Educational systems for the training of scientists and engineers in Meiji Japan

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YOSHIDA Tadashi

The origins of Japan's modernization are commonly traced to Commodore Perry's arrival in 1853, which resulted in the opening of the country. In his travel diary, Perry described contemporary Japan as a "half-civilized" place and brought a model locomotive and a telegraph device as gifts when he returned to the country the following year. These two presents symbolized precisely what Fukuzawa Yukichi (1834-1901) later called "instruments of civilization".

After the Meiji Restoration in 1868, the new government adopted a vigorous policy of Westernization. Fascinated by Western civilization and its products, the Japanese dedicated themselves to acquiring knowledge from the West in order to become a full-fledged "civilized" nation. In the 1870s and early 1880s, there emerged a movement known as *bunmei kaika* (civilization and enlightenment), under the banner of which all sorts of changes and reforms were carried out across the land.

The idea of progress from the barbarian to the half-civilized, and then to the civilized was widely shared by intellectuals of the time. Europe, with its science and technology, as well its social values such as equality, individualism, and independence, represented the model of civilization. In his bestselling works, which sold more than 100,000 copies, Fukuzawa, a leader of the bunmei kaika movement, repeatedly urged his countrymen to strive to attain this advanced civilized stage.

European countries at this time were engaged in the so-called institutionalization of science. This was the era of university reforms, the establishment of academic disciplines, and the emergence of science-based technology. Japan thus didn't seem hopelessly behind. Kume Kunitake (1839-1931) observed the contemporary stage of civilization in Europe as a member of the Iwakura mission in 1873. After touring various factories and cities in England, Kume astutely noted that, "Although there seems to be a wide chasm in the course of civilization between the West and the East, it is only in the last fifty years that even Britain or France attained its flourishing stage," and "The present situation in Europe is greatly different from that of forty years ago." [1]

Progress is brought forth by knowledge, especially science, so knowledge

should be imported from the West. This was the view advocated by Fukuzawa and other champions of civilization and enlightenment. Kume Kunitake too promoted this idea in his *Beiô kairan jikki*, a work that went through four editions and sold 3,500 copies by 1883. The Baconian idea that knowledge is power was well received as the new regime tried to rebuild Japan as an advanced nation under the slogan "rich country, strong army". One of the first steps towards achieving this goal was to develop human resources through education. As early as the end of the Tokugawa period, Fukuzawa wrote to his friend that training the people was vital to realizing a "rich country and strong army."[2] Education was conceived as a cornerstone of the modern state.

Students abroad

One of the means for fostering talent was to send students abroad. Already in the last years of the Edo period, a group of scholars and craftsmen had been sent along with official diplomatic missions to study outside Japan—first to Holland in 1862, then to Russia in 1866, and to the U. K. in 1867. Compared to these sporadic dispatches of the *bakufu*, the Meiji government earnestly set about enacting a policy for educating students abroad. The 1870 regulation for study abroad defines its purpose as follows: promoting study in Europe would enhance the prosperity of the state by encouraging the advancement of civilization and inspiring the people; there would be citizens well-versed in the political situation, manners and customs of European countries as well as knowledgeable about institutions, arts and sciences, and other subjects. Education here was thus considered key to the course of civilization. Let us now recall the fact that fifty-nine students, including five girls, accompanied the Iwakura mission. Although the students were free to choose the country to which they went, the authorities made surveys of the advanced fields in each country. For instance, Great Britain was said to be advanced in the fields of mechanics, commercial law, geology and mineralogy, iron-making, architecture, and shipbuilding, while in Germany it was such fields as politics, economy, physics, astronomy, geology and mineralogy, biology, medicine, and pharmacology that deserved special notice. In the first seven years of the Meiji era (1868-74), more than five hundred students went abroad, with 1871 as the peak. The United States was the most popular country, followed by the U.K., Germany, and France (Fig. 1). After 1872, however, the number of students dropped sharply.

This was due to the control policy of the Ministry of Education. Finances played a part. With the abolition of the *han* system in 1871, the Ministry of Education had to take over from the han and pay all the expenses of the study abroad project. Secondly, some students didn't devote themselves to study, and

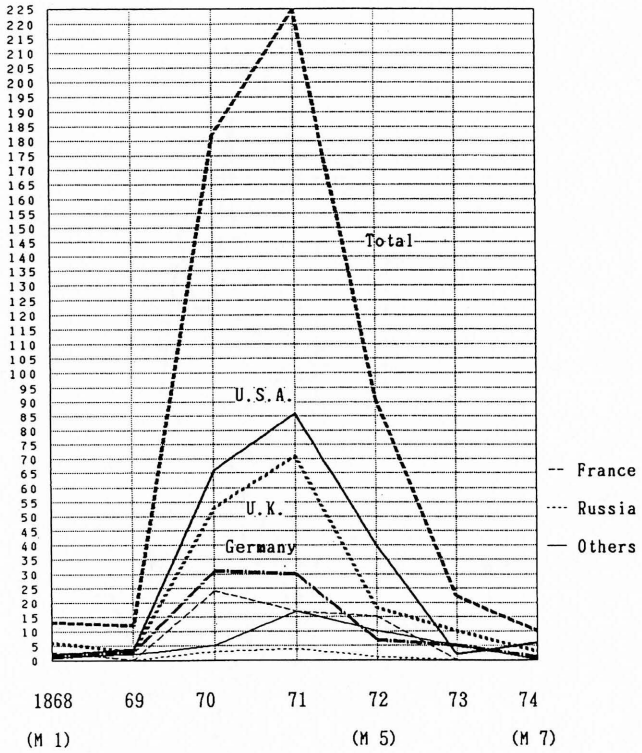

Fig. 1 Countries where students went for study

it was decided not to spend the government's scant funds on financing their stay abroad. A third reason was the ease with which students could change their subject of study. Since the government expected students to learn such practical fields (*jitsugaku*) as science, technology, or the industrial arts, which would contribute directly to the national prosperity, such random changes could not be tolerated. Government financial aid was abolished in 1873 when it amounted to about eighteen percent of the annual budget of the Ministry of Education, and a loan system was introduced instead.

The greatest number of students dispatched overseas by the Ministry of Education studied natural science (Fig. 2). Among those studying physics, mathematics, and chemistry, Germany was the most popular country (Fig. 3), while the USA attracted the greatest number of engineering majors (Fig. 4). A chronological table shows the changes in the total number of students abroad for each field (Fig. 5), and reveals that throughout the Meiji period engineering majors were the most numerous.

