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Ideology in Science Textbooks for Japanese Students in East Asian Colonies: Focusing on Plant Species that Appear in Manchuria Textbooks

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Abstract

Colonial education worldwide has relied on various concepts, from trying to mirror the content of the sovereign country to developing unique content pertaining to the colonies themselves. In this paper, we examined the nature of colonial education for the Japanese in northeast China ("Manchuria") during the colonial period from the viewpoint of the kinds of plants that were the subject of science textbooks. We categorized land plants based on their distribution range and/or usage and quantitatively evaluated their appearance frequencies. We found that useful plants appeared most frequently in the textbooks, suggesting a specific agricultural policy intent. From the perspective of species distribution, plant taxa that are distributed across both Japan and Manchuria frequently appeared, whereas only three Japanese endemic species were cited. Our study suggests the goal of educating students who were likely to be accepted in both the colony and the sovereign state.

Keywords: colonization, elementary school, History of education, flora, Manchuria

INTRODUCTION

Revealing the actual state of education in Japan's colonies is a meaningful effort that allows us to reflect on the past and learn lessons to ensure that wartime education does not reoccur. On the other hand, it has also been pointed out that some aspects of the teaching methods could be used as a reference for the present day (Ikeda & Kurokawa, 2020).

It is known that education is susceptible to the effects of wartime policies (Mart, 2011). Colonization was conducted not only through physical control but also through mental control, which was achieved through education (Mart, 2011). Hence, studies have been conducted to determine the reality of education in past colonies around the world. For example, White (1996) compared Britain's and France's respective educational approaches in their African colonies. He indicated that the British approach can be summarized as indirect domination, whereas the French approach was generally centralized and direct. Such a complex matter suggests that the sovereign state's influence in the colonies does not always affect schools and curricula, highlighting the fact that education varies from colony to colony (Sweeting & Vickers, 2007).

In East Asia and the Pacific during the early twentieth century, Japan came to dominate a huge geographical range. The colonies under its control at that time included Korea, Taiwan, and Micronesia. Other regions, though not formal colonies, were under the control of Japan; this was the case for Manchuria, an area now known as northeast China (Figure 1). Although the Manchuria region was under the sovereign control of China, Japan first acquired some rights in some areas of the region following the Russo–Japanese War (1904–1905). Japan created two colonial organs, the Kwantung Leased Territorial government (Kanto Shu) and the South Manchuria Railway. While the former was a governing body with jurisdiction over cities such as Dalian and Lushun, the latter was a semi-governmental, semi-private, state-run company with jurisdiction over cities such as Mukden. In August 1909, these two organizations joined to form the South Manchuria Education Association, with the aim to carry out educational activities (Ikeda & Kurokawa, 2020). The Japanese military invaded the region in 1931 and founded the puppet state of Manchukuo in 1932. Before then, education in Manchuria was not largely required

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Contribution to the literature

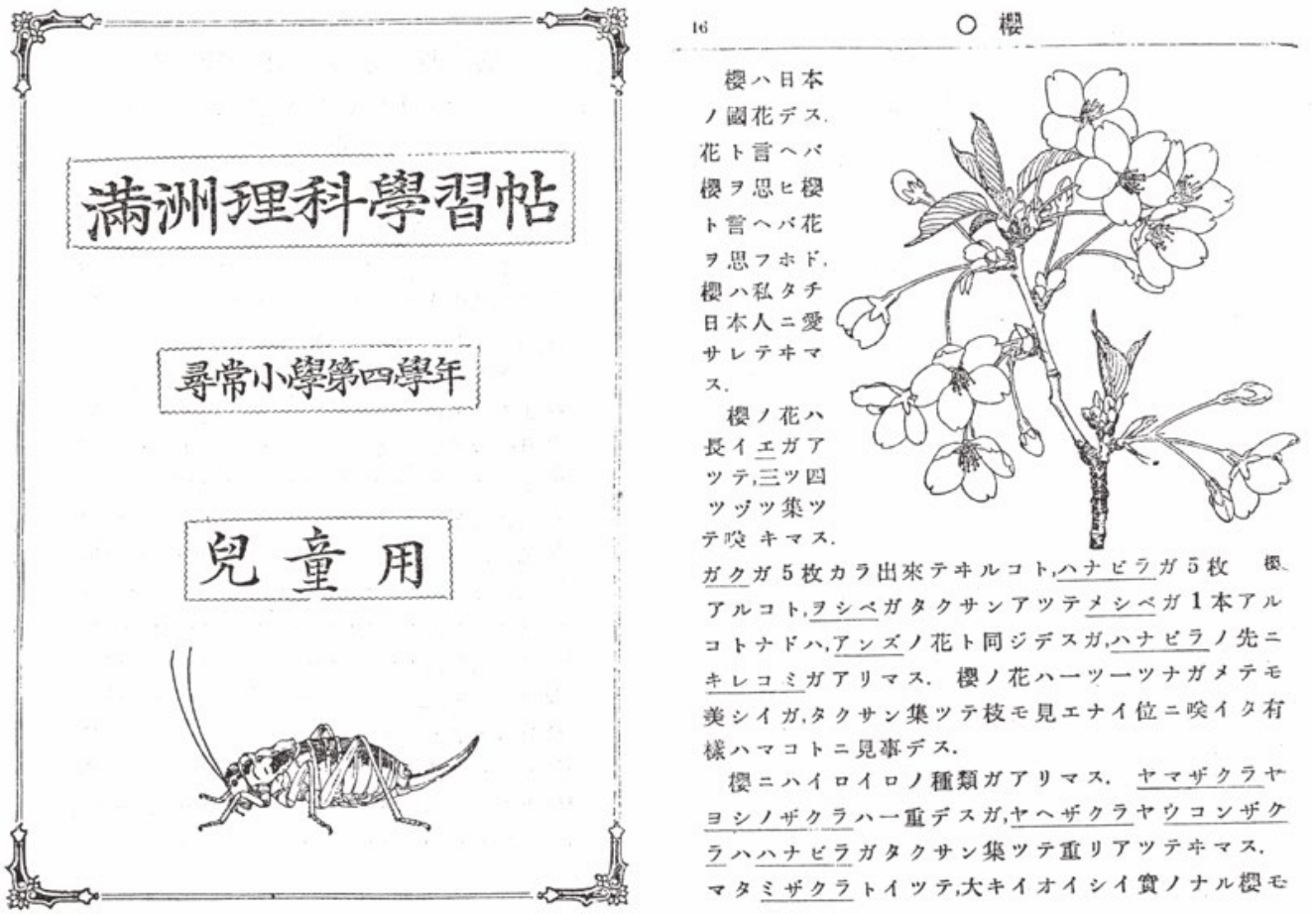
- This study investigated plants that appeared in science textbooks used in Manchuria, a colony in East Asia, and identified the distribution range of the cited plant species.
- This study revealed that Manchurian science textbooks dealt with many "useful plants" and that, while they placed an emphasis on learning content centered on Manchuria, they also dealt with plants that could only be found in the Japanese mainland.
- The textbook compilation efforts in Manchuria had a significance that can be applied to the present day, namely "acquiring learning content through things familiar to the learners."

