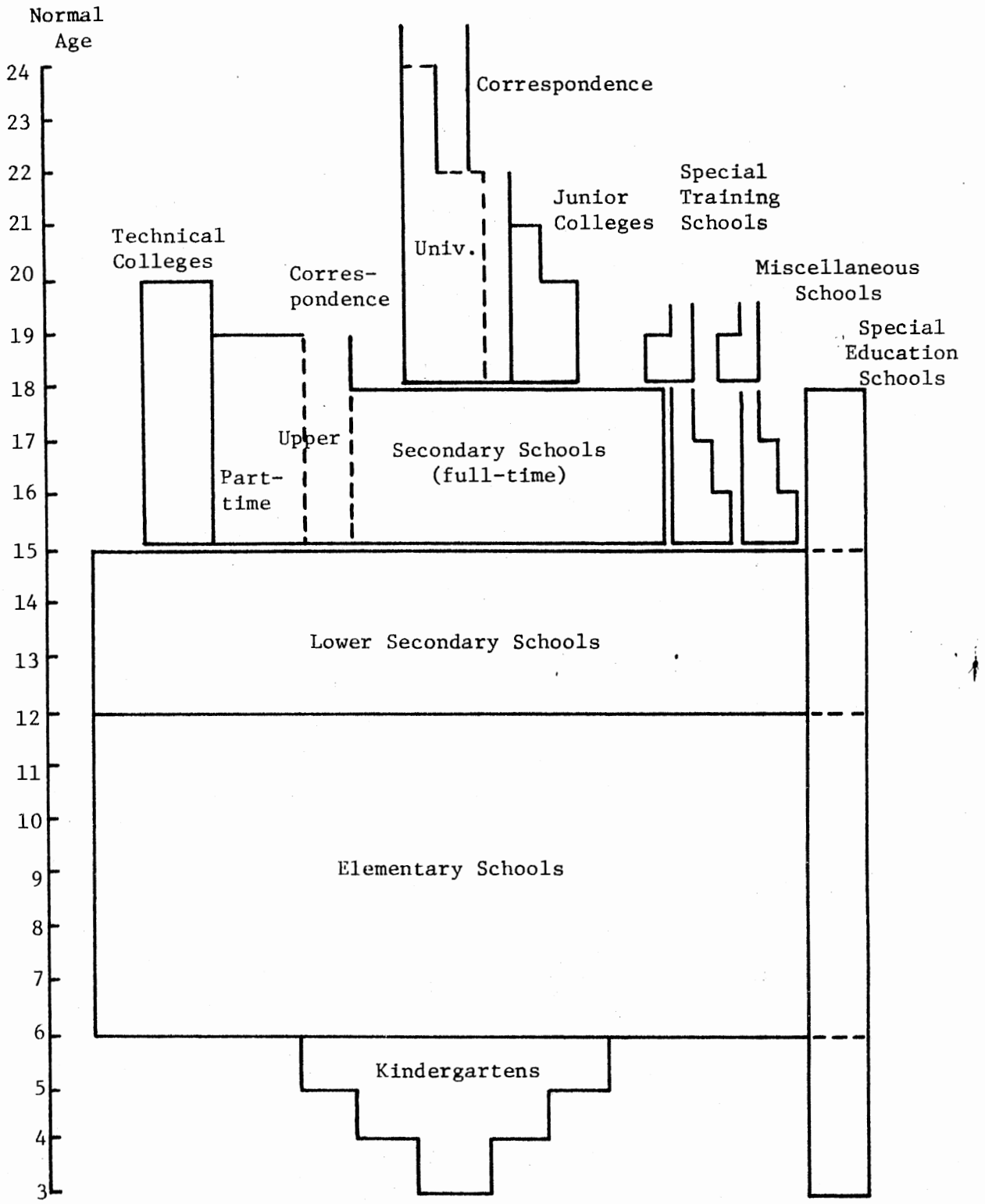
The primary sources of technical employees for Japanese industry are technical colleges and three-year junior colleges of engineering.

Junior Colleges of Engineering

The postwar educational system established in Japan in 1947 was slightly modified in 1950 to add day and evening junior colleges. Another modification to the system occurred in 1962 when technical colleges were established. With the establishment of technical colleges, daytime junior colleges of engineering were abolished and evening junior colleges of engineering were retained as junior college divisions of national universities. These junior college divisions offer instruction only in the evening and are three years in duration.

At the present time there are over 500 junior colleges in Japan, however a very large percentage have no technology related department. Only 29 of the total offer instruction in a technical area. Eight of the 29 are the junior college of engineering division of national universities.

Because of the critical need for trained technicians during the early stages of postwar industrial development and because of the technological level of industry, major emphasis in technician education was on a very practical two-year education to provide technicians which



Source: (20).

Figure 6. Educational System in Existence in Japan in 1976

TABLE III

NUMBER AND TYPE OF SCHOOLS AND THE TOTAL NUMBER OF STUDENTS IN THE DIFFERENT SCHOOLS IN 1978

Type of School	No. of Schools	No. of Students
Kindergartens	12,227	2,497,730
Elementary Schools	24,826	11,146,859
Lower Secondary Schools	10,777	5,048,293
Upper Secondary Schools	5,098	4,415,074
Junior Colleges without Technical Education	491	361,300
Junior Colleges with Technical Education	29	19,000
Technical Colleges	64	46,636
Universities	433	1,862,262
Special Schools	685	71,774

which were immediately employable on the spot of production. Kazuo Okuno, a professor at Tokyo Metropolitan Technical Junior College states that in recent years the character of Japanese society has began to shift from an industrial society, where emphasis is on hard technology, to an informationized society with emphasis on soft technology. People in all areas of science, engineering and technology who must have the ability to arrange and absorb an ever increasing amount of new knowledge and technical information must also develop new technology in seeking solutions to many of the world's problems. The Japanese argue that a traditional high school education and two years of junior college education in inadequate preparation.

The junior college of engineering divisions of national universities are three-year institutions offering instruction four hours per evening, six evenings per week for a minimum of 35 weeks per year. A typical junior college of engineering curriculum which contains approximately 70 to 75 credits, is shown in Table IV and Table V.

Despite pressure for technical education to help modernize the country, junior colleges of engineering education is not held in high esteem in Japan. In fact, many of Japan's larger companies close their doors to junior college of engineering graduates.

Technical Colleges

The first postwar technical colleges were established in Japan in 1962 to provide Japanese industry with much needed technical personnel. Fourteen national technical colleges were established the first year with more added virtually each year. In 1978 there were 64 technical colleges with one school per each of Japan's 47

TABLE IV

TYPICAL GENERAL EDUCATION CURRICULUM PATTERN
FOR 3-YEAR EVENING JUNIOR COLLEGES

Subjects		Units	
		Required Subjects	Elective Subjects
Humanities	Literature	2	
	Philosophy History	2	
Social Sciences	Economics	2	
	Law Japanese Constitution Psychology	2	
Natural Sciences	Mathematics	4	
	Physics	4	
	Chemistry	4	
Foreigh Languages	English	4	
	German		2
Physical Education	Lecture	1	
	Practice	1	
Totals		26	2

TABLE V

TYPICAL CURRICULUM PATTERN FOR SPECIALIZED COURSES
IN 3-YEAR EVENING JUNIOR COLLEGES

	Subjects	No. of Credits	Required Credits	Class Hours Per Week Each Semester 1	2	3	4	5	6
Basic Specialized Subjects	Applied Mathematics	4	4	2	2				
	Electricity and Magnetism	4	4	2	2				
	Alternating Current	3	3	2	2				
	Theory of Networks	2	2			2			
	Transcient Phenomena	2	2				2		
	Electric Measurements I & II	4	2			2	2		
	Control Circuits I & II	4	2					2	2
	Electronics	4	4			2	2		
	Communications	4	4				2	2	
	Electric Machinery I & II	4	4				2	2	
Specialized Subjects (elective)	Design and Implementation of Electric Machines	2	10					2	
	Electric Materials	2				2			
	High Voltage Phenomena	2						2	
	Power Transmission and Distribution	3						2	2
	Electric Power Applications	2							2
	Power Generation and Transformation	2							2
	Applied Electronics	4						2	2
	Television Principles	2							2
	Laws and Regulations Governing Electricity	2					2		
	Laws and Regulations Governing Electric Waves	2							
	Machine Shop Work	2				2			
Practical Subjects	Descriptive Geometry	1	1			2			
	Electric Drawing	1	1				3		
	Electric Exp. I, II & III	5	5	3	3	3	3	3	
	Graduation Thesis							3	3
	Totals	70	50	9	9	15	18	20	15

prefectures and more as needed in the major metropolitan areas. The location of these technical colleges is shown in Chapter IV.

The criteria for the administrative and teaching staff, curricula, equipment and facilities for these institutions were laid out in the Technical College Establishment Standards Law drawn up by the Ministry of Education. This law states that the purpose of technical colleges is to train technicians with well-rounded general knowledge and a thorough specialized knowledge in technology. The overall objective of technical colleges is to "give profound instruction in the specialized science and technology, thereby fostering the students' ability necessary in their future profession" (14, p. 68).

Technical colleges are five year institutions covering grade levels 10 through 14. These institutions have both attractive and unattractive features from the student's vantage point. Probably the most unattractive feature is the fact that students must make a rather definite commitment at quite an early age as to whether they wish to pursue an academic or technical educational route, in Japan's dual-track system, after completing junior high school. This decision may have implications far beyond completion of their formal education. Graduation from a prestigious school is tremendously important with regard to such things as social status, job promotion and government employment in Japan.

Technical colleges also have some very attractive features. One attractive feature is the continuity of the total five year program in that students take courses in their area of specialization each year, including the first year. Another feature, which is very real in Japan but may be difficult for one outside Japan to fully appreciate, is

that students in technical colleges are not under the tremendous pressure placed on students graduating from traditional high schools to successfully pass a very rigorous entrance examination for admission to a regular college or university.

Throughout the Japanese educational system, students wishing to enter the next level of the system must pass the entrance examination. This requirement also applies to students graduating from junior high school who wish to enter technical colleges, however the pressure on students at this level is much less than on high school students preparing to enter college. Depending on the reputation of the technical college, the population of the area, and other factors, the number of applicants for the examination may range from two five times the number of students which can be accepted. This permits the schools to be quite selective which tends to insure good students and quality graduates.