After returning home, the students who had gone abroad as physics and chemistry majors took up jobs almost exclusively in the educational sector,

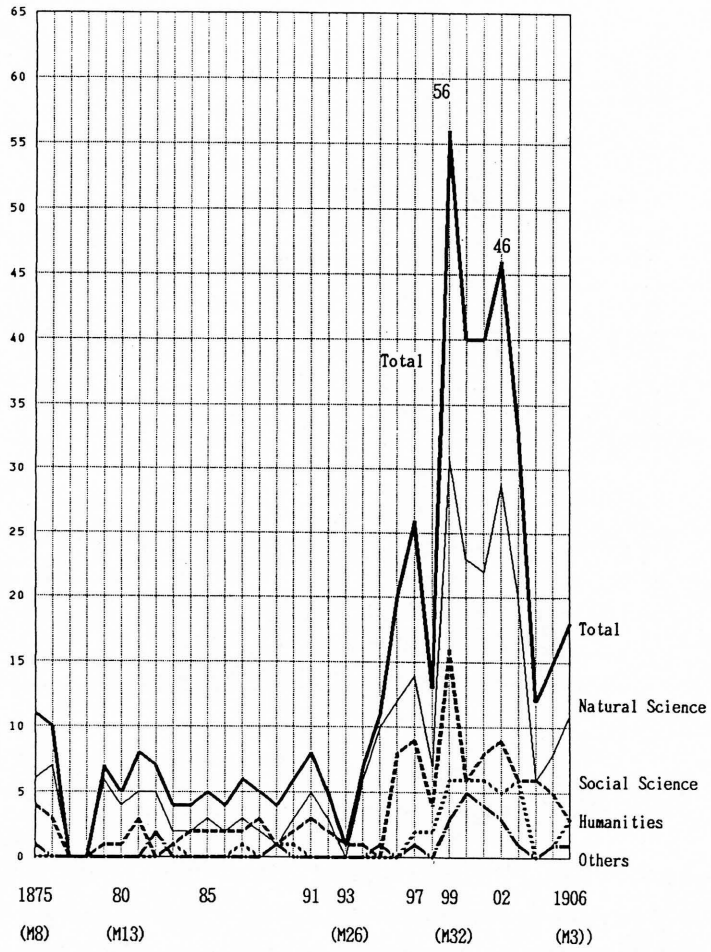

Fig. 2 Students sent abroad by the Ministry of Education

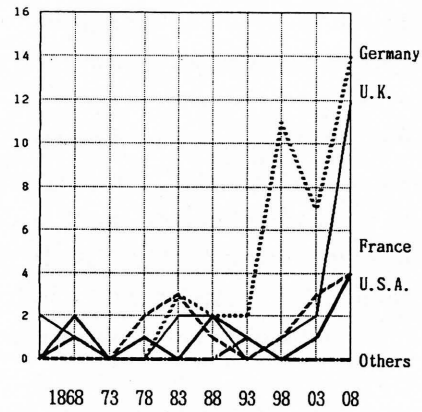

Fig. 3 A Overseas students: physics and mathematics

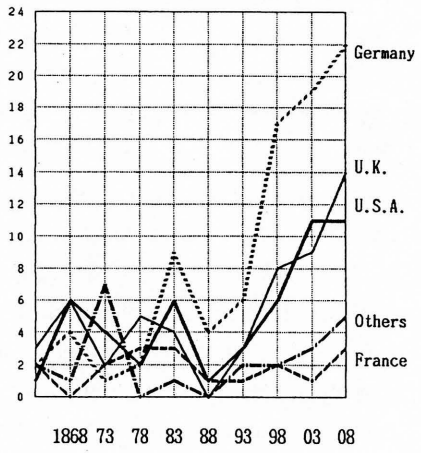

Fig. 3 B Overseas students: chemistry

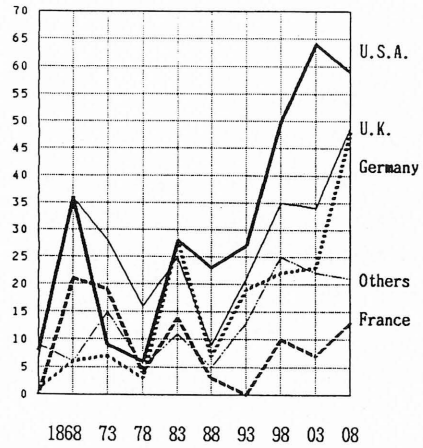

Fig. 4 Overseas students : engineering

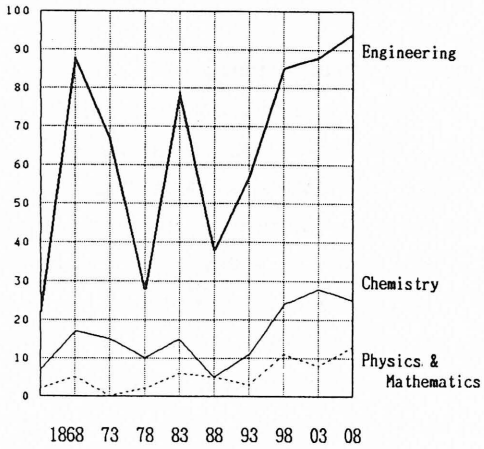

Fig. 5 Overseas students (total)

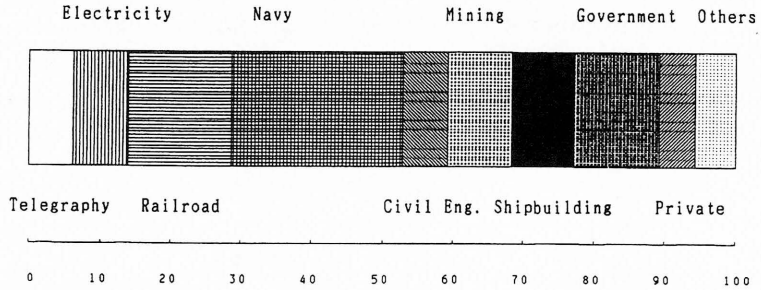

Fig. 6 Fields which overseas students went into after returning home

whereas engineering majors found employment across a wider range of professions. (In the first decade of the Meiji period, however, the majority went into the public sector). If we look more closely at the kinds of jobs that engineering majors entered after their return (Fig. 6), the navy, surprisingly, attracted almost a quarter of students for whom data are available (23.9%), while others worked in railroads (14.6%), government (Ministries of Public Works, Agriculture and Commerce, Education, Home Affairs, *Kaitakushi* [Bureau for Land Development in Hokkaido area] etc.) (11.9%), mining (9.0%) and shipbuilding (8.8%), in that order. The navy attracted students who had specialised in mechanical engineering and shipbuilding. Most civil engineering majors went into railroad construction and government service (national or local), and some of them also worked for the navy on various construction jobs. Though it waned by the end, mining was one of the leading enterpises in the Meiji period. The railway and telegraph, two of Fukuzawa's instruments of civilisation, were vital components of the infrastructure of a modern state, so their study attracted

many students.[3]

Yatoi or foreign employees

The Meiji government adopted a policy of employing foreigners to advise and help in building the fundamental structure of the new nation. The yatoi, or foreign employees, worked in both the public and private sectors. There was an increasing tendency for more foreigners to be employed in the private than in the public sector, although the growth rate in the total number of yatoi was only a little less than 1.4 percent between 1870 and 1900. Two major areas of employment were teaching and engineering. In the case of the public sector, the engineers were overtaken by the teachers by the 1880s, whereas in the private sector the engineers' lead lasted until the 1890s (Fig. 7).

