The Science Room as an Archive

*Taisho Japan and WWI*

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In 1918, the Ministry of Education ordered, for the first time, all junior high schools in Japan to incorporate students’ experiments into teaching and to secure a designated science room in a school building. This was part of the “science boom” in Japan brought about by WWI. With this and other guidelines, the Japanese government launched the first major science education reform since the Civilization and Enlightenment years of the Meiji period.

Historians have documented the ways in which the Great War fundamentally shaped modern science in Japan. ¹ Scholars have also examined the science education reform during the Great War years, mainly at the elementary school level through textbooks and supplemental guidebooks. ² This chapter examines one radical curriculum change during the Great War years that has received little attention from scholars: the introduction of students’ experiments to the classroom at the middle school level. ³

Kishiwada Junior High was one of the schools that immediately responded to the urging of the Ministry of Education by building new science classrooms in 1918. Located in the city of Kishiwada in Osaka’s Senshū region, home of the booming textile industry, Kishiwada Junior High (thereafter Kishikō, as locals call it) provided post-compulsory education to boys in the southern half of the prefecture as well as the northern part of the neighboring Wakayama prefecture. While belonging to the oldest and more prestigious group of junior high schools, the so-called “number schools” in the prefecture, Kishikō was neither the wealthiest nor the most elite among them. Nonetheless, as a result of the science education reform, Kishikō acquired multiple rooms for various science subjects.

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³ Middle schools [*中等学校*] in prewar Japan consisted of junior high schools, normal schools, girls’ higher schools, and various kinds of practical schools; among them, junior high schools and normal schools were the target of the curricular change I discuss. In this chapter, I focus on junior high schools, where boys who graduated from the compulsory elementary schools went. Most junior high schools became high schools [*高等学校*] after WWII.
This chapter uses Kishikō’s science rooms as an archive for Taisho Japan’s relation to the Great War and the world. The approach is unique in the history of science education in Japan, in which the textbook-focused approach has been the norm. Also, while scholarship has conventionally examined either university-level research activities or the elementary school curriculum, this chapter focuses on the middle schools, as their dramatic expansion in the 1910s and 1920s was indeed a significant indicator of economic changes, the formation of the new middle class, and industrial growth during Taisho Japan.

Kishikō offers rare access to the science education reform of the WWI years because the school has kept the records of purchasing experiment tools, specimen collections, and room furniture since Meiji years. It has also preserved more than 100 experiment tools and specimen collections from the Meiji, Taisho, and Showa periods. This is a uniquely rich treasure box for historians. Some elite former high schools, namely the Third High (present Kyoto University) and the Fourth High (Kanazawa University), maintain excellent collections of this sort, but former junior high schools rarely kept any such physical trace of science curriculum of the past. Kishikō’s collection is most likely one of the largest – and quite possibly one of the few existing – collections from former junior high schools in Japan.

The experiment room and materials at Kishikō attest to the moment in Japanese history when hands-on experiments by students – now a standard feature of the science curriculum – became the focus of pedagogy for the first time. In this regard, Kishikō’s science rooms tell a story of the New Education movement, an international movement in the late-19th and early-20th century by such educators and intellectuals as John Dewey, Maria Montessori, Francis Parker, inspired by Johann Heinrich Pestalozzi, Johann Friedrich Herbart and others, who wanted to develop a child-centered pedagogy based on children’s desire to learn and their participation through practical work. In Japan, the

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4 I thank Mrs. Oguchi Etsuko, a former Kishikō teacher and independent scholar, and Mrs. Kakimoto and Mr. Karatsu, physics teachers at Kishikō, for sharing various materials and time. The original objects of the photos as well as school records used in this chapter are all stored at Kishikō’s archival room. The cataloguing of preserved instruments was done and published in 2002 by Mr. Yasufumi Nakaoka, a former physics teacher at Kishikō. The Third High collection is particularly well known and well catalogued. See Yukiko Nagahira, Kindai nihon to butsuri jikken kiki: Kyoto daigaku shozō Meiji Taishoki butsuri jikken kiki (Kyoto: Kyoto daigaku shuppankai, 2001).

5 The “new education” movement was also called the “new school” movement in England, and the “progressive education” movement in the US. For the New Education movement in Japan, see Sekai kyōikushi kenkyūkai, Nihon kyōiku shi, vols. I and II (Toyo: Kōdansha, 1975); Nagao Tomiji, ed., Shin kyōiku undō no riron (Tokyo: Meiji tosho, 1988); Kiuchi Yōichi,
New Education Movement developed into the Taisho Liberal Education movement [Taishō jiyū kyōiku undō] of the 1920s, culminating in the establishment of such alternative schools as Seijō Elementary School and Jiyū Gakuen and new media for children such as Suzuki Miekichi’s magazine Akai tori. “New Science,” shin rika, was a part of this international movement. While the New Science Education Movement in Japan has rarely received attention from scholars, it provides an interesting case in which liberal ideals of New Science were materialized by the government that deemed science education also important but for more practical purposes. The honeymoon between the state and the liberal science educators was short-lived, and its results were disappointing to most advocates of New Science.