Most technical colleges offer instruction in three to five areas of specialization usually including electrical, mechanical, civil chemical, architectural, or precision machinist technology. The maximum enrollment is 40 students per area of specialization per year, therefore most technical colleges have an enrollment of about 800. Total enrollment in technical colleges has increased annually since their establishment in 1962. A large percentage of this increase is due to increasing the number of technical colleges almost annually, however there has been an overall increase in the number of students per technical college. The number of technical colleges versus time is shown in Figure 7 while Figure 8 shows the total number of students enrolled in technical colleges versus time. A typical curriculum

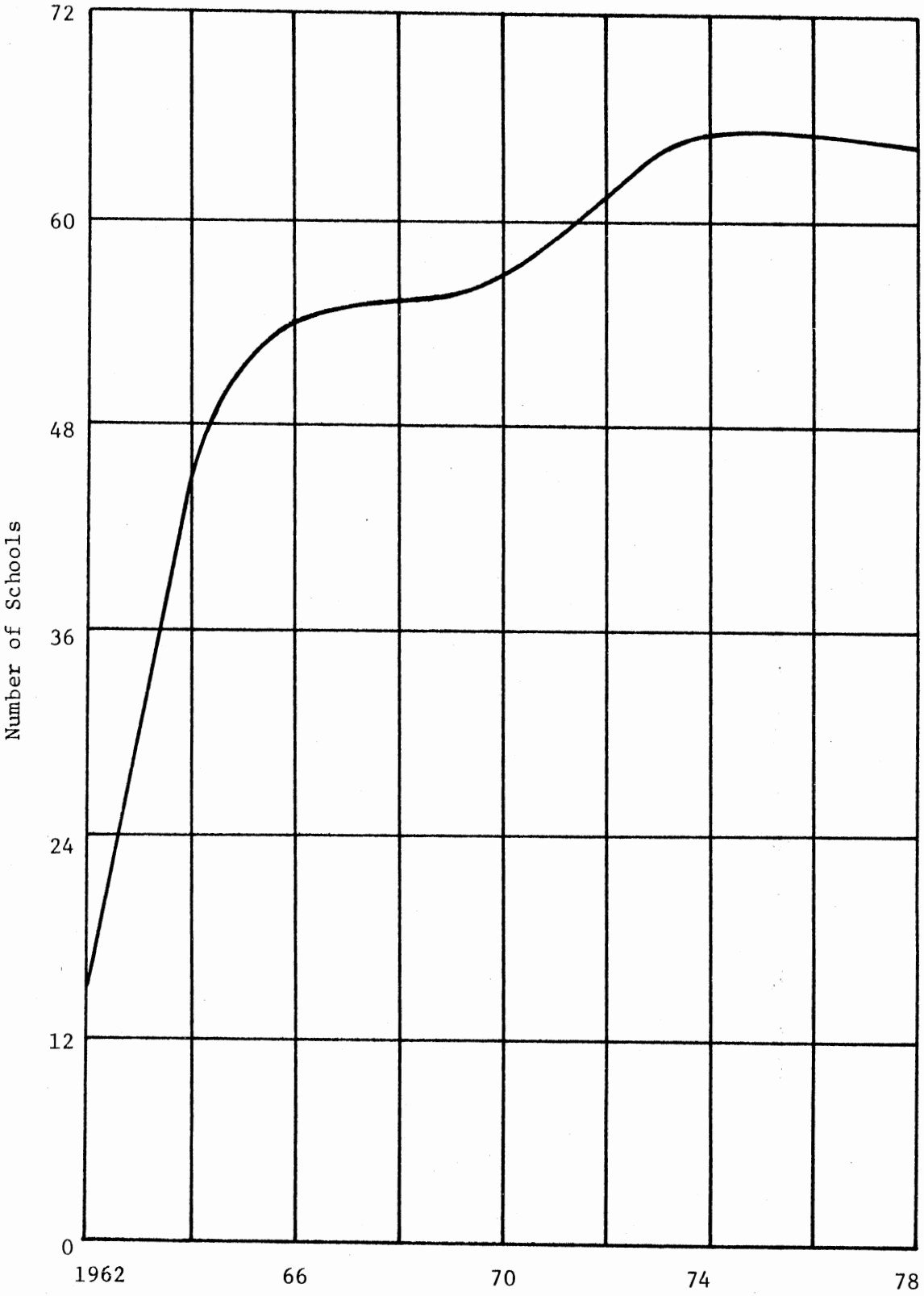


Figure 7. Number of Technical Colleges as a Function of Time

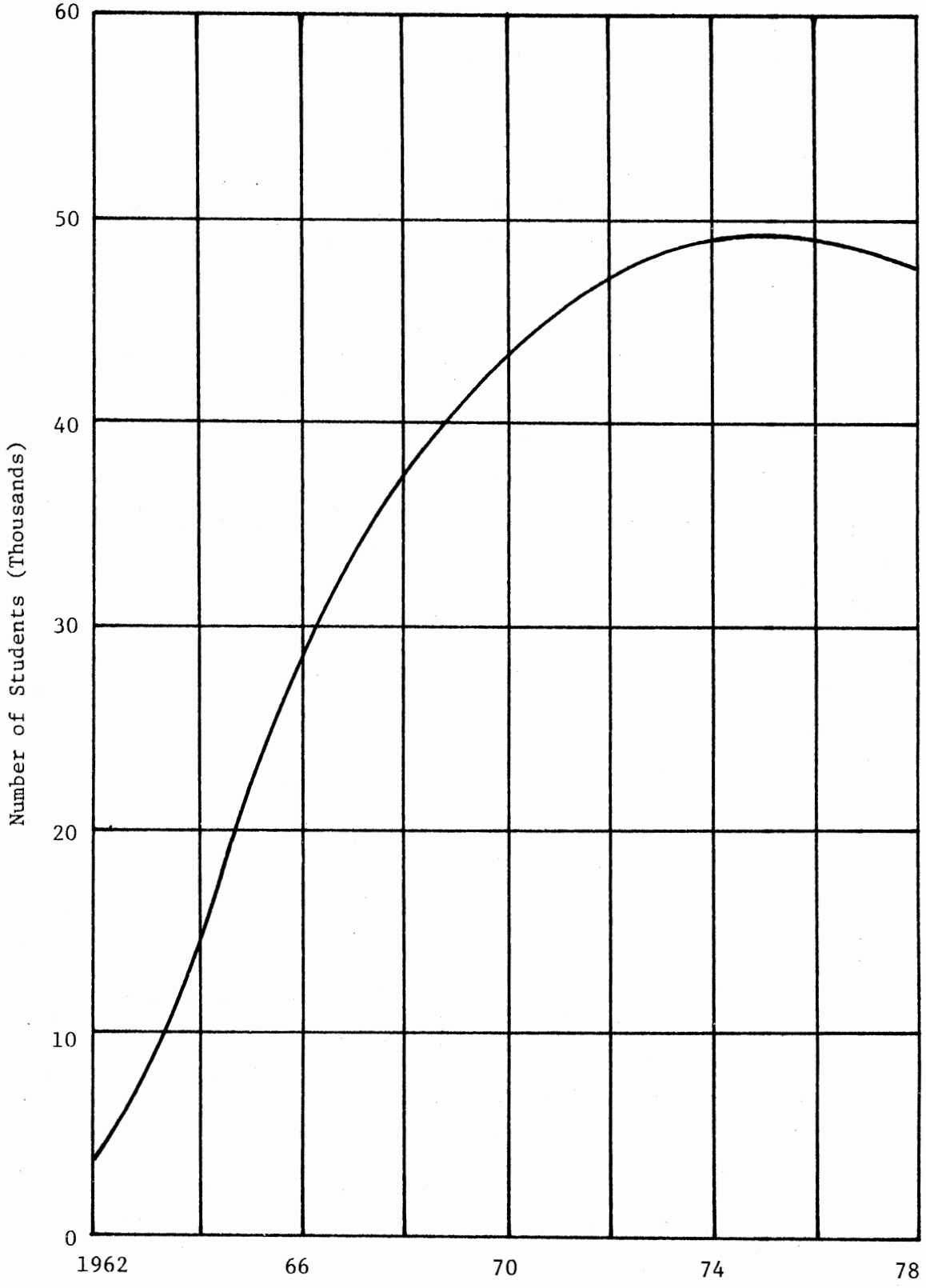


Figure 8. Number of Technical College Students as a Function of Time

pattern for technical colleges is shown in Table VI, which shows general education courses, and Table VII, which shows courses in the area of specialization.

TABLE VI

TYPICAL GENERAL EDUCATION CURRICULUM PATTERN
FOR TECHNICAL COLLEGES

Subject		Total Class Hours Per Week	Number of Hours Per Week for Each Year				
			1st Year	2nd Year	3rd Year	4th Year	5th Year
Humanities	National Language	9	3	3	2	1	
	Ethics and Philosophy	2				2	
	History	4	1	1	2		
Social Science	Geography	2	2				
	Law and Economics	4				2	2
Natural Science	Mathematics	18	6	6	6		
	Physics	5	2	3			
	Chemistry	5	3	2			
Health and Physical Education		10	3	3	2	1	1
Art		2	1	1			
Foreign Language	English	18	6	5	3	2	2
	2nd Foreign Language	6		2	2	2	
Sub-Total		85	27	26	17	10	5
Special Educational Activity		3	1	1	1		
Total		88	28	27	18	10	5

TABLE VII

TYPICAL CURRICULUM PATTERN FOR SPECIALIZED COURSES IN ELECTRICAL ENGINEERING TECHNOLOGY PROGRAM IN TECHNICAL COLLEGES

Subject	Total Class Hours Per Week	Number of Hours Per Week for Each Year				
		1st Year	2nd Year	3rd Year	4th Year	5th Year
Applied Mathematics	4				4	
Applied Physics	5			3	2	
Descriptive Geometry	2	2				
Electricity & Magnetism	4		2	2		
Theory of Alternating Current	4		1	2	1	
Electrical Measurement	3			2	1	
Electronics	3			1	2	
Theory of Circuits	2					2
Mechanical Technology	8		2	4	2	
Electric Machines	6			3	3	
Electric Materials	3				2	1
High Voltage Studies	2				2	
Electric Design	4				2	2
Electric Drawings	6	4	2			
Experiments & Practices	18	2	3	3	4	6
Electives	22			1	4	17
Graduation Project	6					6
Sub-Total (Specialty)	102	8	10	21	29	34
Sub-Total (General Educ.)	88	28	27	18	10	5
Total	190	36	37	39	39	39

CHAPTER III

METHOD OF INVESTIGATION

The purpose of this chapter is to describe the design of the study, the selection of the population to be studied, the instrument used for the collection of data, and the method of data analysis.

Design

An ex-post-facto design was used for the study. This design utilizes descriptive research in one or more of several categories including survey studies. The survey method was used in this research project. Descriptive research conducted by the survey method is useful in describing current practices and conditions, point out competencies and behavioral traits, and to show short term trends.

Procedure

After defining the problem of concern for this study, a review of literature related to education in Japan, with emphasis on technical education was conducted. To have a better understanding of Japan's historical and cultural development and their impact on educational development, an extensive review of pertinent literature was conducted. The review of educational literature revealed 88 schools throughout Japan which offer technical programs in electricity and/or electronics. A control area within a radius of 400 kilometers of Gifu, Japan was

established to provide a manageable population. Within the control area there are 63 of the total of 88 schools. The population for the study was made up of 25 technical colleges and junior colleges randomly selected from the 63 schools within the control area.

The Instrument

After reviewing several research instruments and giving proper consideration to the population and the purpose of the study, an open-form questionnaire was selected as the most appropriate instrument for the study. Although the closed-form questionnaire would be easier for a respondent whose native language was not English to fill out, it was felt that language would not be a serious problem with a personal interview and that data received from open-form questionnaires would be more useful.

A letter of introduction was formulated which explained the purpose and significance of the study and requested permission to visit each school for a personal interview by the researcher. Each of the 25 schools selected at random were mailed a copy of the letter of introduction, a short form on which to respond and a stamped, self-addressed envelope in which to return the request for visit form.

Method of Analysis

The method of analysis of the data was a documentary analysis. Documentary analysis is frequently used by educators to describe specific conditions which exist in schools, spot trends, detect strengths or weaknesses, evaluate the relationships of stated objectives and what is being taught, and detect biases, attitudes interests, and values. The data were described both qualitatively and quantitatively.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

The purpose of this chapter is to present an analysis of data obtained in the research.

Methodology of the Research

The city of Gifu was selected as an approximate central location on the island of Honshu. A circle of radius equal to 400 kilometers (248 miles) was drawn on a map of Japan, with its center at Gifu. Within this circle is approximately two-thirds of Japan's population including six of eight cities in Japan with a population greater than one million. The seven least heavily populated prefectures, which are comparable to states in the United States, are also included. This provides a broad range of population density and a diverse industrial pattern.

There are 88 technical colleges and junior colleges in Japan which offer programs in electricity or electronics and which are categorized by the Ministry of Education as technical education programs. Fifty-nine of these are technical colleges which are scattered throughout the country as shown in Figure 9. The remaining 29 schools are junior colleges with their location shown in Figure 10. Sixty-three of the total 88 schools are located in the selected area.