We see from Fig. 8 the dominance of the U. K., especially in the Kôbusho (Ministry of Public Works). German teachers were the most numerous in the Ministry of Education, followed by British and American teachers. The British led the French in the number of employees in the navy, whereas the French dominated overwhelmingly in the army, because of close ties dating from the end of the Tokugawa period. In the Ministry of Foreign Affairs, Americans were top in number, followed by the British, the German and the French, while in the

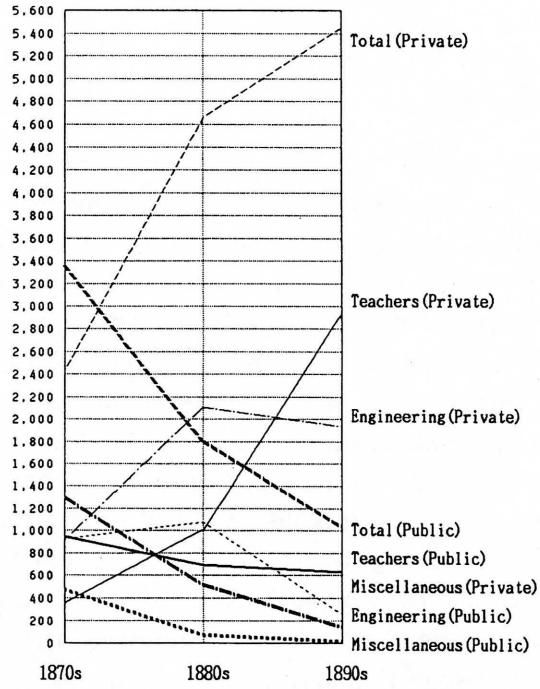

Fig. 7 Foreign employees (public/private sector)

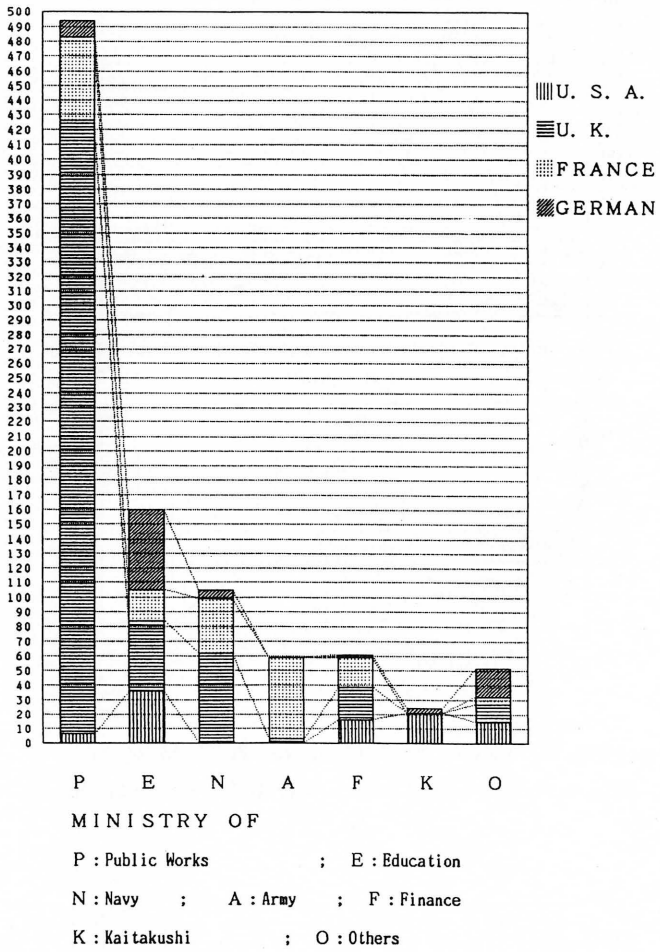

Fig. 8 Foreign employees (Country/Ministry)

Ministry of Home Affairs the Germans and the British were dominant, with no American and French workers. Within the Ministry of Public Works, the Department of Railroads employed large numbers of foreigners, most of them British. The Japanese railroad system was initiated under British supervision. The Departments of Railroads, Mining, and Lighthouses together employed more than eighty percent of the foreigners in the Ministry of Construction (Fig. 10 above). Except for the Department of Railroads, the percentage of foreigners among the total number of employees in each department dropped to less than fifty percent after 1878 (the eleventh year of the Meiji era) (Fig. 10 below). The total number of foreign employees in the public sector thus dropped from 527 in 1875 to 321 in 1878, and in the case of engineering from 205 in 1875 to 118 in 1878. By 1880, the number of foreign teachers as well as engineers had fallen to