Yet, the school science room, the physical trace of this honeymoon, tells more about Japan in the 1910s. I locate the Kishikō’s science classrooms at the intersection of the Great War and the international education movement, as well as that of Japan’s industrial growth and colonial expansion. My goal is to connect the school science room to WWI through a set of networks that become visible by examining various factors behind the new science room. They are the networks of educators, of commercialized educational materials, of the empire, and of what I call pedagogical seeing.

The Room: State Policy and the New Science Education Movement

In 1918, Kishikō was very proud to have completed its new science rooms:

Our school wanted to use this opportunity to improve teaching environment for biology, not just physics and chemistry, within the budget allocated for the latter subjects. We built a new biology room, remodeled the old biology room into a chemistry room for both lecture and experiment; we remodeled the physics storage room into a physics experiment room; the physics room with stair seating now became an exclusively physics lecture room. We furnished shelves in each room to store tools. This way, without any problem, we were able to upgrade all rooms for biology, physics, and chemistry. ...As a result, our school came to possess science rooms that were worthy of pride for a junior high school.6

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6 Kōshi hensan iinkai, Kishidawa kōtōgakkō no daiisseiki (Kishiwada, Osaka: Osaka furitsu kishiwada kōtō gakkō, 1997), 183. ©2007 Miki Sano
One room for biology, one room for chemistry, and two rooms for physics – four rooms assigned specifically for the science curriculum in a local junior high school: sounds extravagant indeed (Figure 16.1).

Science rooms, together with those ubiquitous drawings of room layout, are the quintessential visual embodiment and footprints of the New Science Education Movement in Taisho Japan. This is clear from pages of *Rika Kyōiku* [Science Education], a journal that began in 1918. Dedicated to the New Science Education ideals, this was the first journal in Japan that specialized in science pedagogy. Drawings of the science room layouts frequently appeared as part of the reports that various schools throughout the nation sent to the editors; they proudly demonstrated, through such submissions, their commitment to the new education.

New Science Education ideals had been introduced to Japan by the turn of the century, but the explicit promotion of student experiments began to be published in the early 1910s. Tanahashi Gentarō’s 1913 publication, *Science Education Pedagogy* [Shin rika kyōjuhō], is considered the pivotal text in this movement. A great advocate of Henry Armstrong’s “heuristic method” (translated to “discovery method” in Japanese), Tanahashi emphasized the importance of giving an opportunity for children to “discover” on their own through direct observation and experimentation. This book was written after his time.
spent studying abroad in Germany and the US, and he tirelessly advocated the necessity of experiment rooms that “in the West, even elementary schools, let alone junior high schools, have.” Throughout the 1910s and early 1920s, New Science promoters in Japan devoured pedagogical theories by Johann Heinrich Pestalozzi, Johann Friedrich Herbart, Henry Armstrong, Liberty Hyde Bailey and John Dewey, and discussed new developments such as New Schools, Nature Studies, and general science education in the US and Europe. Those who studied abroad passionately reported back the latest trends they observed at schools and science museums in major cities such as Chicago, New York, Berlin, and Paris, as well as smaller cities like Gary, Indiana, that were receiving international attention. The New Education was a buzzword both in the West and in Japan.

To many advocates, students’ direct experience with natural phenomena, rather than memorization of the textbook or passive observation of the teacher’s demonstration, was the key to a truly scientific education. For them, this was not about an efficient accumulation of scientific facts in the student's brain. It was meant to be a more holistic, fundamental education to create a thinking person with the independent, scientific, and civic mind. Students’ hands-on experimentation and the well-equipped science room that enabled it were deemed essential to this ideal.

In Japan, for many advocates, the ultimate objective of the New Science Education Movement was to nurture the scientific spirit among the Japanese people, as a critical challenge to the Meiji curricula by the authoritarian, bureaucratic state and its militarism. For example, Sano Riki, professor of architecture at Tokyo Imperial University, advocated science as “the only thing that would secure the future of the nation” against “empty


8 Sally G. Kohlstedt, Teaching Children Science: Hands-On Nature Study in North America, 1890–1930 (Chicago: University of Chicago Press, 2010). It is interesting to note that, unlike the important contribution that women educators made to the American Nature Studies movement, the Japanese counterpart lacked a significant woman figure. See also John L. Rudolph, “Turning Science to Account: Chicago and the General Science Movement in Secondary Education, 1905–1920.” Isis, v. 96, n. 3 (September 2005): 353–389. It is also interesting that wwt does not play any significant role in these American movements in the accounts by Kohlsted and Rudolph.
patriotism...constructed through the education that renders dying in the war into the sole ethics.” Likewise, Sawayanagi Seitarō founded Seijō Gakuen in 1917, a famed alternative school of the Taisho Liberal Education Movement with a very progressive curriculum, to challenge the authoritarian and bureaucratic politics. Wada Yaezō, who was in charge of the science curriculum at Seijō Gakuen, was trained at a liberal arts college in the US, not at a Japanese normal school. Wada argued that the purpose of science education should be “to develop and nurture the scientific intelligence to secure and improve the life of the people [kokumin] for the next generation.”