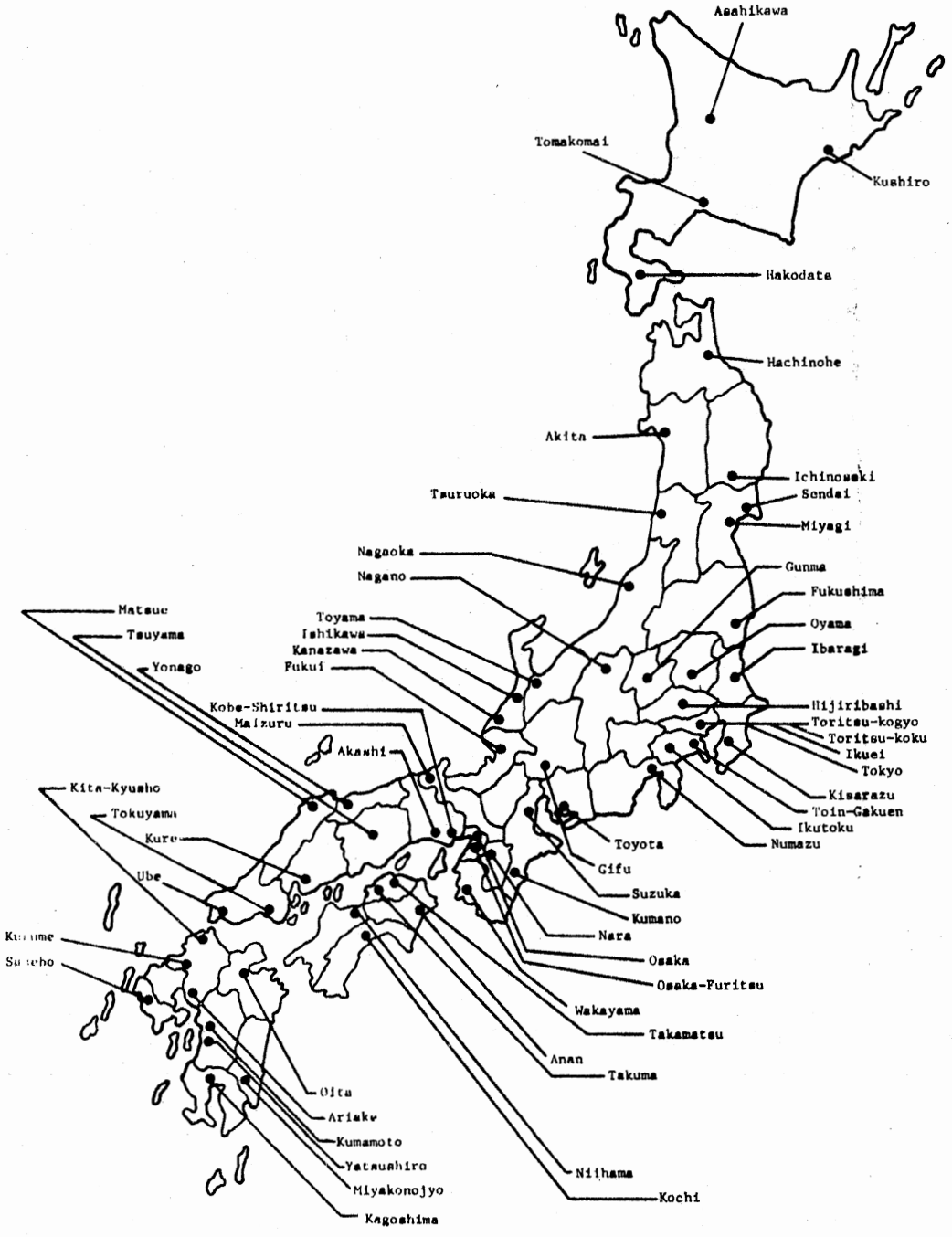


Figure 9. Location of All Technical Colleges in Japan Which Offer Technical Electrical and/or Electronic Programs

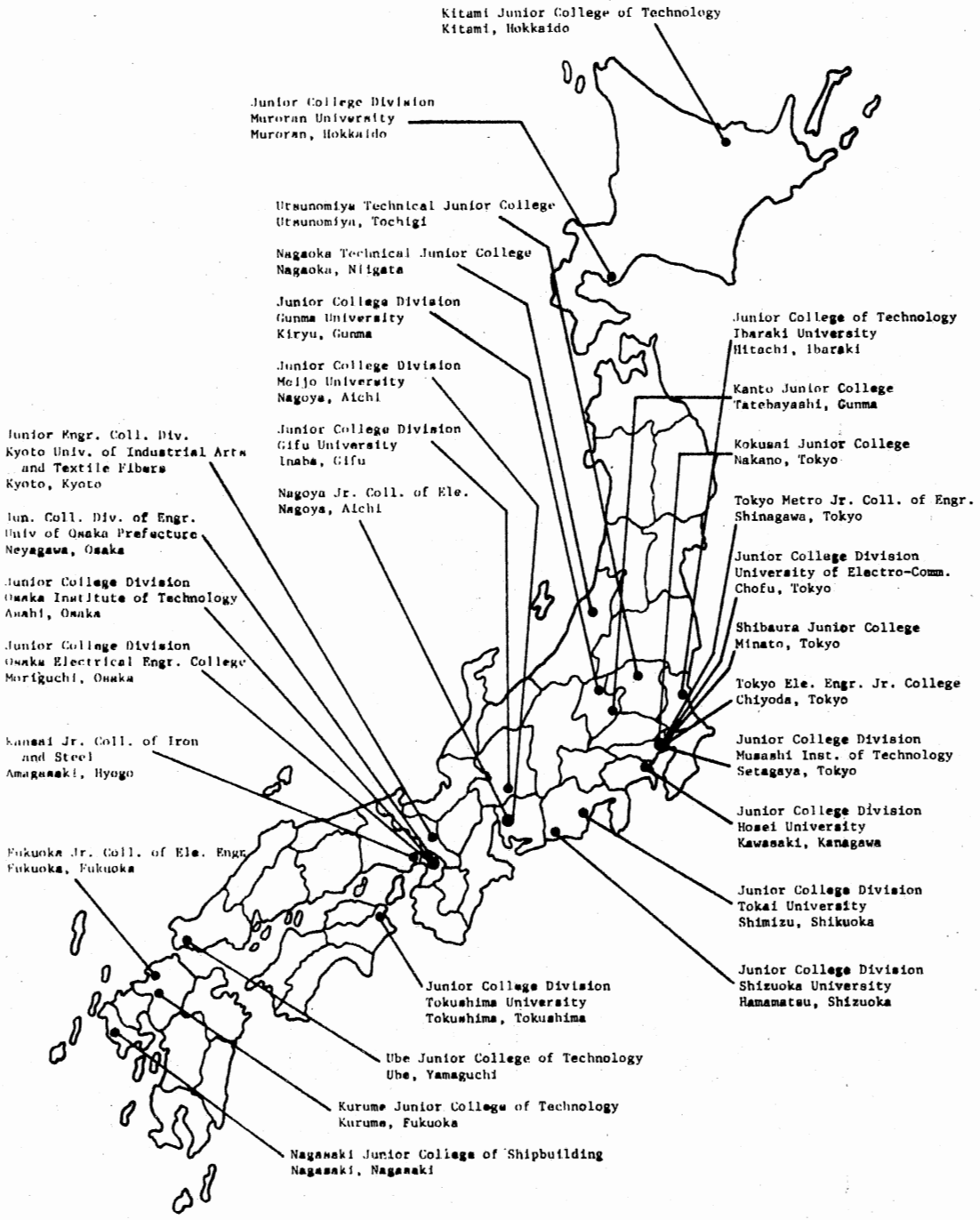


Figure 10. Location of All Junior Colleges in Japan Which Offer Technical Electrical and/or Electronic Programs

Twenty-five of these schools were selected randomly to be visited. The method of selection was by placing the names of the 63 schools within the 400 kilometer radius circle in a container and drawing 25 names. Each of these 25 schools was contacted by mail to attempt to arrange a visit for a personal interview. Seventeen schools responded and were subsequently visited during the summer of 1976 for a personal interview. The names and locations of the schools visited are shown in Figure 11.

Analysis of Research Questions

This section presents an analysis of the research questions. The names and locations of the 17 schools which were visited for a personal interview along with tabulated data for research questions one through five are shown in Table VIII. Data received from the remaining research questions is presented in tabular form in subsequent tables.

Question 1 - Does your school offer a program in Electricity or Electronics?

Response - The schools responses are tabulated in Table VIII.

Comment - As can be seen in Table VIII, all 17 schools visited offer an electrical program while four of the 17 offer an electronics program. The laws establishing technical colleges and junior colleges were very specific regarding the objectives of these schools--"for the education of technicians." Nonetheless, the programs are referred to as "Engineering" and will therefore be referred to as such in this dissertation.

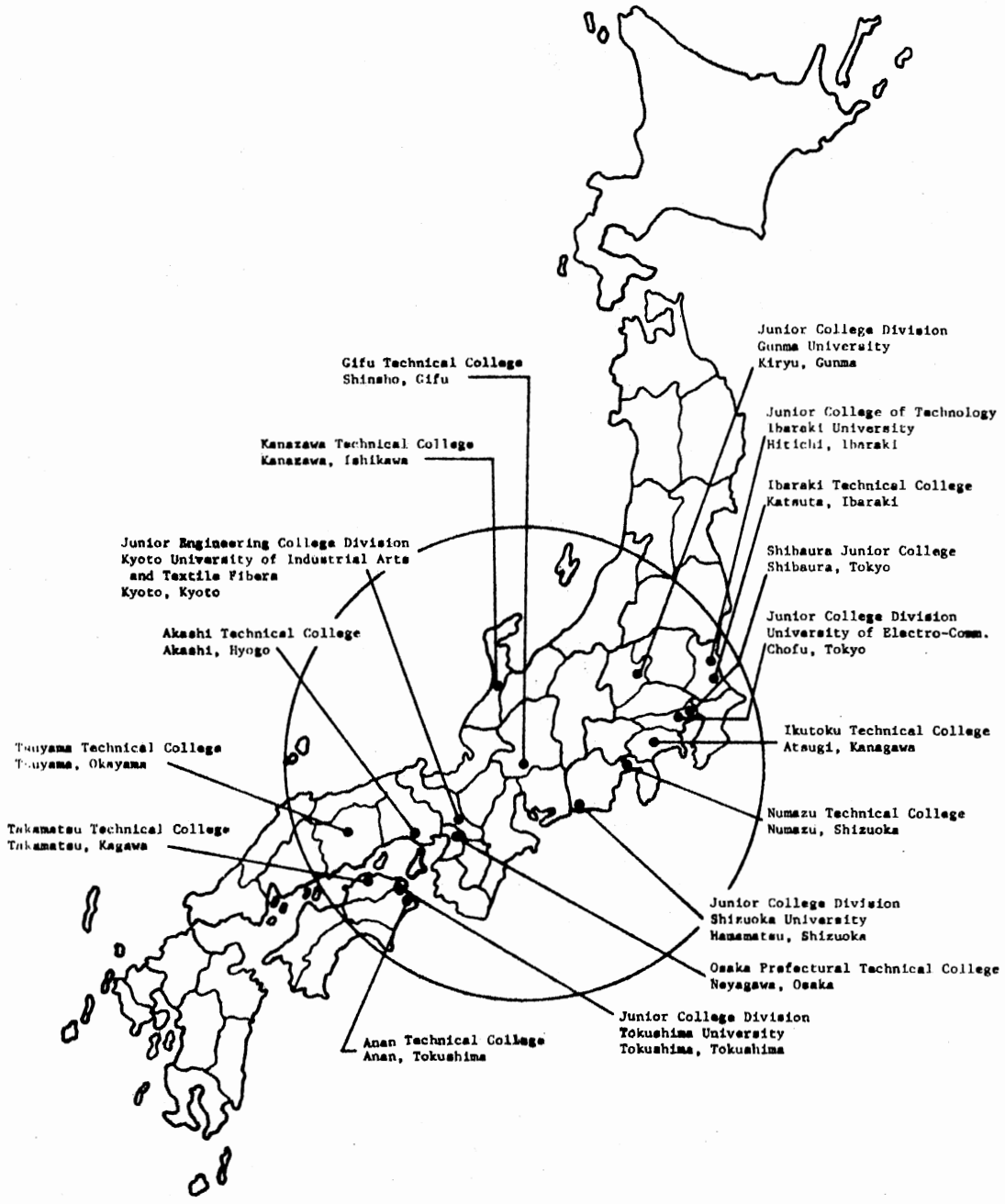


Figure 11. Location of Technical Colleges and Junior Colleges Which Were Visited for a Personal Interview