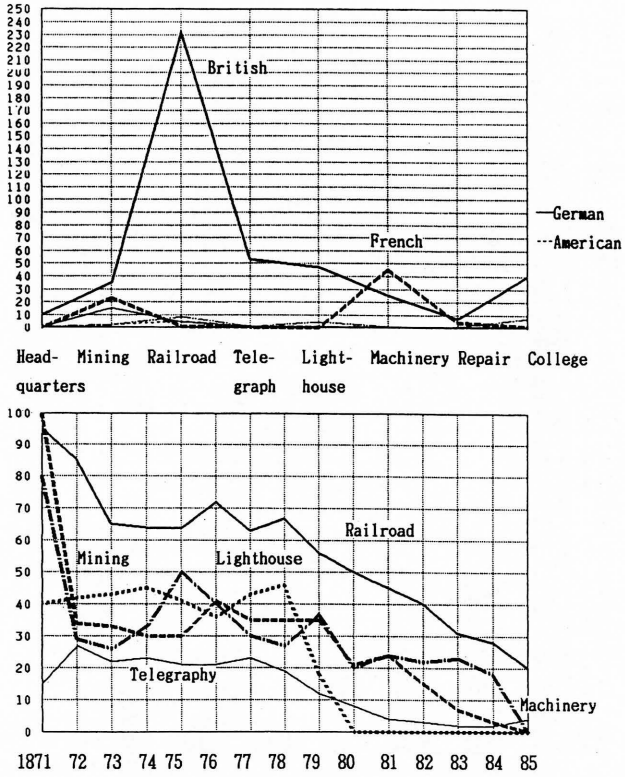

Fig. 9 Foreign employees in the Ministry of Public Works

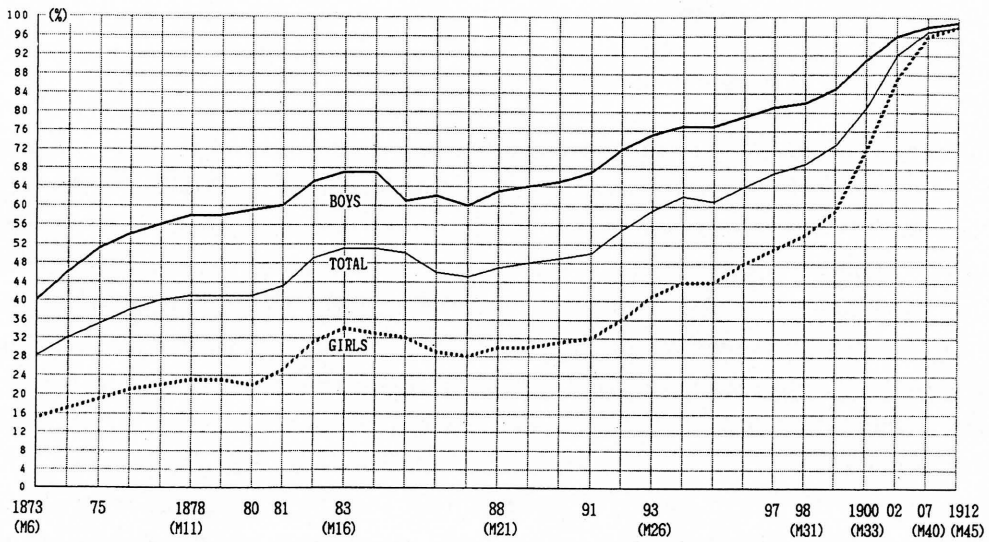

Fig. 10 The percentage of children in elementary school

half compared to its peak in 1874. This reflects the fact that the Japanese had taken over the jobs which foreigners had occupied earlier; the "japanisation" of these areas in engineering started from about this time.

Needless to say, the main reason for these changes lies in the fact that the Japanese scientists and engineers had gained enough experience to handle the jobs in which foreigners had been engaged. However, another pressing reason was financial. The government hired these foreigners with extremely high salaries. For instance, the Ministry of Education paid six hundred yen to the American advisor D. Murray in 1874, whereas the president of the University of Tokyo received 400 yen in the year of its foundation, 1877. Of the one hundred twenty–three foreign teachers of the Meiji period for whom salary data are available, twenty–six yatoi received more than four hundred yen, and fifty–four were paid between three hundred and four hundred. Thus, eighty teachers in total, sixty–five percent of all, received more than three hundred yen, and about twenty–one percent were paid better than or as well as the president of the University of Tokyo. The salary for foreign employees consumed about fourteen percent of the whole budget of the Ministry in 1874, while the University of Tokyo had to pay foreign professors about one–third of its budget in its first year of operation (1877–8). Such heavy financial burdens led administrators to encourage substitution with qualified Japanese.

An overview of the Meiji educational system

Let us briefly survey the history of the development of the Meiji educational system.[4]

The new government drew up plans for a nationwide modern educational system to enlighten the people. Its efforts materialized in 1871 when the Ministry of Education was established after seven other Ministries (Finance, Home Affairs, Military Affairs, Justice, Imperial Household, Foreign Affairs and Public Works). The *Gakusei*, or Educational Ordinance, was issued in August 1872. Outlining the fundamental philosophy of this educational reform, the Preamble to the Gakusei advanced a bold proposal, declaring that learning was the key to success in the world for all people : "It is only by studying hard to the best of their ability that people can make their way in the world". Although it encouraged children to go to school by referring to the idea that learning would bring success in life, yet the Ordinance was intended as the first step toward enriching the country and stabilizing public order.

According to the Gakusei, the whole country was divided into eight (later seven) large districts, and each large district was in turn divided into thirty–two middle districts (256 in all), where middle schools were to be established. These

middle districts were each divided into 210 still smaller districts (53,760 in total), in which elementary schools were to be created. This was of course an ideal plan, according to which one elementary school was founded for six hundred people, while one middle school served a population of one hundred and thirty thousand. 12,597 elementary schools (a great number in itself) and only twenty middle schools were created in the first year, 1873; some 25,750 elementary schools — about half of the number in the original plan— and 314 middle schools existed at the end of the Meiji period. The marvelous results achieved in educational reform can be seen in the percentages of children attending elementary school. From Fig. 10, we see about forty percent of boys went to school in the beginning, but it quickly hit fifty percent in two years and, after a long period of stagnation it reached seventy percent in 1892. Showing a rather rapid rise after 1891, it reached eighty percent in 1899, and crossing the border of ninety percent in 1900, it climbed to 98.8 percent at the end of Meiji times. The education of girls lagged markedly behind. Just fifteen percent attended school in the first year, and it took almost a quarter of century before attendance crossed the fifty percent line (1897); afterwards, however, attendance displayed a steep rise, quickly reaching sixty percent in 1899, seventy in 1900, eighty in 1901, ninety

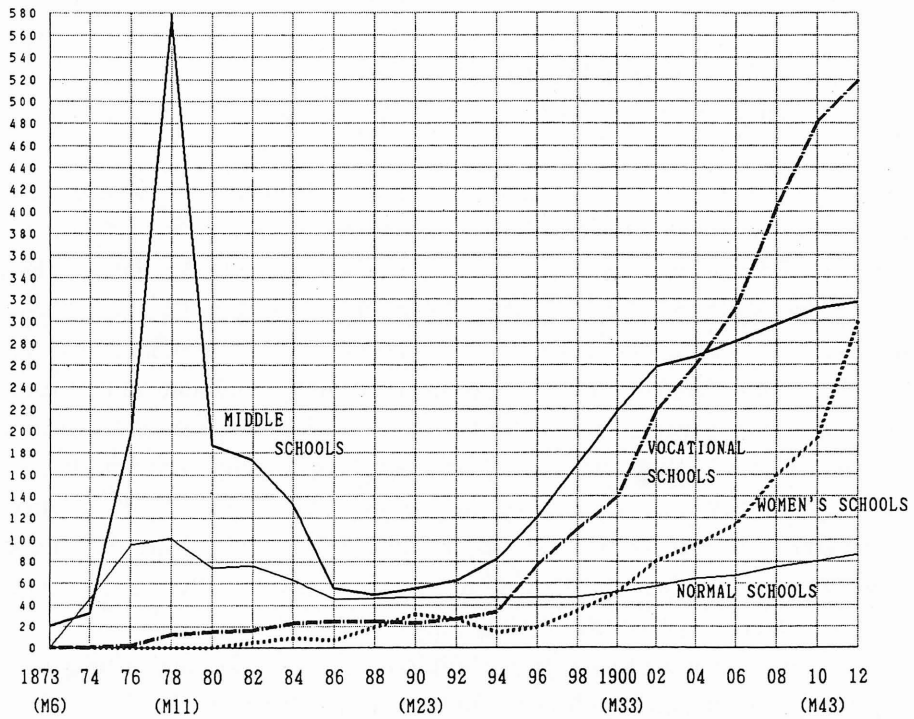

Fig. 11 The number of schools at secondary school level

in 1904, and ended up at 97.6 percent. The sharp rise was caused by the institution of compulsory education in 1900. The long interval of stagnation for both boys and girls owed partly to financial pressures and partly to a series of educational reforms (1878, 1880, 1885) which reduced the eight year course of study to four years (the minimum requirement was four months a year, i. e., sixteen months at the elementary level), and dampened public enthusiasm for school-going.