While the New Science Education promoters assumed that the revision of science education would take a long time in Japan, the onset of WWI betrayed this pessimism. As the war continued in Europe, Japan was no longer able to import crucial industrial and pharmaceutical materials from Europe. This posed a serious challenge to a Japanese economy that had relied so heavily on Western products and resources. The Japanese government immediately issued special directives and established various ad hoc commissions for the purpose of promoting domestic research and development (R&D), leading to the opening of numerous research centers, an increase in university chairs in the fields of science and engineering, the establishment of private research funding, and so forth. “Domestic production” became a key phrase for solving the immediate problems as well as for determining the future direction of Japan.

The government and industry considered science education crucial for this new direction. Expecting the practical result along the lines of the Meiji slogan “Wealthy Nation, Strong Military,” the Taisho government expanded the science curriculum. At the elementary school, science now began at the 4th grade rather than the 5th grade. At the middle school, hours for science increased from four hours a week in the fourth and fifth years to additional two hours a week in the third year as well.

The Diet also approved the special budget of 205,220 yen in 1917 to finance new science room constructions at the nation’s junior high schools and normal schools. The following year, the Ministry of Education issued “the Guideline for Student Experiment in Physics and Chemistry at Middle Schools,” requiring all the junior high schools and normal schools to incorporate student experiments into the classroom. The 1918 Guideline stipulated in detail which lessons in physics and chemistry textbooks needed to be accompanied by what kind of

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9 Nippon kagaku gijutsu taikei, v. 9, 383.
10 See Bartholomew, Formation of Japanese Science, for details.
practical work. Renowned biologist Oka Asajirō described this sudden promotion of science as follows:

In the past, shortsighted politicians and businessmen treated science as if it were a hobby of dilettantes, paying no attention to its benefit. Now, facing the great problem [caused by the war in Europe], people suddenly started talking about science, just like a herd of birds flying up at once, and loudly demanding the promotion of scientific research.

New Science Education promoters welcomed this state initiative. Tanahashi Gentarō responded by writing in his Revised New Science Pedagogy in 1918 that “I assumed that it would take a decade or some decades for Japan to accept student experiments in the classroom, but due to the European War, it was all of sudden put into practice, only several years after [the initial publication of this book]. I am deeply satisfied.” In the words of one junior high teacher in Hiroshima, “for us the science teachers, this is the most rewarding time in our profession.”

Local governments were even more enthusiastic about the promotion of science education than the central government in Tokyo. When the central government requested supplemental budgets from each prefectural government, prefectural governments responded immediately and enthusiastically, though the amount of funding they came up with varied greatly. For example, Ishikawa Prefecture set aside 29,000 yen within its 1918 budget, but Iwate Prefecture only set aside 13,000 yen. Nationally, the total of 1,689,569 yen was contributed from prefectural governments. The total of 377 schools in the nation —
public junior high schools, 53 private junior high schools, and 12 normal schools – applied for the special funding. One school received anywhere between 420 yen and 8917 yen. The average amount per school was 2600 yen, of which only 550 yen came from the central government’s budget. This reflected the expectation these local governments held that the science education should contribute to local industry and economy.

Building new science experiment rooms was costly because the rooms required water, gas, and electricity, in addition to various equipment, storage space, specialized benches, and ideally a dark room. One of the most extravagant cases was Hiroshima Higher Normal School’s Junior High, which spent as much as 19,115 yen to construct chemistry and physics experiment rooms from scratch. Yet, this figure was not completely outrageous. In Ōita Prefecture, 14% of the schools spent more than 10,000 yen on room construction. When funding from the governments failed to cover all the costs, some prefectures raised tuition.

As a result of this new policy, most junior high schools in the nation obtained a science room. According to a survey conducted in 1921, only 13% of junior highs lacked a room specifically designated for science experiments. As there were 385 junior high schools in Japan at the time, a simple calculation reveals that only about 50 schools in the entire nation had no separate science room. The majority of the junior high schools were equipped with one or two science rooms, multi-tasking them for physics, chemistry, and biology. On the other end of the spectrum were about 15% of the schools that had the luxury of having three or four separate rooms to be used for each subject of science, as was the case of Kishikō.

Kishikō teachers must have been very pleased with the expansion of the science rooms, as the New Education movement was popular there too. According to the school chronicle,

The new trend of the New Education influenced Kishiwada as well. Workshops and study groups were frequently held at each school, across
the city, and across the prefecture, to exchange ideas about theoretical and practical aspects of the New Education…. When a national conference or workshop took place, teachers went whether it was in [nearby cities like] Nara and Akashi or remote cities such as Hiroshima, Tokyo, and Nagano, using their own pocket money.21

Records show that Kishikō teachers also went to lecture at workshops for elementary school teachers.22 Kishikō’s rich collection of science materials was in part a result of these teachers who used their own pocket money to learn and teach the latest educational trend and pedagogical techniques. Although we do not have a record of how much Kishikō received for the new science rooms, the scale of the construction indicates a large amount. This was no doubt assisted by the fact that the Senshū region was economically supported by the booming textile industry.23

In other words, those newly constructed science rooms at Kishikō embodied the educators’ desire to introduce the student-centered learning environment, the government’s demand for an effective teaching environment for an internationally competitive Japan, and the local government’s expectation for more vigorous economy.