TABLE VIII

NAME AND LOCATION OF SCHOOLS OFFERING ELECTRICAL OR ELECTRONIC PROGRAMS WHICH WERE VISITED, LENGTH OF THE PROGRAMS, NUMBER OF FULL-TIME FACULTY MEMBERS TEACHING IN THE ELECTRICAL OR ELECTRONIC PROGRAMS AND TOTAL ENROLLMENT

NAME AND LOCATION	Electrical Program	Electronics Program	Two-year Evening Program	Three-year Evening Program	Five-year Daytime Program	Degree Awarded	Certificate Awarded	Number of Electrical or Electronic Professors	Total Enrollment
Junior College of Technology Ibaraki University Hitichi, Ibaraki	X	X		X			X	8	480
Junior College Division University of Electro-Comm. Chofu, Tokyo	X	X		X			X	10	720
Junior College Division Gunma University Kiryu, Gunma	X			X			X	5	600
Junior College Division Shizuoka University Hamamatsu, Shizuoka	X	X		X			X	5	720
Junior Engr. College Division Kyoto Univ. of Industrial Arts & Textile Fibers Kyoto, Kyoto	X			X			X	5	480
Junior College Division Tokushima University Tokushima, Tokushima	X	X		X			X	7	600
Shibaura Junior College Shibaura, Tokyo	X		X				X	6	160
Akashi Technical College Akashi, Hyogo	X				X		X	10	800
Anan Technical College Anan, Tokushima	X				X		X	7	800
Gifu Technical College Gifu, Gifu	X				X		X	10	766
Ibaragi Technical College Katsuta, Ibaragi	X				X		X	10	800
Ikutoku Technical College Atsugi, Kanagawa	X				X		X	10	616
Kanazawa Technical College Kanazawa, Ishikawa	X				X		X	8	570
Numazu Technical College Numazu, Shizuoka	X				X		X	11	800
Osaka Pref. Tech. College Neyagawa, Osaka	X				X		X	13	1,000
Takamatsu Technical College Takamatsu, Kagawa	X				X		X	10	757
Tsuyama Technical College Tsuyama, Okayama	X				X		X	11	500

Question 2 - How long is the program?

Response - Table VIII shows the responses which were received.

Comment - As can be seen from the data, all programs offered by junior college division of national universities are three-year evening programs while all technical colleges offer five-year daytime programs. The one program which was two years in length was offered as a full-time program during the evening by the one private junior college which was visited.

Question 3 - Does a graduate of your program receive a certificate or a degree upon completion of the program?

Response - The responses which were received are shown in Table VIII.

Comment - As can be seen from the data in Table VIII, all of the schools visited award a certificate upon successful completion of the program.

Question 4 - If the graduate receives a degree, what degree is it?

Response - The graduates of technical colleges and junior colleges receive no degree. All graduates receive a certificate as shown in Table VIII.

Comment - There is no degree less than a bachelor's degree, such as an associate degree, offered in technical colleges and junior colleges in Japan.

Question 5 - How many professors teach this program?

Response - Table VIII presents the data for both full-time and part-time professors, received from the schools visited.

Table IX presents the average number of full-time and part-time professors for the different type of institutions visited.

Comment - As can be seen from the data in Table IX, national junior colleges have the highest number of part-time professors. This is because these schools are junior college divisions of several universities. As such, some full-time university professors will teach part-time for the junior college division.

TABLE IX

AVERAGE NUMBER OF PROFESSORS OF ELECTRONICS AND ELECTRICITY AT EACH TYPE OF INSTITUTION VISITED

	Private Junior College	National Junior College	Private Technical College	Prefectural Technical College	National Technical College
Full-time	6	8	9	13	10
Part-time	15	26	3.5	3	7.4

Question 6 - What is the level of education of the electrical and electronic professors who teach in this program?

Response - The composite responses received from all schools visited are presented in Table X while Table XI shows a comparison of the highest degree held for the faculty of the different types of schools visited.

TABLE X

HIGHEST DEGREE HELD BY ELECTRICAL AND ELECTRONIC PROFESSORS

Highest Degree	Number	Percentage
Less than B.S. degree	6	3.8
B.S. degree	84	53.8
M.S. degree	42	26.9
Doctor's degree	24	15.4

TABLE XI

COMPARISON OF THE HIGHEST DEGREE HELD BY THE ELECTRICAL AND ELECTRONIC PROFESSORS IN THE DIFFERENT TYPE SCHOOLS VISITED

	Private Junior College	National Junior College	Private Technical College	Perfectural Technical College	National Technical College
Less than B.S. degree	0%	3.1%	0%	0%	5.5%
B.S. degree	50%	25.7%	67%	62%	65.0%
M.S. degree	33%	30.6%	22%	38%	21.0%
Doctoral degree	17%	40.6%	11%	0%	8.5%

Comment - It is interesting to note in Table XI that all professors with less than a B.S. degree are on the faculty of national institutions. It is also interesting to note that the national junior colleges have the largest percentage of professors with a doctorate and the lowest percentage of professors whose highest degree is the B.S. degree.

Question 7 - What kind of degree do professors have who teach in this program?

Response - Table XII shows the responses which were received.

TABLE XII

TYPE OF DEGREE HELD BY PROFESSORS IN THE ELECTRICAL AND ELECTRONIC PROGRAMS IN THE SCHOOLS VISITED SHOWN IN PERCENTAGES

Percentage having a technical degree	2.6%
Percentage having an education degree	0.6%
Percentage having an engineering degree	95.6%

Comment - The four professors listed as having a technical degree are technical college graduates and have a technical certificate. There are no technical teacher education programs in Japan.

Question 8 - What industrial experience does the professors teaching in this program have?

Response - The responses received from all schools visited are listed in Table XIII.

Question 9 - How many students are enrolled in your college?

Response: The total enrollment in the schools visited ranged from a low of 160 to a high of 1,000. Fifteen of the 17 schools had enrollments between 480 and 800 students.

The average enrollment for the 17 schools was 657, while the median enrollment was 720.

TABLE XIII

INDUSTRIAL EXPERIENCE BY PROFESSORS

	Number of Professors	Total Number of Years	Least Years	Most Years
Technician experience	2	10	2	8
Engineering experience	47	563	1	30
Skilled craftsman experience	0	0	0	0
Other experience	4	18	3	5

Question 10 - How many students are enrolled in your electrical or electronics program?

Response - Table XIV shows the average enrollment in the electrical or electronics programs for the 17 schools visited.

TABLE XIV

AVERAGE ENROLLMENT IN ELECTRICAL OR ELECTRONICS PROGRAMS IN ALL SCHOOLS VISITED

Full-time students	193
Part-time students	1.2

Comment - In each of the national technical colleges visited there is an admission quota of 40 new students per program per year. The failure rate and drop-out rate is very low in Japan, therefore each program has approximately 40 students times the number of years duration of the program, or approximately 200 students per electrical or electronics program. The other schools visited had similar admissions quotas.

Question 11 - Are there entrance requirements for the program?

Response - The responses received are presented in Table XV.

TABLE XV

NUMBER OF SCHOOLS WITH ENTRANCT REQUIREMENTS

Yes	17
No	0

Question 12 - If there are entrance requirements, what are the requirements?

Response - Table XVI shows the tabulated data received.

Comment - The minimum score on the entrance examination range from 50 to 75 percent for the various schools.

TABLE XVI

TYPES OF ENTRANCE REQUIREMENTS VERSUS PERCENTAGE OF SCHOOLS WHICH REQUIRE THEM

Minimum score on an entrance examination	100%
High school grade point	71%
Approval of an application	6%
Recommendation by a member of the faculty or staff	6%
Recommendation by a person outside of the school	18%
Interview and evaluation by one or more faculty members	12%

Question 13 - What is the cirriculum pattern of the program?

Response - Table XVII shows a typical curriculum pattern for technical colleges, while Table XVIII shows a typical curriculum pattern for junior colleges.

TABLE XVII

TYPICAL CURRICULUM PATTERN FOR TECHNICAL COLLEGES

Year in the Program	Technical Hours per Week	Related Technical Hrs. per Week	Math Hours per Week	Gen. Education Hours per Week	Total Hours per Week
1	3	10	6	17	36
2	6	9	6	16	37
3	15	6	6	12	39
4	23	3	4	10	40
5	32	1	0	5	38

TABLE XVIII

TYPICAL CURRICULUM PATTERN FOR JUNIOR COLLEGES

Semester in the Program	Technical Hours per Week	Related Technical Hours per Week	Math Hours per Week	Gen. Education Hours per Week	Total Hours per Week
1	5	8	4	7	24
2	7	8	4	5	24
3	13	4	2	5	24
4	14	4	2	4	24
5	19	2	0	3	24
6	22	0	0	2	24

Question 14 - Who teaches the laboratory portion of the courses in the program?

Response - Table XIX shows the tabulated data received.

TABLE XIX

PERSON RESPONSIBLE FOR TEACHING LABORATORY

Same person that lectures	76%
Another full-time professor	24%
Laboratory instructor	59%

Comment - Several schools made more than one response. Unlike most technically oriented schools in the United States, theory and laboratory are separate in schools in Japan.

The question therefore was probably not interpreted the same as it would have been in a school in this country.

Question 15 - How many hours are devoted to laboratory work for each hour of theory in the technical courses?

Response - Laboratory and lecture are independent of each other and laboratory work is not stressed as heavily in Japan as in the United States. Students in technical colleges spend an average of 3.6 hours per week, or 9.5 percent of their time, in laboratory. Students in junior colleges spend approximately 3 hours per week, or approximately 12.5 percent of their time in laboratory.

Question 16 - How many students are in lecture class?

Response - Table XX presents the tabulated data received from the technical colleges visited while Table XXI shows the data received from the junior colleges visited.

TABLE XX

AVERAGE NUMBER OF STUDENTS PER LECTURE CLASS IN TECHNICAL COLLEGES

Technical classes	40
Technical related classes	40
Mathematics classes	40
General education classes	40

TABLE XXI

AVERAGE NUMBER OF STUDENTS PER LECTURE CLASS IN JUNIOR COLLEGES

Technical classes	45
Technical related classes	40
Mathematics classes	58
General education classes	58

Question 17 - Are advisory councils, whose members are from local industry, used by the program for advice?

Response - Table XXII lists the tabulated data received.

TABLE XXII

SCHOOLS USING ADVISORY COUNCILS

Yes	1
No	16

Comment - The one "yes" response was received from the only independent junior college visited. The people interviewed at several schools responded that their role was to give advice to industry rather than seek advice from industry.

Question 18 - Where does your school fit into the figure shown here?

Response - Figure 12 shows the type and the number of each type institution visited.

Question 19 - How is the program funded?

Response - Table XXIII presents the data received.

TABLE XXIII

SOURCES OF FUNDING FOR SCHOOLS VISITED

National technical colleges - national funds	100%
Junior college division of national universities - national funds	100%
Prefectural technical colleges	
tuition	55%
national funds	35%
municipal funds	5%
donations	5%
Private technical colleges	
tuition	42%
national funds	13%
industry	45%

Question 20 - What are the names of five companies which have hired your graduates in the past?

Response - While it is not practical to list all the companies named, Table XXIV provides a representative list.