As for secondary education, middle schools were, in the beginning, supposed to give an opportunity for education to children aged fourteen to nineteen. Since the Gakusei set a high standard for middle schools (one middle school among 210 elementary schools), other types of schools were created to teach those who could not enter middle schools (see "Vocational schools" in Fig. 11). These were schools for industry, commerce, agriculture, interpreter-training and "folk-schools". The folk-schools (*shomin gakkô*) were night schools meant for male workers over eighteen years old, which also served to give preparatory vocational education to children twelve to seventeen years old. In short, a variety of educational channels were made available.

Chronological table of Meiji educational development

1868 (Meiji1)	*Igakkô* (Medical School) and *Kaisei Gakkô* were established
1869 (M2)	Igakkô becomes the Eastern Campus, and Kaisei Gakkô becomes the Southern Campus
1871 (M4)	Ministry of Education created
1872 (M5)	Gakusei or Education Ordinance issued Normal School established in Tokyo
1875 (M8)	School age set as between the ages of six to fourteen
1877 (M10)	School of Engineering of the Ministry of Public Works renamed the (Imperial) College of Engineering The University of Tokyo founded
1879 (M12)	Education Act tightens standards for middle schools, resulting in a sharp drop in student numbers the following year
1881 (M14)	Tokyo Mechanic's Institute founded
1885 (M18)	Ministry of Public Works abolished; Imperial College of Engineering placed under the supervision of the Ministry of Education, and incorporated in the Imperial University in the following year
1886 (M19)	Imperial University of Tokyo started

	The First and Third Higher Middle Schools (High Schools), and
	Superior Normal School founded
1890 (M23)	Women's Higher Normal School founded
1893 (M26)	Chair system (*kôzasei*) introduced in the Imperial University
	Inoue Kowashi becomes the Minister of Education
1897 (M30)	Kyoto Imperial University founded
1903 (M36)	Special Training School Act enacted
1907 (M40)	Tôhoku Imperial University founded in Sendai
1910 (M43)	Kyûshû Imperial University founded in Fukuoka

Institutions of higher education

After many vagaries, the University of Tokyo was founded in April 1877 (the tenth year of Meiji). Let me briefly discuss its prehistory.[5]

The Kaisei Gakkô

The Kaisei Gakkô started in 1869 as a reorganized version of the Edo period Kaiseijo. Although it was subsequently known under a variety of names—the Southern Campus, the First Middle School of the First Larger District, Tokyo Kaisei Gakkô—all these institutions can be considered nothing more than preparatory stages for the Faculties of Law and Science of the University of Tokyo. When the Gakusei was promulgated, the Southern Campus became the first government middle school, where students were to acquire sufficient ability in foreign languages to pursue specialized, higher level education. Thus, it served as a preparatory institution.

When this government middle school was renamed the Kaisei Gakkô in 1873, it was no longer a middle school, and not a university, either. It was identified as the *senmon gakkô* (specialized school), a prestigious institution where education was given in foreign languages, and whose goal was the acquisition of the advanced arts and sciences of the West. Although first-year students were engaged exclusively in foreign language training, upper classmen spent much of their amount of time studying science and mathematics. The Kaisei Gakkô had five specialized courses: law, chemistry, engineering, polytechnique, and mining. Only the first three were regular courses, however, and the latter two were considered temporary. When the specialized school system was established, the Ministry of Education ordered a focus on the English language, and abolished the French and German classes. In order to help those students who had studied the latter two languages, a course for polytechnique

was established for French classes, and a mining course for German classes. Two years later, the French course for polytechnique was incorporated into a newly established French course for physics, while the German course for mining was abolished. All these four courses became predecessors of the Faculties of Science and Law of the University of Tokyo.

To supply preparatory foreign language training for applicants to the Kaisei Gakkô, where teaching was conducted only in foreign languages, seven Foreign Language Schools were created in various places. The name of these schools were changed into English Language Schools when English became the sole language of the Kaisei Gakkô. Owing to financial difficulties, however, five of these schools were abolished in 1877, leaving the Tokyo and Osaka schools. The last was soon reorganized into a college of specialized education, and one, the Tokyo English Language School remained as a preparatory institution.

In 1877, the same year when five English Language Schools were abolished, the Kaisei Gakkô, together with the Tokyo Medical School (former the Eastern Campus), became Tokyo University. These two schools were united to form the first modern university in Japan. The Tokyo English Language School became the preparatory school for the University by merger with the preparatory course of the Kaisei Gakkô.

Imperial College of Engineering

Right after the Ministry of Public Works (Kôbusho) was created in 1871, Yamao Yôzô (1837–1917), who was the fifth highest rank official in the Ministry at that time and became the Minister about nine years later, formed a plan to found a school for engineering attached to the Ministry.[6] He advocated the need to train men of practical knowledge by saying that "those who want to advance the civilization of the nation are all required to let persons possess knowledge and proceed into the course of public welfare." He proposed to build a preparatory school where boys under sixteen would study for two years, as well as an engineering college where these boys, after finishing their two-year preparatory courses, would be trained in various fields of engineering through actual practice. In spite of Yamao's eagerness to establish this school as early as possible, there were difficulties in finding and employing proper foreign teachers. The job of hunting for these competent teachers was entrusted to Ito Hirobumi (1841–1901), then Vice-Minister for Public Works, who was visiting London as a member of the Iwakura mission.

Twenty-four-year-old Henry Dyer (1848–1918) was recommended for Principal of the new college by his teacher William J. M. Rankine (1820–72), a professor of Glasgow University. Dyer landed on Yokohama in June 1873, and

eight foreign professors soon joined him. Thirty-two students were admitted, and the school for engineering started in August 1873. It happened that both Yamao and Dyer had studied at Anderson's College in Glasgow, and this coincidence helped foster trust and cooperation between the two.