Student experiment required more than the physical space of the room. Experiment instruments were also a necessary part of the science room. The next section will place the science room at the intersection of the growing domestic industry of scientific instruments, and the formation of a new middle class that composed the student body at junior high schools in Taisho Japan.

### The Physics Experiment Room: Capitalism and the Rise of the New Middle Class.

Kishikō purchased a variety of experiment materials for the physics and chemistry curricula in 1918 and 1919. The surviving school ledger gives us an excellent look at what tools and materials educators purchased. In 1918, Kishikō spent

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21 Kishidawa kōtōgakkō no daiisseiki, 174.
22 Kaihō, vol. 21 (November 1919): 1. Kaihō was the monthly school journal of Kishiwada Junior High.
23 Its largest spinning factory, Kishiwada Bōseki, is remembered for the 1930 strike by Korean and Japanese factory girls. Kim Ch’an-jŏng, Chōsenjin jokō no uta (Tokyo: Iwanami shinsho, 1982). Prefectures and areas that had budgetary problems could not allocate much funding for the student experiment requirement, as was the case with Shizuoka Prefecture. See Sakai & Isozaki.
335 yen on physics; it made no purchase specifically for chemistry. In 1919, the expense for physics was 444 yen 40 sen, while chemistry was 103 yen 22 sen. The most expensive purchases included a generator (dynamo) for 290 yen, a voltage converter for 280 yen, and an electric bulb for 140 yen, all for physics experiments. Since the previous years’ expenses had been much smaller, we can assume that these 1918 and 1919 purchases were made with help of the government special funding (Figure 16.2). Some items were clearly for student experiments, such as an order of fifty-five burette tables in 1918.

Yet, if we also examine Meiji entries on the ledger, it becomes immediately clear that this was not the only time that Kishikō purchased expensive materials for the science curriculum. In fact, Kishikō purchased experiment tools most actively in the 1900s, well before the government initiative; especially during the years following the opening of the school in 1897, Kishikō spent even more than during the Taisho period (Figure 16.3). The late Meiji purchases included very expensive items, such as a projector (magic lantern) in 1901 for 300 yen (including sets of educational slides), and a Crookes tube for 380 yen for a teacher to demonstrate an experiment of electrostatic discharge. This indicates that Kishikō was probably able to use most of the supplemental funding during WWI for the room construction and remodeling, as the school had already accumulated decent sets of materials over the last two decades. Subsequently, it is possible to speculate that the 1918 ordinance by the Ministry of Education mattered most crucially to those junior high schools that were newly established and needed to furnish science rooms from scratch.

And there were many such schools, as middle school education expanded dramatically in Taisho Japan. From 1917 to 1926, the number of junior high schools jumped about by 1.6, from 329 to 518. The number of students increased at an even higher pace, as the 1917 revision of the Junior High School Edict increased the enrollment cap per school from 600 to 800. In 1895, only 5% of boys in Japan went on to the middle school level. By the end of the Taisho period, the figure reached almost 20%. In actual numbers, students who attended junior high schools more than doubled from 147,467 in 1917 to 316,759 in 1926. This was the case for girls too. In 1895, only 1.3% girls went to a middle school (girls’ higher school, girls’ normal school, or equivalent practical schools); in 1925, the figure was 14.1%. The middle-school student enrollment, for both boys and girls, continued to increase through prewar years. As the income level of the Japanese increased, more Japanese went beyond the compulsory elementary school.24
Thus, the Ministry of Education’s ordinance to promote student experiment at the junior high level should not be understood as targeting only the small

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number of the nation’s elite. Middle schools, especially junior highs, were increasingly becoming part of ordinary middle-class life in Taisho Japan. It makes sense that New Science Education promoters tended to speak as if junior high education were part of the fundamental, civic education. As I quoted earlier, advocates such as Wada considered it to be part of the “people’s life” of the next generation, not as the specialized, privileged preparation for high school entrance examination for the tiny elite.

Consequently, the function of junior high school was greatly debated during WWI years and in the 1920s. As more and more young Japanese went on to attend junior high schools, its significance as the place for the higher civic education gained more attention. Since only a small percentage of junior high graduates went on further to high schools (prep schools for college), more educators and policy makers began to think that the role of junior high schools should be the producer of the solid middle strata of the Japanese population and labor force, rather than that of the elite leaders of the nation. At the same time, however, since the competition to enter high schools became fiercer (a larger number of junior high students competing over the limited spots in high schools), preparation for the entrance exams became a more urgent
agenda for junior high schools. These two goals were not compatible, with a competing priority over the efficient memorization of information necessary for entrance examinations vs. the fundamental understanding of the natural laws that called for time-consuming student experiment. The junior high science room, therefore, was not only the embodiment of the promotion of science education but also contained competing visions for the role of the middle school education that directly reflected the formation of a new middle class in Taisho Japan.