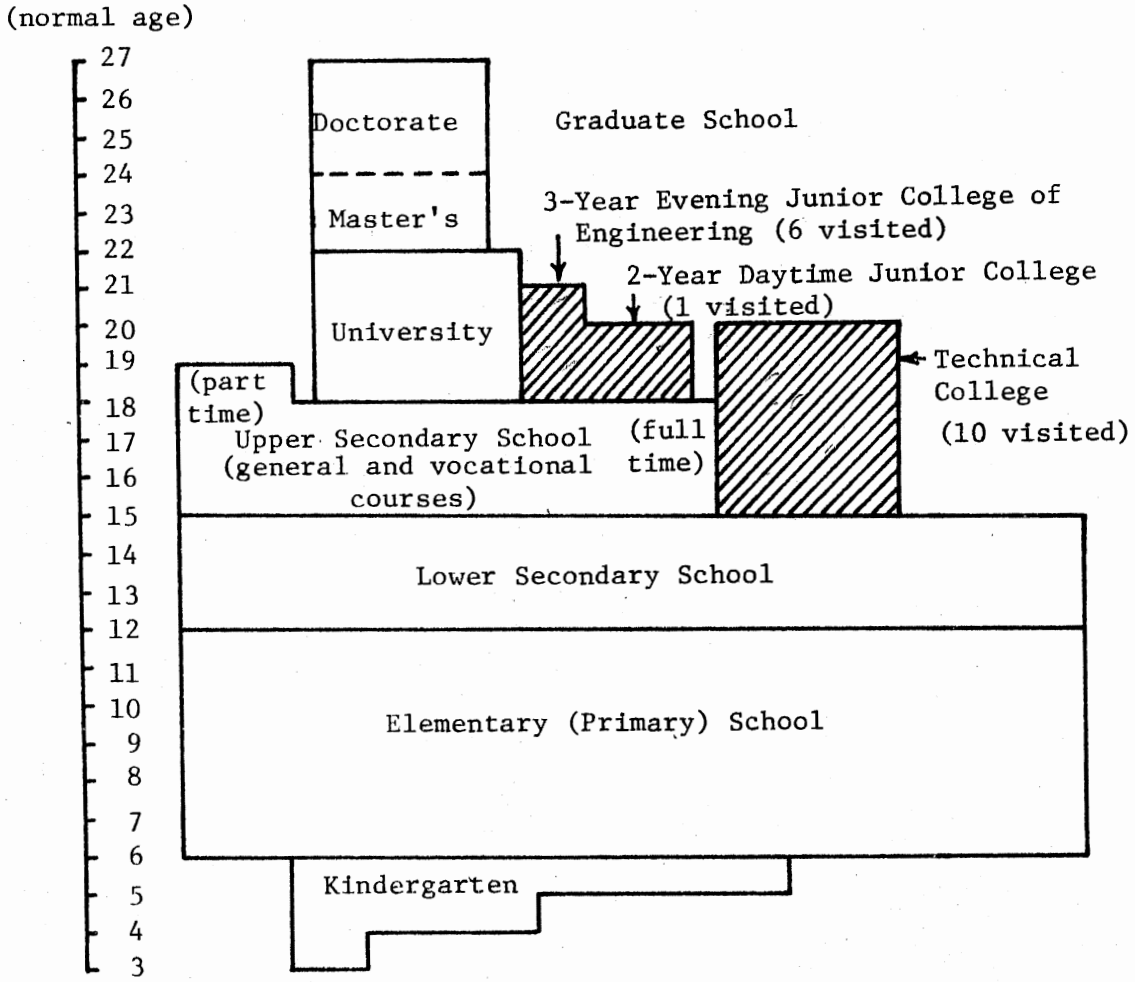


Figure 12. Japan's Present Educational System

TABLE XXIV

REPRESENTATIVE LIST OF COMPANIES WHICH HAVE EMPLOYED TECHNICAL COLLEGE AND JUNIOR COLLEGE GRADUATES IN THE PAST

Company	Location	Primary Product
Matsushita Electric	Osaka	Consumer electronics
Nisshin Denki	Kyoto	Power distribution equip.
Sanyo Electric	Osaka	Consumer electronics
Fujitsu	Tokyo	Computers
Hitichi	Tokyo	Electric machinery
Kansai Electric Power Co.	Osaka	Utility company
Toshiba	Tokyo	Communications equipment
Japan Telephone & Telegraph	Tokyo	Public communications
Minichi Newspaper	Tokyo	Newspaper
Yamaha	Shizuoka	Musical instruments

Comment - The locations given are for the company headquarters. A very high percentage of the graduates of all schools visited are employed in the same prefecture in which the school is located.

Question 21 - Is there a set number of new students admitted to the program each year?

Response - Each of the 17 schools visited stated that there was a set number of new students admitted to the program each year.

Question 22 - If the answer to question 21 is "Yes," is the number of new students admitted the same each year?

Response - Each of the 17 schools visited stated that the number of new students admitted each year was the same.

Question 23 - If the answer to question 22 is "Yes," what is the number of new students admitted to the program each year?

Response - Table XXV presents the tabulated data received.

TABLE XXV

AVERAGE NUMBER OF NEW STUDENTS ADMITTED ANNUALLY TO THE ELECTRICAL OR ELECTRONICS PROGRAM IN THE 17 SCHOOLS VISITED

Technical colleges	42
Junior colleges	57

Question 24 - How many students have taken the entrance exam for the program during each of the past five years?

Response - Table XXVI presents the tabulated data, according to the type of school, which was received.

Question 25 - What is the organizational structure of your school?

Response - Figure 13 is a typical organizational chart for technical colleges while Figure 14 shows a typical organizational chart for junior colleges which are divisions of national universities.

Question 26 - What department teaches the mathematics and physics courses in the curriculum?

Response - Table XXVII presents the tabulated data received.

TABLE XXVI

AVERAGE NUMBER OF STUDENTS WHICH HAVE TAKEN THE ENTRANCE EXAM FOR THE PROGRAM AT THE DIFFERENT TYPE SCHOOLS VISITED DURING A FIVE YEAR PERIOD

Year	National Technical College	Prefectural Technical College	Private Technical College	National Junior College	Private Junior College
	Average Number of Students Taking Entrance Exam				
1972	150	122	73	285	80
1973	126	113	73	280	80
1974	148	106	80	282	80
1975	149	151	59	302	80
1976	156	175	59	226	80
	Applications as a Percent of Accepted Students				
1972	375%	305%	152%	250%	100%
1973	315%	283%	152%	246%	100%
1974	370%	265%	166%	247%	100%
1975	373%	378%	123%	265%	100%
1976	390%	438%	123%	198%	100%