Dyer's plan was far wider and thorough than Yamao's. Students were supposed to study for six years at the College, going through three stages of two years each: introductory courses, advanced specialized courses, and practical training. The College had seven specializations: civil engineering, mechanical engineering, telegraphy, architecture, practical chemistry, mining, and metallurgy. The branch for shipbuilding was created in 1882. Following the British practical tradition of engineering training, and the new curriculum at Zurich's Polytechnikum, Dyer stressed the importance of the education of engineers as learned profession. He required students not only to reach a high level of comprehension in their specializations, but also to achieve practical mastery. Thus practical training was emphasized in the curricula of the College. For instance, for the last two years, students were dispatched to different sites around the country in order to take part in ongoing construction works under the supervision of the various departments of the Ministry of Public Works, such as mining, railroad, lighthouse, telegraphy, and civil engineering.

Dyer and his colleagues devoted themselves passionately to teaching. Dyer took charge of lecturing in civil engineering and mechanical engineering, using the textbooks written by his mentor Rankine in both fields, and William E. Ayrton (1847–1908) taught electrical engineering and physics. Together with John Perry (1850–1920), a successor to Dyer in civil engineering, Ayrton published many articles on electrical experiments. Both of them had been students of Lord Kelvin. Edward Divers (1837–1912), a student of Hoffmann at the Royal College of Chemistry in London, eventually succeeded Dyer as Principal, and stayed for twenty-six years in Japan, continuing his yatoi career as a professor at the Imperial University of Tokyo until 1899. All of these teachers ultimately assumed important teaching jobs after they returned home. For instance, Divers became the vice-president of London Chemical Society in 1900, and the head of the chemistry branch of the BAAS in 1902. As Dyer himself admitted, the enthusiasm of these foreign teachers in carrying out their duties was responsible for the success of the College of Engineering.

In 1879, twenty-three students completed the course as the first graduates of the College. Throughout its existence (1873–1886) the College produced 211 graduates. We see that mining, civil engineering, and mechanical engineering were the top three majors among the graduates, while the number of graduates who specialized in metallurgy and shipbuilding was relatively small (Fig. 12). In

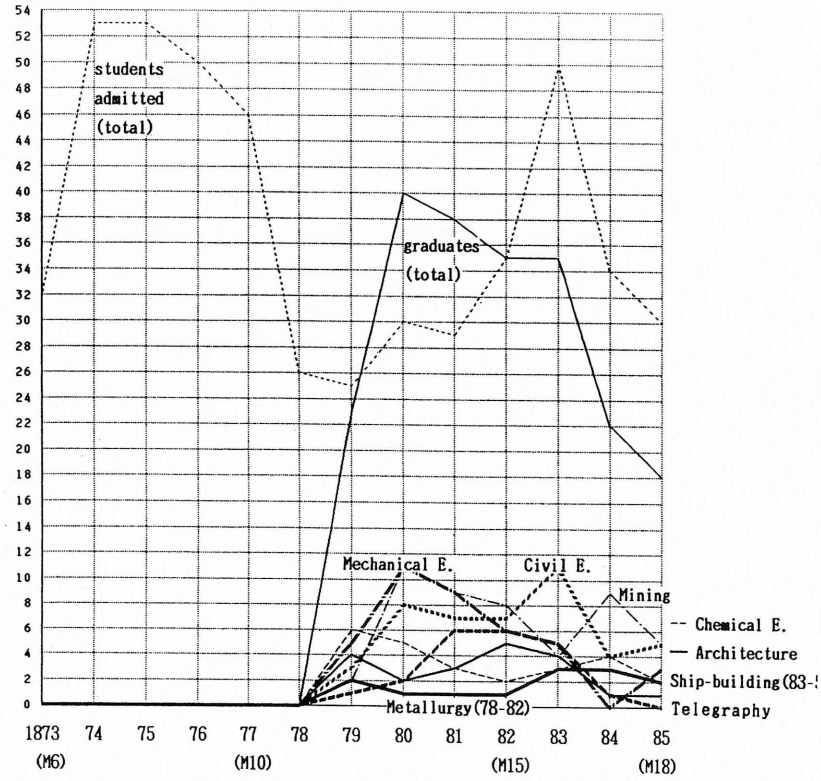

Fig. 12 Number of graduates from the Imperial College of Education

1882, ten graduates were appointed as faculty at their alma mater, and eight joined in the following year, although they were assistant professors. Graduates now became qualified to teach at the college level. When the College was incorporated into the Imperial University in 1886, three graduates occupied professorships at the Engineering College of the Imperial University, nine being graudates of either Kaisei Gakkô or Tokyo University. If we look at the backgrounds of those associate professors, six out of seven were graduates of the College of Engineering. Both the chairs for professor and associate professor in electrical engineering were occupied by graduates of the College of Engineering.

Since the students had received scholarships, they were required to serve the government for seven years after the completion of their studies. The majority of the early graduates went to work in the public sector, either as engineers in the Department of the Ministry of Public Works or teaching. Regulations were loosened in 1882, however, and there gradually appeared students who studied at their own expense, and then went on to work in the private sector. By the end of the Meiji period, many graduates were working in private sector. For instance, of 151 graduates whose data at the time of 1907 are available, fifty–

three were working in the private sector (including fifteen as executives of various companies), forty-three worked in government service, and twenty-six were engaged in teaching—sixteen as university professors and three as the principals of higher specialized schools.

The University of Tokyo and the Imperial University

The Kaisei Gakkô was the product of a transition period, and it created the need for an institution that would receive its graduates, who were now ready for lessons of a higher level. Thus, in 1877 Tokyo University started with four faculties : Law, Science, Literature, and Medicine. The Faculty of Science had six departments : chemistry, physics-mathematics-astronomy, biology, engineering, geology, and mining. Despite its name, the Faculty of Science included departments of engineering (civil as well as mechanical) and mining, and its chemistry department offered courses in applied chemistry. In 1878, three majors in civil engineering graduated from the university; and before the Imperial University came into existence in 1886, fifty-eight students had graduated from the four courses of engineering in the Faculty. About half of these fifty-eight were students of civil engineering, and a little less than thirty