Another important dimension of the physical space of the school science room is experiment tools. The dominant supplier of experiment tools at Kishikō was a company named Shimadzu Corporation [Shimadzu Seisakusho]. This was the case with most schools of all levels, including elementary schools as well as prestigious high schools such as the Third High and the Fourth High, especially in the Kansai region where the company headquarters were located. The government could not even have conceived of mandating all junior high schools to utilize student experiments, had there not been the availability of reasonably-priced domestic supplies of experiment materials and the maturity of that industry. This material factor behind the government policy should not be taken lightly. Shimadzu Corporation's growth as the pioneer in this area was a pre-requisite for the science education reform during WWI in Japan.

Shimadzu Corporation was established in 1875 by Shimadzu Genzō in Kyoto. Son of a craftsman of Buddhist alters, Genzō transformed his craft knowledge of metal and wood works into a new business in scientific instruments, with an amazing entrepreneur vision and training received from Gottfried Wagener, a government-hired chemical engineer from Germany whose office, Seimikyoku (an industrial chemistry laboratory later to be

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25 One new public junior high school in Tokyo attempted to resolve this tension by “training the person with characters [jinkakusha] by prioritizing scientific observation skills as the foundation of daily life...when science education these days regrettably inclined to become too practical...” This Sixth Junior High in Tokyo proposed to incorporate a more holistic “nature studies” approach rather than relying on the existing division of the school subjects, to use the reader materials to acquire scientific knowledge, and to visit the newly built Riken [National Physics and Chemistry Research Institute] across the street as part of field trips. “Rikagaku to shutosuru shinsetsu no furitsu gochū,” Tokyo Asahi shimbun, December 17, 1918: 5.


27 This is the same Shimadzu Corporation where Tanaka Köichi, Nobel Prize laureate in chemistry in 2002, is employed.
incorporated into the Third High School), was located across the street from Genzō's store. By the early 1880s, Genzō began manufacturing a wide range of scientific and medical instruments, won prizes at various industrial fairs in Japan, and established his name in the industry of scientific and educational instruments.

Under his son, Shimadzu Genzō Jr., who succeeded him in the business, the company developed into the first-rate corporation in Japan. Born gifted in mechanical and physical engineering, Genzō Jr. grew up in his father's store and Wagener's lab. At the age of fifteen, Genzō succeeded in manufacturing the electric generator in 1885 by modeling after the Wimshurst influence machine, which had been perfected by James Wimshurst only a few years earlier. Genzō Jr.'s machine immediately became available to schools in Japan as the “Shimadzu electricity” and was used widely for decades. At the age of nineteen, Genzō Jr. began teaching at the Kyoto Normal School. Meanwhile, Shimadzu expanded its business by building new branch stores in Osaka, Okayama, and Kanazawa and by adding more space to its factories and main store front in Kyoto, with the entire second floor dedicated to displaying instruments and demonstrating experiments.28

The 1890s and 1900s, the decades of Shimadzu’s rapid growth, coincided with the establishment of higher education in Japan, especially in the Kansai region. Newly opened schools included the Third High in 1894, Osaka Industrial College [Osaka kyōgyō daigaku] in 1896, Kyoto Imperial University and especially its College of Science and Engineering in 1897, and Nara Women’s Normal School in 1908. The earliest junior high schools in Kansai opened their doors during those decades, including Kishikō in 1897. Shimadzu grew as the higher education system in Japan did. By 1906, its catalogue listed more than 3000 instruments in a wide range of areas including mechanics, electromagnetics, thermology, acoustics, optics, radium, and chemistry.29

Until the mid-Meiji period, most scientific instruments in Japan were imported from Europe and the US. They were expensive. British products were in general the most expensive, followed by German products. Starting in the mid 1880s, however, domestic products began to enter the market. According to records of Third High School, among its experiment and research instruments acquired between 1898 and 1924, fifty recorded items were domestic products, with 36 of them by Shimadzu.30 By the 1900s, when Kishikō made
numerous purchases, the school was able to procure a wide range of materials from Shimadzu (specimen, physics lab tools, so forth) for a more affordable price. Approximately half of all Kishokō’s materials were made by or purchased via Shimadzu.

The ascendance of Shimadzu did not happen automatically. Since the mid Meiji period, Shimadzu marketed its products aggressively, by holding experiment demonstrations throughout the nation at various meetings and conferences related to education. Once the state announced the new guideline for student experiments, Shimadzu added a new line of experiment tools accordingly, such as measuring scales and experiment benches. That is, things that had been imported so far, Shimadzu took an aggressive initiative to mass-produce, anticipating the needs created by the curriculum change. Shimadzu also successfully marketed its storage batteries useful for newly constructed school experiment rooms. Scholarship on science education rarely pays attention to companies such as Shimadzu, but it is worth considering the role that these companies and their marketing strategies might have played in the promotion of students’ experiments in Japan.