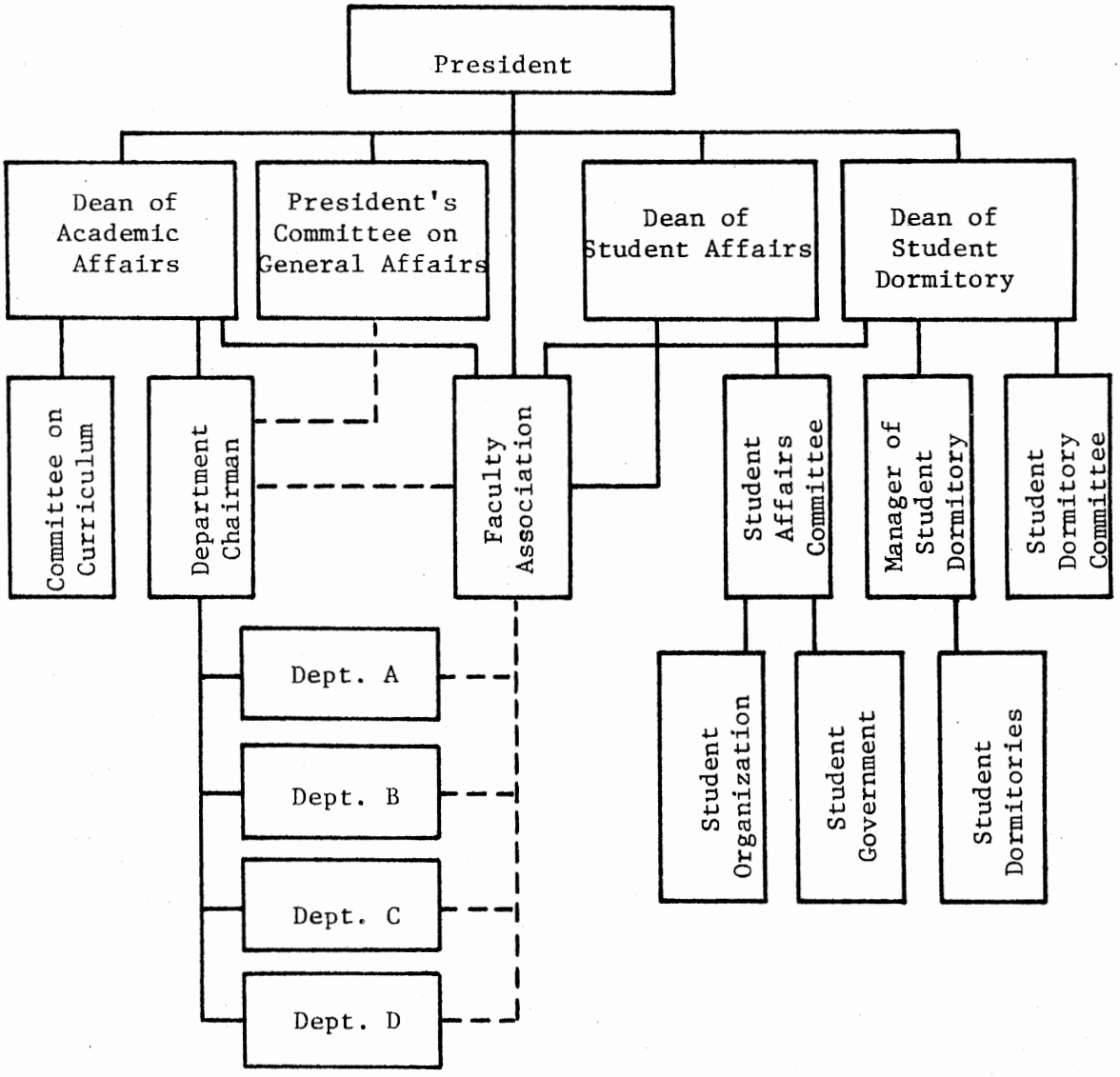


Figure 13. Typical Organizational Chart for Technical Colleges

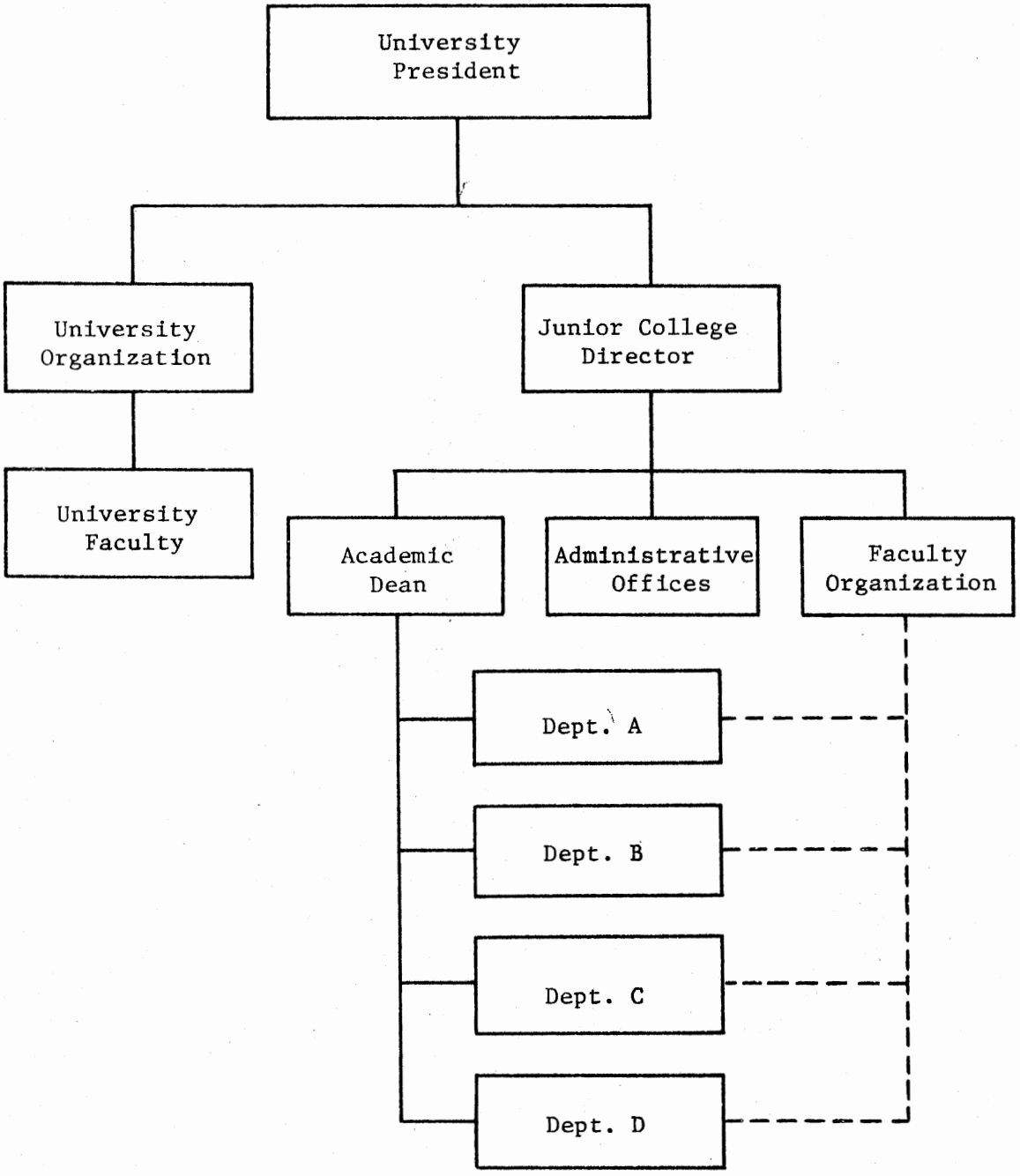


Figure 14. Typical Organizational Chart for Junior Colleges of Engineering

TABLE XXVII

RESPONSES FROM SCHOOLS REGARDING TEACHING OF MATHEMATICS AND PHYSICS COURSES

Mathematics	
taught by technical department	0
taught by mathematics department	17
Physics	
taught by technical department	0
taught by physics department	17

Question 27 - What is the average number of hours which students spend in class?

Response - Table XXVIII presents the tabulated data received.

TABLE XVIII

AVERAGE NUMBER OF HOURS WHICH STUDENTS SPEND IN SCHOOL EACH WEEK

Technical colleges	38 hours
Junior colleges	24 hours

Comment - Junior college students attend class only in the evening and attend four hours per evening, six evenings per week for three years.

Question 28 - How many hours per week do professors lecture?

Response - Table XXIX presents the tabulated data received.

TABLE XXIX

HOURS PER WEEK SPENT IN LECTURE AT TECHNICAL AND JUNIOR COLLEGES BY PERCENTAGE

	Technical Colleges	Junior Colleges
8 or fewer hours	0%	70%
9 to 12 hours	50%	15%
13 to 16 hours	30%	15%
over 16 hours	20%	0%

Comment - Junior college professors have significantly fewer hours of lecture per week because they teach only in the evening.

Question 29 - How many hours per week do professors spend in research?

Response - Table XXX presents the tabulated data received.

TABLE XXX

HOURS PER WEEK SPENT IN RESEARCH BY TECHNICAL COLLEGE AND JUNIOR COLLEGE PROFESSORS

Technical college professors	approximately 20
Junior college professors	approximately 30

Comment - Junior college professors spend more hours per week in research because, as full-time employees, they spend at least part of the daytime hours on campus without any students which provides them somewhat more opportunity for research.

Question 30 - How many days per year are students in class?

Response - The schools which were visited are in session an average of 224 days per year.

Comment - Japanese law requires schools to be open a minimum of 210 days per year, however many are open from 220 to 250 days per year.

Question 31 - What is the basis for government funding of the program?

Response - All schools receiving government funds stated that such funding was determined on the basis of the number of students and the number of professors.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The problem with which this study was concerned was the lack of information related to technical education in Japan. This island nation is the leading industrial society in Asia, yet few Americans know anything about Japan. Even fewer know anything about the Japanese educational system which has been, in part, responsible for Japan's tremendous industrial and economic growth since World War II. This chapter includes a summary of the study with conclusions and recommendations.

Summary

The primary purpose of the study was to describe the development of Japanese education with emphasis on technical education, and to investigate the technical education system which presently exists in technical colleges and junior colleges of engineering. The study was designed to answer the following questions:

1. What is the curriculum content at technical colleges and junior colleges of engineering in terms of technical courses, related technical courses, mathematics, and support courses?
2. What is the organizational structure of these institutions?
3. What are the entrance requirements of the technical education programs?

4. How are their technical education programs funded?
5. What is the length of programs in technical education?
6. What are the sourses of faculty for technical education programs?
7. Where does technical education fit into the total educational structure in Japan?
8. What are the enrollment trends in technical education?
9. What is the average faculty teaching load?
10. What are the employment opportunities for technical education graduates?
11. What emphasis is placed on laboratory experiences?
12. What industrial experience do faculty members possess?

The design of the study was ex-post-facto in nature and descriptive research was used. Data was collected by the researcher during a visit to each school in the Summer of 1976 by use of an open-form questionnaire. Data received was expressed in both quantitative and qualitative form.

Limitations

In descriptive research there are certain limitations which should be considered when analyzing or interpreting the results. Descriptive research may be useful in spotting trends, describing specific conditions and practices which may exist, detecting weaknesses, and evaluating relationships. However the accuracy of the analysis is limited by the ability of the researcher to critically examine source materials, to make clear the terminology used in gathering and presenting data, to make observation, to randomize populations and to properly interpret and predict.

Summary of Findings Related to the Research Questions

Answers to 12 research questions were sought in this study. After analyzing the data presented in Chapter IV, the following summary of findings related to the research questions is presented. Each research question will be stated and each question will be followed by a summary. Conclusions are then reported.

Research Question One

What is the curriculum content at technical colleges and junior colleges of engineering in terms of technical courses, related technical courses, mathematics, and support courses?

The data received from the technical colleges visited shows that students attend school an average of 38 hours per week for five years. An average of 15.8 hours per week are spent in technical courses. This represents 41.6 percent of the total time. An average of 5.8 hours per week (15.3 percent) are spent in related technical courses while an average of 4.4 hours per week (11.6 percent) are spent in mathematics courses. An average of 12 hours per week (31.5 percent) are spent in general education courses.

The data from the junior colleges visited shows that students spend an average of 24 hours per week in class. An average of 13.3 hours per week (55.5 percent) are spent in technical courses. An average of 4.33 hours per week (18.1 percent) are spent in related technical courses while an average of 2 hours per week (8.3 percent) are spent in mathematics courses. An average of 4.33 hours per week (18.1 percent) are in general education courses.

Combining the data from the technical colleges and junior colleges provides an average figure for the percentages of time in the total curriculum devoted to the four areas of interest. These figures are: technical courses, 14.6 hours per week (48.5 percent), related technical courses, 5.1 hours per week (16.6 percent), mathematics courses, 3.2 hours per week (10.1 percent), and general education courses, 8.17 hours per week (24.8 percent).

Research Question Two

What is the organizational structure of these institutions? A summary of the study results related to this question is as follows.

Technical colleges are five year institutions extending from grade 10 through grade 14. Each is a self-standing institution with the highest administrative officer the president of the college. Each technical college has from one to six departments which may include a program in electronics, electricity, precision mechanics, architecture, chemistry and other similar programs. A typical organizational structure for technical colleges is shown in Figure 8, while Figure 9 shows a typical organizational structure for junior colleges of engineering.

Research Question Three

What are the entrance requirements of the Technical Education Programs?

Every school visited stated that there are entrance requirements to be satisfied before a student is admitted to the school. All schools stated that a passing score on an entrance examination was

required. Seventy-one percent of the schools stated that a certain level high school grade point is also required. Other requirements by some schools are recommendations by a person outside the school (18 percent), interview and evaluation by one or more faculty members (12 percent), recommendation by a member of the faculty or staff (6 percent), or approval of an application (6 percent).

Research Question Four

How are their technical education programs funded? A summary of the study results related to this question is as follows.

The data received from the schools visited shows that national technical colleges and the junior college division of national universities are totally funded by the national government. Prefectural technical colleges are totally funded by the prefectural level. This is comparable to state funding in the United States.

Private junior colleges receive funds from the following sources in the percentages shown: tuition (55 percent), national funds (35 percent), municipal funds (5 percent), and donations (5 percent). Private technical colleges receive funds from the following sources in the percentages shown: tuition (42 percent), national funds (13 percent), and industry (45 percent).

Research Question Five

What is the length of programs in technical education? A summary of the study results to this question is as follows.

The data received shows that technical colleges are five year institutions covering grades 10 through 14. Technical colleges offer

instruction 240 days, or 34.28 weeks, per year. Students attend class an average of 38 hours per week. This represents 6,514 hours of instruction.

Junior colleges are three years in length offering instruction only in the evening. Students attend class 24 hours per week, 30 weeks per year, for a total of 2,160 hours of instruction.

Considering only the hours of instruction at grade levels 13 and 14, technical college students attend class approximately 2,605 hours, which is approximately 20 percent more time in class than in spent by junior college students.

Research Question Six

What are the sources of faculty for technical education programs? A summary of the study results to this question is as follows.

The data show that 95.6 percent of all faculty members of technical colleges and junior colleges have engineering degrees while 2.6 percent have a technical degree (graduates of a technical college). There are 0.5 percent of the faculty with no degrees and 0.6 percent have an education degree.

Research Question Seven

Where does technical education fit into the total educational structure in Japan?

The two institutions primarily responsible for technical education in Japan are technical colleges and junior colleges of engineering which are a division of several national universities. The technical college is a five year institution extending from grade levels 10

through 14. Because students who have completed grade 9 have a choice of attending a traditional high school or a technical college the system is viewed as a dual track.

Junior colleges of engineering which are divisions of several national universities offer instruction at grade levels 13, 14, and 15. Instruction is offered four hours per evening, six evenings per week, and 30 weeks per year for three years.

Research Question Eight

What are the enrollment trends in technical education? A summary of the study results to this questions is as follows.

One would conclude from the data supplied by each institution individually that enrollment in technical colleges and junior colleges was virtually constant from year to year. Each school visited reported that a set number of new students was admitted each year and that the number was constant. Any increase in enrollment in technical education is due primarily to increasing the number of technical colleges or junior colleges. Data obtained from the Ministry of Education shows that the number of junior colleges of engineering has remained virtually constant for the past 15 years. However, the number of technical colleges has increased from 14 schools in 1962 to 65 schools in 1976 and enrollment has increased from 3,375 students in 1962 to 48,400 students in 1976. It appears that any significant increases in future enrollment will be due to increasing the number of technical colleges or junior colleges of engineering.

Research Question Nine

What is the average faculty teaching load? A summary of the study results to this question is as follows.

The data received shows that 20 percent of the faculty at technical colleges have a teaching load greater than 16 hours per week. Thirty percent of the faculty have a teaching load of 13 to 16 hours while the remaining 50 percent have a teaching load of 9 to 12 hours. In the junior colleges, 15 percent of the faculty teach from 13 to 16 hours, 15 percent teach from 9 to 12 hours, and the remaining 70 percent teach 8 or fewer hours. Junior college instructors teach significantly fewer hours per week than technical college instructors because they teach only in the evening.

Research Question Ten

What are the employment opportunities for technical college graduates?

The data received from the schools visited shows that past graduates have been employed by many outstanding Japanese companies. The list of comparnies includes manufacturers of consumer electronic and communications equipment products, research firms, utilities, computer companies, national and private railroads, and newspaper, radio and television firms.

Research Question Eleven

What emphasis is placed on laboratory experiences? A summary of the study results to this question is as follows.

The data shows that less emphasis is placed on laboratory work in the schools which were visited than in technical institutes and junior colleges in the United States. Lecture and laboratory are independent of one another and students spend only 10 to 15 percent of their total time in the laboratory. It should be pointed out that 30 to 40 percent of the laboratory work occurs during the last year of the program in the form of an assigned design project which students are required to design, fabricate, test, and troubleshoot.