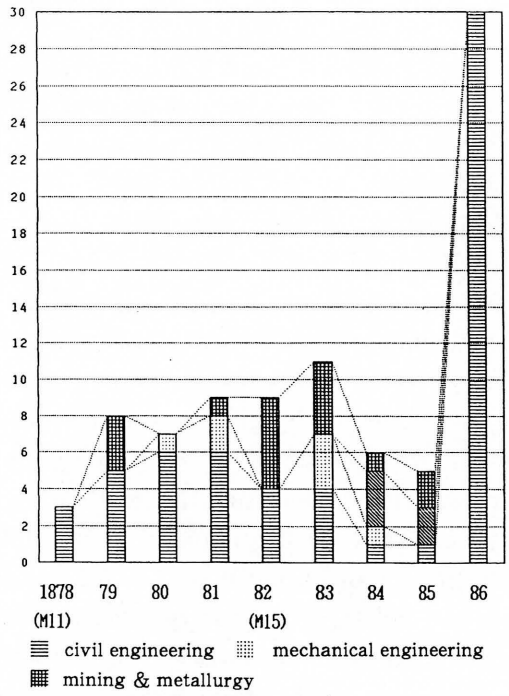

Fig. 13 The number of graduates from engineering-related departments in the Science Faculty

percent studied mining and metallurgy (Fig. 13). As far as engineering education is concerned, the University of Tokyo allocated only three years, whereas the College of Engineering of the Ministry of Public Works (CEMP) assigned four years of study at the upper level. Students of Tokyo University received practical training in engineering during the summer vacation. The CEMP had a much stronger program in practical training, giving full time to it in the last two years. CEMP was exclusively staffed by British foreign professors, whereas at Tokyo University an American worked in civil engineering, a French in mechanical engineering, and a German in mining and metallurgy. By 1855, 211 students had graduated from CEMP, whereas the Faculty of Science had produced only fifty-eight graduates.

The dominance of civil engineering in terms of the number of graduates was not challenged by other fields during the Meiji period (Fig. 14). The departments which produced more than hundred graduates in the period (1,315 graduates in all) were (in descending order of numbers): mechanical engineering, electrical engineering, mining and metallurgy, applied chemistry, and shipbuilding. As for the Faculty of Science, more than a quarter of students belonged to the physics department, followed by chemistry and botany (Fig. 15).

The Gakusei of 1872 simply defined a university as a specialized school of higher learning, and the Education Act of 1879 similarly spoke of a university as a place where special courses of law, science, medicine, literature and the like were given. The purpose of the Imperial University, on the other hand was "to teach arts and sciences in response to the necessities of the state, and to pursue research of deep significance to learning." While, then, the university was recognized for the first time as a place for high-level academic research, the aim

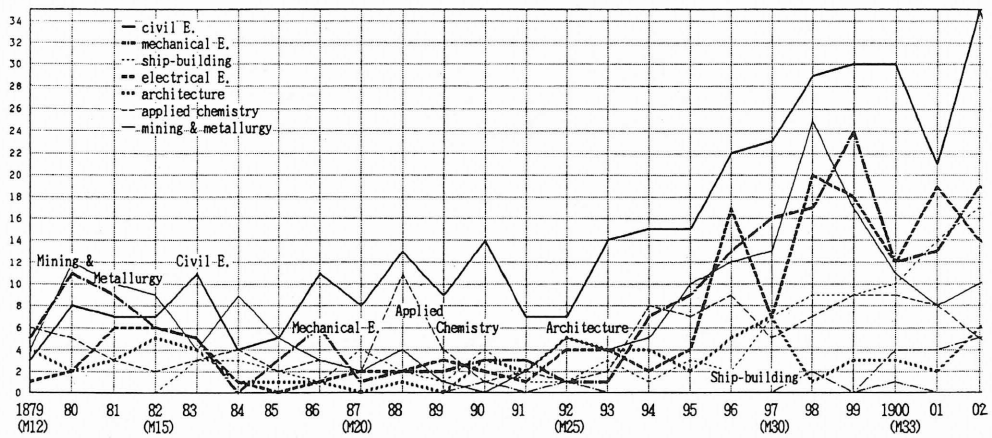

Fig. 14 The number of graduates of each department of the Faculty of Engineering

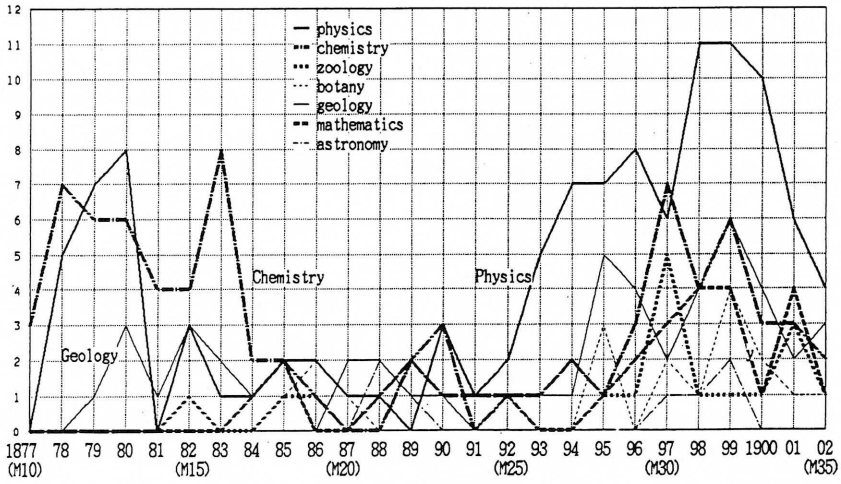

Fig. 15 The number of graduates of each department of the Faculty of Science

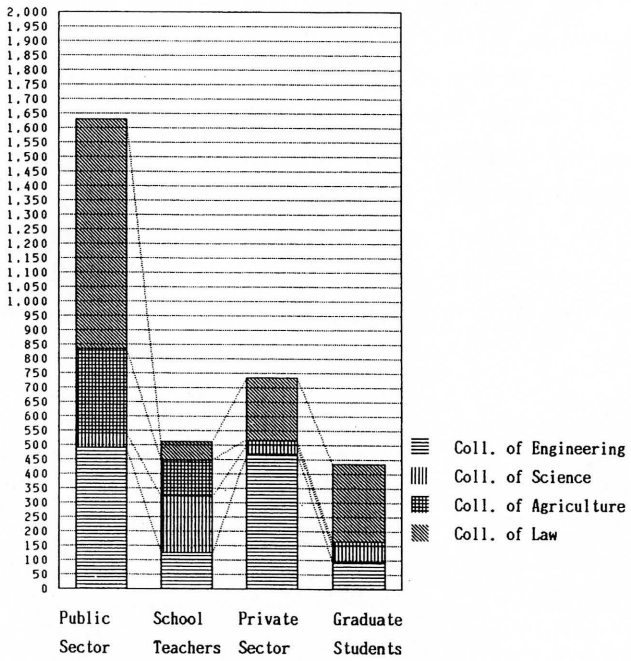

Fig. 16 Career course of the graduates of the Imperial University (1903)

of studies at the Imperial University was defined in terms of service to the state. From the beginning of the university, graduates of engineering-related departments in the Faculty of Science were meant to serve in the various branches of the government. Even as late as 1903, more than one-third of the

graduates of the College of Engineering went into governmental service as engineers, and nearly a half of the graduates of the College of Science became teachers at various schools (Fig. 16 & 17).