Shimadzu greatly profited from the state promotion of science in Japan during the Great War. It met the urgent needs created by the blockage of European imports as well as the drastic expansion of research centers, higher educational institutions in science and engineering, the mandate for student experiments at junior high and normal schools, and the “experiment boom” among elementary and girls’ schools. In the absence of German products, for example, Shimadzu’s GS Storage Battery, developed in the 1900s, came to receive orders from the Navy and the Ministry of Transportation, as well as from research centers and schools. To solve “the national crisis,” Shimadzu made its battery section into a new buttery company, with a financial help of Mitsubishi. Shimadzu itself became a corporation in 1917, with the backing of powerful finance houses in Kansai, as its market expanded to include the colonies. At the end of the war, Shimadzu Corporation was one successful business that supplied scientific instruments to the empire.

The Specimen Collection: The Empire and Pedagogical Seeing

Biology was not a subject included in the government science education reform, but it was an important subject for the New Science Education movement. In the final Section I invite the reader to Kishikō’s biology room, where WWI enriched its specimen collection as well.
Kishikō’s biology room boasted a rich specimen collection of insects, animals, plants, and minerals. The school record shows that it had already accumulated a good collection by the mid 1910s. This may have something to do with one teacher who taught biology in 1899–1901 at Kishikō, Kuriyama Shōhei. Kuriyama was a skilled collector-researcher of plants and sea creatures and a friend of Minakata Kumagusu, one of the most internationally renowned Japanese naturalists at the time. Kuriyama remained an active collector-researcher during his Kishikō years; we know this because his specimen of a *myra cleris galil* (tenaga kobushi gani) submitted in 1899 from Kishiwada is still preserved in the Tokyo Imperial University Natural History Museum. Kishikō’s numerous tools for dissection as well as various specimens of plants, animal body parts, and stuffed animals were probably ordered by him during his three-year tenure. His personal role, however, should not be over-emphasized, as many materials, including nice Leica microscopes, were also purchased after he had transferred to another school.

Kishikō’s collection in fact testifies to the wide distribution of specimen boxes and jarred animals in formalin at the junior high level by the 1910s. As explained earlier, New Science advocates considered direct observation of natural objects as an important pedagogical process. Shimadzu’s role here, just like its role in physics and chemistry experiment instruments, was immense. Shimadzu established a new Specimen Production section in 1891, steadily expanded it over the years, and dominated the market well before the science education promotion during WWI. Kishikō was one of many schools in the nation that contributed to Shimadzu’s sales by continuing to order new sets of specimen collections as the company expanded its repertoires.

An immense impact on Kishikō’s biology room by WWI is apparent. For example, as we have seen, the school managed to use the government supplement funding for physics and chemistry to build a new biology room as well. Kishikō also purchased a particularly large number of mineral, botanical, and animal specimens in 1917, 1918, and 1919, along with physics and chemistry experiment equipment.

New purchases for the biology class included more than 50 specimens that the school principal, Miura Kikutarō, collected during his trip in 1918 to Nan’yo, the South Pacific region that Japan occupied due to German retreat. It is worth noting that a local junior high principal was touring Nan’yo already, before the official conclusion of the war. Most likely, Miura joined an “observation trip” orchestrated by the local government or the military for educators, as this was a common way for schoolteachers to visit the Empire. We know, for example,
that Miura’s successor, Principal Ochiai, went to Manchuria three times as part of his official duty.31

Principal Miura, upon returning from his 10-day trip to Nan’yo on September 4, gave a lecture titled “About Newly Occupied Nan’yo” in front of the entire school. In detail, he explained Nan’yo’s geography, peoples, customs, natural resources and their significance for the Japanese Empire. His lecture was full of numbers (as to specific locations of islands, population of the native peoples, etc) and detailed names. “There are those who speak of birth control these days,” Principal Miura spoke: “But I disagree. Our population should be larger, and we should send our energetic youth abroad to the south and the north.” He ended his talk with a message: Japanese capitalists seem to exploit native laborers, but such phenomena darkens the future of Japan and should be amended. Together with this story, Principal Miura brought back specimens of a hawks bill turtle, a long-tail tropicbird, a sea shell of Cassis cornutus – all stuffed and preserved – as well as a boxed collection of tropical plants native in Nan’yo and many more: the total of more than fifty sets of specimen. They were displayed at school first and then used for class.32

The natural history materials in the classroom, therefore, were not simply a collection of dead animals and stones simply stuffed in wooden boxes. These specimens came with narratives and meanings attached, of the Nan’yo as an exotic place with tropical plants, rare creatures, important natural resources, unfamiliar peoples, and most importantly of the triumphant Japanese Empire that now occupied such a far-away territory. They transformed Kishikō students into the scientific Japanese who could categorize those fauna, flora, and native peoples into the systematic knowledge with academic names. They bridged the periphery of the empire and a not-so-urban region of the metropole, erasing the physical as well as psychological distance that might have hindered those boys from becoming adventurers and honorable capitalists.

31 Ochiai’s third trip was to participate in the All Junior High School Principals Conference of Greater Japan, held in Shinkyo in 1934. Kishiwada kōtō gakkō no daiisseiki, 181. Records show that as early as 1906, three teachers and six students from Kishikō visited Manchuria and Korea. For school trips at other schools, see Song An’nei, “Hyōgoken kyōikukai ni yoru kyōin no ‘shina mansen shisatsu ryokō,‘” Shakai shisutemukan’kyō, v. 21: 115–142. See also Ueda Takuji, “Meijiki o shutoshita ‘kaigai kankō ryokō’ nit suite,” Nagoya gaikokugo daigaku gendai kokusai gakubu kiyō, vol. 6 (March 2010).