Research Question Twelve

What industrial experiences do faculty members possess? A summary of the study results to this question is as follows.

The data received shows that the 156 full-time faculty members at the schools visited had a combined total of 563 years of engineering work, ten years of technician experience, and 18 years of various other work experience. This represents an average of 3.79 years of industrial experience per full-time faculty member.

Conclusions

The data collected at technical colleges and junior colleges which were visited brought the researcher to the following conclusions.

1. Technical colleges are five-year institutions which offer high quality technical education uninterrupted over the five-year period which extends from grade level 10 through grade level 14.

2. Technical colleges are self-standing institutions which may be funded at the national, prefectural or municipal level or they may be private institutions.

3. All technical colleges and junior colleges of engineering have entrance requirements. The most common entrance requirement is an entrance examination similar to those required at several levels throughout the Japanese educational system. These examinations are somewhat notorious throughout most of the world for their degree of rigor.

4. More than 95 percent of the faculty or technical colleges and junior colleges of engineering have engineering degrees.

5. Technical colleges begin at grade level 10 which is also true of secondary schools, therefore students may choose either of two tracks which are open to them; the academic track through secondary school and on to a four-year university or the technical track through the five-year technical college. This is equivalent to three years at the secondary level and two years at the junior college level. Graduates of technical colleges may apply for admission to a four-year university with advance standing, however very few do this.

6. Enrollment in technical colleges has increased every year since their inception in 1962. Much of this increase can be attributed to the building of new schools rather than increases in enrollment in existing schools. Technical colleges accept a fixed number of new students in their program each year, therefore, total enrollment for all technical colleges would remain fairly constant if new schools were not built.

7. Neither technical colleges nor junior colleges award any type of degree. A certificate of completion is awarded upon successful completion of a technical college or junior college program.

8. Laboratory work is not emphasized in technical programs in Japan as heavily as in the United States. However, the laboratory work

which is done appears to be quite rigorous and to require considerable understanding on the part of the students.

9. Junior colleges of engineering are three-year institutions offering instruction only in the evening. Total enrollment in all junior colleges combined is increasing annually, however, total enrollment in junior colleges of engineering is virtually constant because of the fixed number of new students admitted each year. The number of persons taking the entrance examination for junior colleges of engineering has also remained relatively constant.

10. Funding for technical colleges may be provided by the national or prefectural government or from private sources as is the case for private institutions.

11. Junior colleges of engineering are divisions of national universities and are therefore funded by the national government.

Recommendations

After visiting the schools which provided the data that made this study possible, reviewing pertinent literature, and careful evaluation of the study, the following recommendations are offered.

1. Just over a century ago Emperor Meiji and a group of young, very capable leaders set out to transform Japan into a modern, industrial nation as quickly as possible. Recognizing that industrial development would require skilled, educated workers a comprehensive educational system was set up. The resulting industrial and economic growth were remarkable. It is recommended that developing nations consider the tremendous impact of technical education on industrial development.

2. Japan's educational system becomes a dual-track system after middle school in that students have a choice of attending a traditional academic track through secondary school and to a university or four-year college or from middle school to a technical college. The technical college route is essentially a terminal track. It is recommended that consideration be given by Japan's Ministry of Education to providing additional educational opportunities for graduates of technical colleges and junior colleges.

3. Japan is one of the world's major producers of electrical and electronic equipment. In recent years many of the major innovations in electronics have come from Japan. It is very apparent from having visited a number of technical programs in Japan that they are outstanding, high level programs producing high caliber graduates. Such graduates generally produce high level technical work. It is recommended that technical education in the U. S. place more emphasis on high quality, high level technical programs.

4. Japan's technical colleges are five-year institutions covering grade levels 10 through 14. This continuous five years of quality education provides a graduate with very good technical skills. It is recommended that developing countries consider a similar institution to provide them with high quality technical personnel after completing grade level 14.

5. Entrance requirements for technical programs insure better students with more uniform ability. Such students could probably succeed in more rigourous, higher level programs thus providing industry with more technically competent technicians. It is recommended that technical departments in junior colleges and community colleges in the U. S.

consider adopting program entrance requirements.

6. Advisory councils serve several very useful functions when properly utilized, including advice on curriculum content, assistance in placement of graduates, and as a possible source of funds and/or equipment. It is recommended that Japanese technical colleges and junior colleges consider using advisory councils.