When the University of Tokyo was changed into the Imperial University in 1886, the Imperial College of Engineering (CEMP) was incorporated into the newly established College of Engineering of the Imperial University. In 1890, a school for agriculture and forestry (Tokyo Superior School for Agriculture and Forestry) was also merged into the University as the College of Agriculture. The

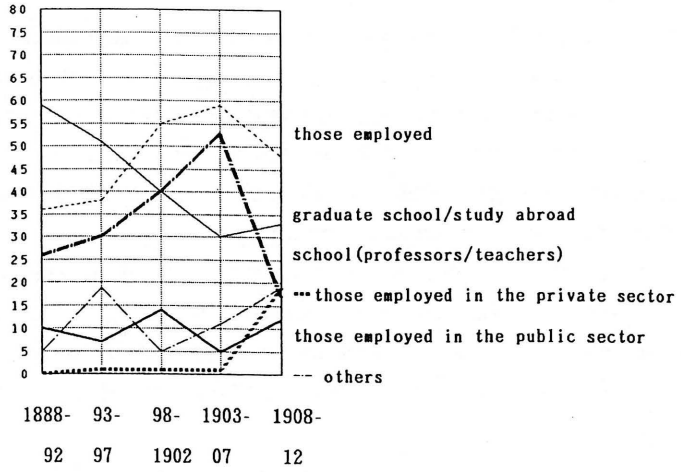

Fig. 17a Career course for graduates of the College of Science, Imperial University

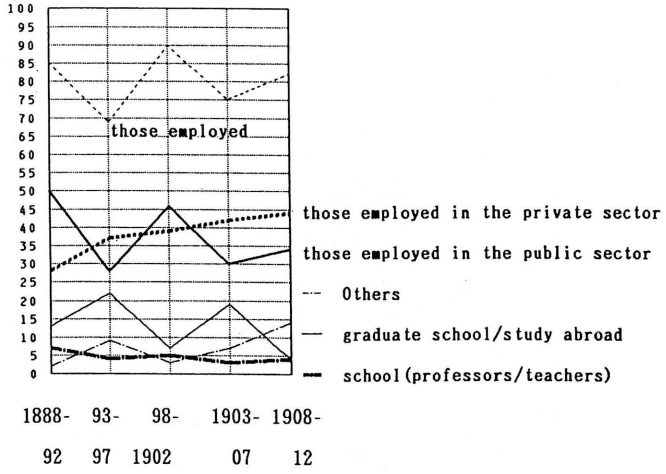

Fig. 17b Career course for graduates of the College of Engineering, Imperial University

fact that such practical training institutions for engineering or agriculture were incorporated into the university was rather unusual in Europe, where education in science and technology had traditionally been conducted quite separately. Without such a tradition, Japan had no difficulty incorporating them into the university. Thus a modern university with four scientific colleges, namely that of Science, Engineering, Medicine and Agriculture, came into being. This became the model for later imperial universities, and even for the organization of Japanese universities today.

Conclusion

As we have seen, the Meiji educational system was designed for the service of the state. Primary importance was laid on the urgent task of building of a new nation, for which education was considered crucial. Promoting industry was the first step torward a "rich country". It is for this reason that a great portion of the budget went to hiring foreign employees and dispatching students abroad. The university and various schools were no exception.

When we survey the number of the students at the University of Tokyo in early Meiji times, we are struck by how graduates majoring in engineering, who in the early years were the most numerous, were gradually overtaken by those majoring in law (Fig. 18). Moreover, among those enrolled in the Faculty of

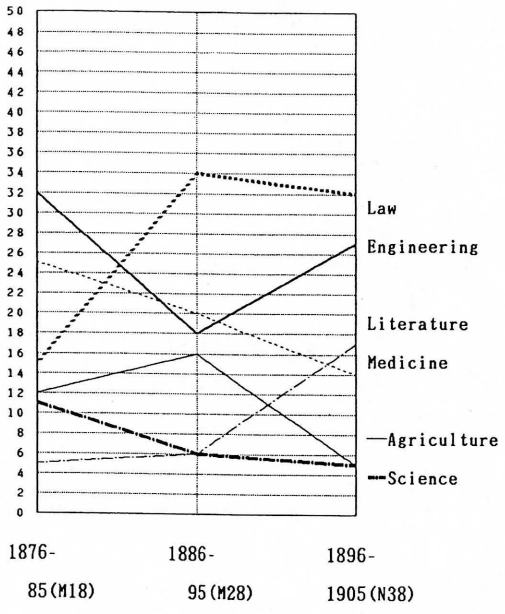

Fig. 18 Graduates of each college of the Imperial University (%)

Engineering, students from samurai families outnumbered those of commoner origin. The descendants of samurai were now striving to build the new nation through engineering. After graduation, the overwhelming majority of them worked in government service or on projects in the public sector. However, with the advent of the Imperial University, students in law became the majority, and although they too worked for the government as bureaucrats, they were engaged in a rather different mission. Emphasis was thus shifting from engineering to law –that is, from construction to legislative and administrative works.

Notes

1. Respectively, Kume Kunitake, *Beiô kairan jikki* (A true account of the tour of the special embassy to America and Europe), vol. 2 (Iwanami Bunko edition), 254, 68.
2. Quoted in Iida, *Fukuzawa Yukichi.*
3. In the sections on 'Students Abroad' and 'Foreign Employees' below, I repeated the discussion and figures presented in my previous paper: Yoshida Tadashi, " 'Tradition' vs. 'modern' in the Japanese context" in C. Jami et al., eds., *East Asian science: tradition and beyond* (Kansai University Press, 1995), 119–139. Among the many studies on these topics see, for instance, Ishizuki Minoru, *Kindai Nihon no kaigai ryûgaku* (A history of Japanese overseas students in the modern period) (Chûko Bunko, 1992); Umetani Noboru, *Oyatoi gaikokujin* (Foreigners in government service) (Kajima Shuppankai, 1968); Ogata Hiroyasu, *Seiyô kyôiku inyû no hôto* (The process of the introduction of Western education) (Kôdansha, 1961).
4. Information on this section is drawn from Matsumoto Kenji and Suzuki Hiroo, *Genten kindai kyôiku-shi* (Sourcebook: a history of education in the modern period) (Fukumura Shuppan, 1962).
5. For Tokyo University, see the multivolume *Tôkyô Daigaku hyakunen-shi* (A hundred-year history of the University of Tokyo) (Tokyo: Tokyo University Press, 1984).
6. For the Imperial College of Engineering of the Ministry of Public Works, see Miyoshi Nobuhiro's following works: *Nihon kôgyô kyôiku seiritsu-shi no kenkyû* (A study on the history of the establishment of industrial education in Japan) (Kazama Shobô, 1969), chap. 5; *Dyer no Nippon* (Dyer's Japan) (Fukumura Shuppan, 1989).