We may say that the newly acquired specimen collections from Nan'yo provided a “pedagogical seeing” of the empire. The prevalence of pedagogical seeing in Taisho Japan is well documented by scholars who have studied fairs and exhibitions. During the decade and half of Taisho, there held at least 116 major exhibitions and fairs. It is, perhaps, possible to say that commercialized imperial spectacle and pedagogical seeing defined Taisho culture. Iwan Rhys Morus argues that seeing – and its power to convince the viewer – was a central aspect of science as the process of knowledge-making and knowledge-legitimizing in the 19th century Europe. This was true even after science became a firmly established field of knowledge. In Taisho Japan, too, seeing was considered crucial for the scientific education of the masses, as Tanahashi Gentarō and New Science promoters argued.

The Japanese indeed saw a great deal of “science” in numerous fairs and exhibitions. Take, for example, the most popular fair in Taisho Japan, the Tokyo Taisho Exhibition of 1914 that attracted 6,470,000 visitors during the four months of its opening. As the mission of this fair was to showcase the progress Japan made since the Meiji Restoration, science and technology was a major display factor. Visitors saw the first domestically produced Japanese car, DAT, the predecessor of Datsun; the cable car that went over Shinobazu-no-ike; the first escalator in Japan; and various agricultural and industrial technologies in pavilions such as the Coal Mine Pavilion (the first pavilion devoted to the industry). Even an entertainment pavilion, the Island of Beauties, was advertised as the “application of science,” as the clever use of light and mirrors magically illuminated beautiful women like magic lanterns. The fantastic technological and scientific advancement was displayed side by side with the pavilions from the Japanese empire such as the Taiwan Pavilion and the Korea Pavilion.

The symbiosis of science and the empire on the fairground was seen at many other popular exhibitions. The Peace Exhibition of 1922, held at Ueno Park to commemorate the end of WWI, featured the “water airplane,” the modified glider that roamed around on the water of Shinobazu-no-ike with the Asahi beer advertisement; and a real airplane produced by Japanese at the Airplane Pavilion. Also occupying this exhibition space, along with other

33 For example, see Yoshimi Shun’ya, Hakurankai no seijigaku: manazashi no kindai (Tokyo: Chūō kōronsha, 1992).
36 Yamada and Yasuda, 40.
industrial and technological pavilions, were colonial pavilions such as the Nan'yo Pavilion, the Korea Pavilion, and the Manchu-Mongolian Pavilion.37

Kishikō's science classroom belonged to this Taisho Japan. Students did not have to travel to a far-away exhibition to see the flora and fauna of Nan'yo; the empire came to them in boxes of specimen, together with the principal's story of the place and its significance to the empire. It is possible to assume that many other schools' science rooms were connected to the empire through this pedagogical seeing, as Kishikō was one of numerous schools whose principals and teachers were invited to join the tour of Nan'yo and other parts of the empire.

**Beyond the Science Room**

Despite initial enthusiasm, New Education Science movement promoters were disappointed by the lack of any immediate effect of student experiments on children's learning. One most frequently mentioned reason was the lack of teachers capable of effectively guiding student experiments. For example, Kanbe Isaburō, in his 1922 book, *Learning-Centered New Pedagogy of Science*, lamented that many teachers simply transferred the burden of doing the experiments to the student. He also criticized that teachers often cared more about strictly following the guideline instruction than using experiments as an opportunity to induce their curiosity and questions.38

Disappointment like Kanbe's was shared by elementary school teachers who quickly dominated the New Science Education movement. It was probably and ironically because of the lack of special government funding that elementary school educators actively discussed and exchanged ideas about how to make simple experimental tools by themselves and how to guide students within the confines of limited resources. In the words of Ujiie Yuuki, the author of *Detailed Instruction of Science Experiments in Elementary School*, “it was a big mistake to think that students' scientific mind would be nurtured if they conducted experiments by themselves.”39 The frustration turned to despair when in the 1930s the reactionary emphasis on ultra-nationalist spiritualism in education dumped the New Science Education movement and the succeeding Liberal Education movement.

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37 Yamada and Yasuda, 49–51.
38 Kanbe Isaburō, *Rika no shin shidōhō* (1922), in *Nippon kagaku gijutsushi* vol. 9, 395.
As Ujiie’s words reveal, however, the sense of disappointment came from their assumption that doing experiments would automatically lead students to the “scientific mind,” a kind of independent, critical mind they envisioned. While it is understandable that child-centered learning and self-discovery were meant to challenge the more authoritarian style of textbook memorization, conducting experiments as told by teachers does not inherently entail an exercise of a critical mind or democratic politics.