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APPENDIX A

FIFTY-NINE TECHNICAL COLLEGES IN JAPAN WHICH OFFER TECHNICAL PROGRAMS IN ELECTRICITY OR ELECTRONICS

1. Akashi Technical College
   Akashi-shi, Hyogo-ken, Japan

2. Akita Technical College
   Akita-shi, Akita, ken, Japan

3. Anan Technical College
   Anan-shi, Tokushima-ken, Japan

4. Arake Technical College
   Olmuta-shi, Fukuoka-ken, Japan

5. Asahikawa Technical College
   Asahikawa-shi, Hokkaido, Japan

6. Fukui Technical College
   Takeo-shi, Fukui-ken, Japan

7. Gifu Technical College
   Shinsho-cho, Gifu-ken, Japan

8. Gunma Technical College
   Maebashi-shi, Gunma-ken, Japan

9. Hakodate Technical College
   Hakodate-shi, Hokkaido, Japan

10. Hachinohe Technical College
    Yato-shi, Aomori-ken, Japan

11. Ibaraki Technical College
    Katsuta-shi, Ibaraki-ken, Japan

12. Ichinoseki Technical College
    Ichinoseki-shi, Iwate-ken, Japan

13. Ishikawa Technical College
    Kanazawa-shi, Ishikawa-ken, Japan

14. Kagoshima Technical College
    Hayato-cho, Kaogoshima-ken, Japan

15. Kisarazo Technical College
    Kisarazu-shi, Chiba-ken, Japan

16. Kitakyushu Technical College
    Kitakyushu-shi, Tukuoka-ken, Japan

17. Kochi Technical College
    Nangoku-shi, Kochi-ken, Japan

18. Kure Technical College
    Kure-shi, Hiroshima-ken, Japan

19. Koyoma Technical College
Koyoma-shi, Tochigi-ken, Japan

20. Kumamoto Technical College
Kikuchi-gun, Kumamoto-ken, Japan

21. Kurume Technical College
Kurume-shi, Fukuoka-ken, Japan

22. Kushiro Technical College
Kushiro-shi, Hokkaido, Japan

23. Maizuru Technical College
Maizuru-shi, Kyoto-fu, Japan

24. Miyagi Technical College
Natori-shi, Miyagi-ken, Japan

25. Matsue Technical College
Matsue-shi, Shimane-ken, Japan

26. Miyakonogo Technical College
Toshiro, Miyazaki-ken, Japan

27. Nagano Technical College
Nagano-shi, Nagano-ken, Japan

28. Nagaoka Technical College
Nagaoka-shi, Niigata-ken, Japan

29. Nara Technical College
Yamatokoriyama-shi, Nara-ken, Japan

30. Niihama Technical College
Niihama-shi, Ehime-ken, Japan

31. Numazu Technical College
Numazu-shi, Shizuoka-ken, Japan

32. Oita Technical College
Oita-shi, Oita-ken, Japan

33. Sasebo Technical College
Sasebo-shi, Nagasaki-ken, Japan

34. Sendai Technical College
Sendia-shi, Miyagi-ken, Japan

35. Suzuka Technical College
Suzuka-shi, Mie-ken, Japan

36. Taira Technical College
Taira-shi, Tukushima-ken, Japan

37. Takamatsu Technical College
Takamatsu-shi, Kagawa-ken, Japan

38. Takuma Technical College
Mitoyo-gun, Kagawa-ken, Japan

39. Tokuyama Technical College
Tokuyama-shi, Yamaguchi-ken, Japan

40. Tokyo Technical College
Hachioji-shi, Tokyo-to, Japan

41. Tomakomai Technical College
Tomakomai-shi, Hokkaido, Japan

42. Toyama Technical College
Toyama-shi, Toyama-ken, Japan

43. Toyota Technical College
Toyota-shi, Aichi-ken, Japan

44. Tsuruoka Technical College
Tsuruoka-shi, Yamagata-ken, Japan

45. Tsuyama Technical College
Tsuyama-shi, Okayama-ken, Japan

46. Ube Technical College
Ube-shi, Yamaguchi-ken, Japan

47. Wakayama Technical College
Gobo-chi, Wakayama-ken, Japan

48. Yatsushiro Technical College
Yatsushiro-shi, Yamaguchi-ken, Japan

49. Yonago Technical College
Yonago-shi, Tottori-ken, Japan

50. Osaka Prefectural Technical College
Neyagawa-shi, Osaka-fu, Japan

51. Tokyo Metropolitan Prefectural Technical College
Shinagawa-ku, Tokyo-to, Japan

52. Kobe City Rokko Technical College
Kobe-shi, Hyogo-ken, Japan

53. Hijiribashi Technical College
Osato-gun, Saitama-ken, Japan

54. Ikuei Technical College
Suginami-ku, Tokyo-to, Japan

55. Kanazawa Technical College
Kanazawa-shi, Ishikawa-ken, Japan

56. Ikutoku Technical College
Atsugi-shi, Kanagawa-ken, Japan

57. Kumano Technical College
Kumano-shi, Mie-ken, Japan

58. Osaka Technical College
Neyagawa-shi, Osaka-fu, Japan

59. Toin Gakuen Technical College
Yakohama-shi, Kanagawa-ken, Japan

APPENDIX B

TWENTY-NINE JUNIOR COLLEGES IN JAPAN WHICH OFFER TECHNICAL PROGRAMS IN ELECTRICITY OR ELECTRONICS

1. Junior College Division
   Gifu University
   Inaba-gun, Gifu-ken, Japan

2. Junior College Division
   Gunma University
   Kiryu-shi, Gunma-ken, Japan

3. Junior College Division
   Hosei University
   Kawasaki-shi, Kanagawa-ken, Japan

4. Junior College of Technology
   Ibaraki University
   Hitachi-shi, Ibaraki-ken, Japan

5. Junior College Division
   Kyoto University of Industrial Arts and Textiles
   Kyoto-shi, Kyoto-fu, Japan

6. Junior College Division
   Meijo University
   Nagoya-shi, Aichi-ken, Japan

7. Junior College Division
   Muroran University of Engineering
   Muroran-shi-Hokkaido, Japan

8. Junior College Division
   Musashi Institute of Technology
   Setagaya-ku, Tokyo-to, Japan

9. Junior College Division
   Osaka Institute of Technology
   Asahi-ku, Osaka-fu, Japan

10. Junior College Division
    Osaka Electrical Engineering College
    Neyagawa-shi, Osaka-fu, Japan

11. Junior College Division
    Osaka Prefectural University
    Neyagawa-shi, Osaka-fu, Japan

12. Junior College Division
    Shizuoka University
    Hamamatsu-shi, Shizuoka-ken, Japan

13. Junior College Division
    Tokai University
    Shimizu-shi, Shizuoka-ken, Japan

14. Junior College Division
Tokushima University
Tokushima-shi, Tokushima-ken, Japan

15. Junior College Division
University of Electro-Communications
Chofu-shi, Tokyo-to, Japan

16. Fukuoka Junior College of Electrical Engineering
Fukuoka-shi, Fukuoka-ken, Japan

17. Kansai Junior College of Iron and Steel
Amagasaki-shi, Hyogo-ken, Japan

18. Kanto Junior College
Tatebayashi-shi, Gunma-ken, Japan

19. Kitami Junior College of Technology
Kitami-shi, Hokkaido, Japan

20. Kokusai Junior College
Nakano-ku, Tokyo-to, Japan

21. Kurume Junior College of Technology
Kurume-shi, Fukuoka-ken, Japan

22. Nagaoka Technical Junior College
Nagaoka-shi, Niigata-ken, Japan

23. Nagasaki Junior College of Shipbuilding
Nagasaki-shi, Nagasaki-ken, Japan

24. Nagoya Junior College of Electricity
Nagoya-shi, Aichi-ken, Japan

25. Shibura Junior College
Minato-ku, Tokyo-to, Japan

26. Tokyo Electrical Engineering Junior College
Chiyoda-ku, Tokyo-to, Japan

27. Tokyo Metropolitan Junior College of Engineering
Shinagawa-ku, Tokyo-to, Japan

28. Ube Junior College of Technology
Ube-shi, Yamaguchi-ken, Japan

29. Utsunomiya Technical Junior College
Utsunomiya-shi, Tochigi-ken, Japan

APPENDIX C

QUESTIONNAIRE MAILED TO SCHOOLS

Questionnaire for Schools in Japan

Name of School _____

Location of School _____

1. Does your school offer a program in the following?

   Electronics Technology _____

   Electrical Technology _____

2. How long is the program?

   (a) less than one year _____

   (b) one year _____

   (c) two years _____

   (d) three years _____

   (e) over three years _____

3. Does the graduate receive a certificate or degree upon completion of the program?

   (a) certificate _____

   (b) degree _____

4. If the graduate receives a degree, what kind of degree is it?

   _____

5. How many faculty members teach in this program?

   Number full time _____

   Number part time _____

6. What level of education does the faculty have?

   Number having less than B.S. degree _____

   Number having B.S. degree _____

   Number having M.S. degree _____

   Number having Doctorate _____

7. What kind of education does the faculty have?

   Number having technical degree _____

   Number having education degree _____

   Number having engineering degree _____

   Number with other degrees _____

8. What industrial experience does the faculty have?

   Technician experience

   Number faculty _____

   Total years _____

   Engineering experience

   Number faculty _____

   Total years _____

   Skilled craftsman experience

   Number faculty _____

   Total years _____

   Other experience besides teaching

   Number faculty _____

   Total years _____

9. How many students are enrolled in your college? _____

10. How many students are enrolled in this program?

    Number of full time students _____

    Number of part time students _____

11. Are there entrance requirements for the program?

    Yes _____ No _____

12. If there are entrance requirements, what are they?

    (a) Minimum score on examination _____

    (b) High school grade point _____

12. (cont'd)

(c) Approval of application _____

(d) Recommendation by member of faculty or staff _____

(e) Recommendation by person outside school _____

(f) Other (please list) _____

13. What is the curriculum content of the program?

Number of technical courses in major area _____

Credit hours _____

Contact hours per week _____

Lab hours _____

Length of courses in weeks _____

Number of related technical courses _____

Credit hours _____

Contact hours per week _____

Lab hours _____

Length of courses in weeks _____

Number of mathematics courses _____

Credit hours _____

Contact hours per week _____

Lab hours _____

Length of courses in weeks _____

Number of support courses _____

Credit hours _____

Contact hours per week _____

Lab hours _____

Length of courses in weeks _____

14. Who teaches the laboratory portion of the courses in the program?

Same person that lectures _____

Another full time faculty _____

Laboratory instructor _____

Graduate student _____

Other _____

15. How many hours are devoted to laboratory work for each hour of lecture in the technical courses?

(a) one hour lab. for one hour lecture _____

(b) two hours lab. for one hour lecture _____

(c) two hours lecture for one hour lab. _____

(d) other (please specify) _____

16. How many students are in lecture classes?

Technical classes:

less than 20 _____

20 to 35 _____

35 to 50 _____

over 50 _____

Technical related classes:

less than 20 _____

20 to 35 _____

35 to 50 _____

over 50 _____

Mathematics classes:

less than 20 _____

20 to 35 _____

35 to 50 _____

over 50 _____

16. (cont'd)

Support classes:

less than 20 _____

20 to 35 _____

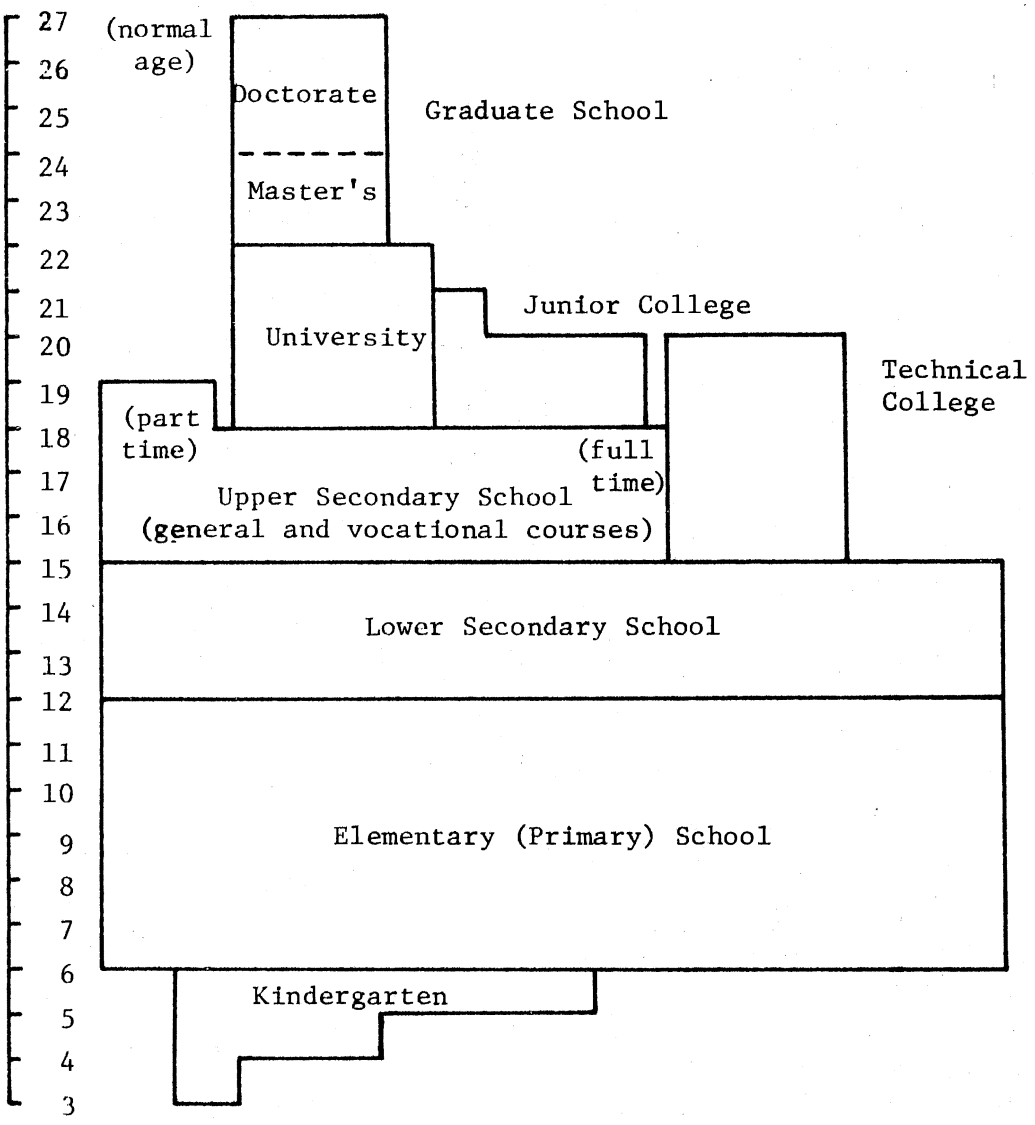
35 to 50 _____

over 50 _____

17. Are advisory councils, whose members are from local industries, used by the program for advise?

Yes _____ No _____

18. Where does your school fit into this drawing?



19. How is the program funded?

(a) National funds _____%

(b) Prefectural funds _____%

(c) Municipal funds _____%

(d) Donations _____%

(e) Other _____%

20. Please list five companies which have hired your graduates as technicians.

Company	Location	Primary Product
(a)		
(b)		
(c)		
(d)		
(e)		

21. Is there a set number of new students admitted to the program each year?

(a) Yes _____

(b) No _____

22. If the answer to question #21 is "Yes," is the number the same each year?

(a) Yes _____

(b) No _____

23. If the answer to question #22 is "Yes," what is the number of new students each year?

_____

24. How many people have taken the entrance examination during each of the following years?

1972 _____ 1975 _____

1973 _____ 1976 _____

1974 _____

25. How is the school organized with regard to administration?

26. Who teaches the following courses?

Mathematics:

electrical professor _____

math professor _____

Physics:

electrical professor _____

physics professor _____

27. How many hours per week are students in class?

less than 20 _____

20 to 30 _____

30 to 40 _____

over 40 _____

28. How many hours per week do professors teach?

less than 8 _____

8 to 12 _____

12 to 16 _____

over 16 _____

29. How many hours per week do professors spend in research?

less than 10 _____

10 to 20 _____

20 to 30 _____

over 30 _____

30. How many days per year is school in operation?

31. What is the basis for government funding?

(a) Number of students _____

(b) Number of professors _____

(c) Number of departments _____

(d) Formula involving several variables _____

(e) Other (please list) _____

APPENDIX D

LETTER OF TRANSMITTAL FOR SCHOOLS

April 12, 1976

Dear Sir:

The electrical and electronics industries of Japan rank among the world's finest. I am sure this same high quality is reflected in Japan's educational programs related to electricity and electronics. As a faculty member of Tulsa Junior College, I am involved in the education of electrical and electronics technicians.

I plan to visit Japan during June and July of 1976. While there, I would like to do a study of electrical and electronics technician education in Japan by visiting several of your universities and colleges. If possible, I would like to visit your school. Please complete the enclosed form and return it to me in the enclosed envelope.

Thank you very much for your cooperation.

Sincerely,

Larry Jones, Coordinator
Industrial Technologies

LJ/nlk

Enc. (2)

APPENDIX E

FOLLOW-UP LETTER FOR SCHOOLS

Dear _____

Several weeks ago you received a letter, in which I inquired about the possibility of visiting your school this Summer, and a short form for your response. Most schools have responded, however a few have not yet returned the form. If you have failed to return yours for some reason I would be most appreciative of a few minutes of your time to complete and return the form.

I look forward to a positive response and to meeting you this Summer to discuss your electrical and/or electronics program. Thank you very much for your cooperation.

Sincerely,

Larry Jones, Coordinator
Industrial Technologies
Tulsa Junior College

LJ/kp

VITA

Larry Dean Jones

Candidate for the Degree of

Doctor of Education

Thesis: A STUDY OF ELECTRICAL AND ELECTRONIC TECHNICAL EDUCATION PROGRAMS IN JAPANESE TECHNICAL COLLEGES AND JUNIOR COLLEGES

Major Field: Occupational and Adult Education

Biographical:

Personal Data: Born in Perkins, Oklahoma, August 21, 1936, the son of Lyle and Maurine Jones.

Education: Graduated from Perkins High School, Perkins, Oklahoma, in May, 1954; received an Associate degree from Oklahoma State University with a major in Electronics Technology in May, 1962; received the Bachelor of Science degree from Oklahoma State University with a major in Technical Education in May, 1968; received the Master of Science degree from Oklahoma State University with a major in Technical Education in May, 1974; completed requirements for the Doctor of Education degree in Occupational and Adult Education at Oklahoma State University in July, 1980.

Professional Organizations: Oklahoma Technical Society, Instrument Society of America, American Society for Engineering Education

Professional Experience: Electronic Technician, Los Alamos Scientific Laboratory, Los Alamos, New Mexico, 1962-1966; Electronic Technician, Research Foundation, Oklahoma State University, Stillwater, Oklahoma, 1966-1968; Electrical Engineer, McDonnell Douglas Corporation, Huntington Beach, California, 1968-1970; Electronics Instructor, Tulsa Junior College, Tulsa, Oklahoma, 1970-1978; Electronics Instructor, National Institute for Electricity and Electronics, Boumerdes, Algeria, 1978-1979; Program Coordinator, Technology Extension, Oklahoma State University, January, 1980 to present.

Publications:

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