Mark Lincicome in his study of the “international education movement” in Japan between 1905 and 1931 argues that scholarship has painted too dominating a picture of the powerful school system disseminating emperor-centered nationalism. As a result, he maintains, it “tends to overlook, downplay, or dismiss evidence of challenges to the status quo that was allegedly established by the early 1890s. To appreciate the dynamic, even contentious history of educational development in Japan after 1890, and its convoluted role in the dissemination of nationalism and the formation of Japan’s imagined community before World War II, requires that those challenges be examined more closely.”40 I agree with Lincicome, but the New Science Education movement examined in this chapter complicates this picture. The New Science Education movement shared the same pedagogical ideals with the other new education movements but was supported and materialized as part of the state promotion of science. It embodied both challenges to and support of the state’s agenda, thereby refusing to be located in the binary of the emperor-centered nationalism and internationalism that Lincicome sets up.

This rejection of the binary illuminates the ambiguous place of science in wartime Japan (both World Wars) and in Taisho liberalism. Science experiments continued to be utilized at a higher rate in the curriculum. According to one survey, in 1921, after most junior high schools built science rooms, only 11 percent of the junior high schools fully incorporated student experiments into the third year curriculum as stipulated, 24% for the fourth year, and 32% for the fifth year. By 1928, however, the figure increased to 83% of all junior high schools.41 This indicates that, while the immediate impact of the 1918 curriculum change was disappointingly limited to contemporary observers, its long-term effect – the normalization of student experiments – was far-reaching. At the same time, the high percentage of student experiments in the late 1920s did not convince the successors of New Education teachers, Taisho Liberal

41 Katagiri & Iozaki, 16.
Education reformers, that science education in Japan had improved. Their continuing frustration with the science curriculum, in fact, would later lead them to celebrate the next major science education reform in 1941, as the wartime government mobilized effective science pedagogy for total war. The tension between the wartime state ideology – emperor-centered ultranationalism – and liberal ideals of individuality and creative thinking was noticeable but ignored. Historians generally portray this as a hard-won triumph of liberal educators whose Taisho Movement failed but nonetheless persisted beyond the dark period of the 1930s. However, as I have argued elsewhere, science education could easily be mobilized for the production of the scientifically capable imperial subject obedient to the state and imperial duties. The vision of a scientific Japan, including the concept of the scientific mind, was something that could easily be co-opted into the state's goal of a militarily and economically competitive empire. The case of the New Science Education movement in Taisho Japan demonstrates that the cooperation between the liberal education movement and the wartime government was already set in the years of WWI.

If we step outside of the science rooms, Kishikō's history does reveal something of which New Education advocates might have approved. Kishiko held theme-based educational fairs annually during the Taisho period. As seen in the list below, most of the themes were related to science and technology (in parenthesis are teachers who supervised the production):

1915 Measurement Fair (math and science teachers)
1916 Transportation Fair (geography teachers)
1917 Time Fair (math and science teachers)
1918 Letters Fair (reader and English teachers)
1919 Earth Fair (math, science, natural sciences, geography teachers)
1920 Energy Fair (math and science teachers)
1921 Measurement Fair (math and science teachers)

For these fairs, students conducted their own research, consulted with experts at universities and research institutions, organized information, and presented it with visual display. In other words, here we actually see students actively involved in knowledge making for the public. Nearby elementary schools made a field trip to Kishikō fairs, Kyoto University professors were invited to give

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43 Kishiwada kōtō gakkō no daisseiki, 186–188. The pamphlet is mentioned on 188.
Figure 16.4  Cover of a Kishiko student fair book, Records of the Earth Fair, 1918 (photo taken by the author).
public lectures, and other schools borrowed materials and information from Kishikō in order to hold fairs on similar themes. Some fairs even resulted in publications such as a little booklet, “Report from the Earth Fair,” that came out of the 1919 Earth Fair (Figure 16.4).44

It is impossible to read adequate and accurate meanings out of these school events here, as we have such scant records of science fairs at junior high schools in Taisho Japan. There is no indication that these events were promoted by the government, but there is also no information about how much students’ initiative took place or what these fairs meant to the students. The science fairs at Kishikō were discontinued after 1921. Yet, these extra-curricular student activities strongly suggest that historians need to look not just at textbook and policy changes, but also at various events and activities that took place in and beyond the science classroom in order to better understand the New Science Education movement and the wartime state promotion of science.

In addition, rather than seeing the student experiment from the perspective of a success or failure of the liberal education, we want to pay attention to the colonial, commercial, and industrial networks that constituted the new space of the science rooms in Taisho Japan. This space was materialized not only due to the international education movement and the state wartime promotion of science, but also due to the availability of inexpensive experiment instruments that were domestically produced and vigorously marketed by Shimadzu. The space tells a story of a Japanese company taking advantage of wwi, transforming Japan reliant on European imports to a nation of competitive domestic supplies, and growing to be the dominant corporation for the empire. The space was also composed of specimen collections brought back from Nan’yo, the newly acquired territory of the Japanese empire, and an increasing number of students whose family background was becoming more middle-class than elite. Direct observation of the nature through these specimens provided a pedagogical seeing of the empire to students. The science room in Taisho Japan was a dynamic space. For a historian, it is a place composed of physical, intellectual, and political traces of various networks and stories of Taisho Japan, an archive of a sort.

44 Kishiwada kōtō gakkō no daiisseiki, 188.