Figure 1. Geographical location and the range of Manchuria (shown in red)

to follow the strict instructions of the Japanese government, and it served as a testing ground for the future of education in Japan (Isoda, 1999). Manchuria, therefore, was not a simple colony, as the Japanese had to take into consideration other countries.

In the studies on Japanese colonial educational history, Manchuria has received considerable attention (Hall, 2004; Isoda, 1999; Nomura et al., 1995; Oishi, 2017; Takenaka, 2019; Wang, 2019). Historical sociologist Eiji Oguma (2017a, 2017b) has shown that Japan's policy in colonies such as Taiwan and Korea fluctuated. The fluctuating lies between "inclusion," which places the local population inside the boundaries of "Japanese," and "exclusion," which places them outside those boundaries. In Manchuria, however, this can be applied not only to education for the local population but also to Japanese students. In general, the term "colonial education" refers to the enslavement of the local population. However, there were also colonial educational activities for Japanese students because education in Manchuria developed under the influence of the political factor of colonial rule policy as well as education common to Japan's mainland (Takenaka, 2000a).

In previous studies, textbooks in particular have received a great deal of research attention (Funakoshi, 2017; Ugajin, 2017). This is because Japanese colonial textbooks of the time were compiled by the government rather than the private sector, and thus it is easy to understand the relevance of the policy aspects. In 1922, the South Manchuria Education Association Textbook Editing Department was established, which included education officials from both the Kwantung Territorial government and the South Manchuria Railway. Their joint efforts at textbook editing sought to overcome the educational policy differences between the Kwantung Leased Territory and South Manchuria Railway. The Kwantung Leased Territory has had a strong tendency toward internal extensionism that was developing learning content that mirrors that taught in Japan regarding education in Manchuria. On the other hand, South Manchuria Railway has had a strong tendency to



(a) (b)

Figure 2. Image of *the primary science textbook*, (a) is the front cover of the textbook and (b) is the textbook's learning content, showing an illustration of a cherry blossom tree (*Cerasus jamasakura*)

educate through local adaptationism, trying to tailor learning content to the unique local environment and culture (Takenaka, 2000a). Japanese students in Japanese-run schools in Manchuria usually used the same textbooks as in mainland Japan. However, they were also provided with unique supplementary textbooks for each subject, created by the South Manchuria Education Association Textbook Editing Department. One noteworthy textbook is the *Manchuria Supplemental Reader* (*Manshu Hoju Tokuhon*), used in Japanese language education for Japanese elementary school students (Ikeda & Kurokawa, 2020; Isoda, 1999; Ugajin, 2017). The textbook was written to help Japanese students adapt to and understand the nature, climate, culture, and lifestyle of Manchuria and coexist with the region's many ethnic groups (Yagibashi, 1978). The use of these textbooks was due to the spread in Japan of discussions that had developed in Europe about educational methods allowing students to observe actual objects and events and understand them concretely and sensitively. In Japan, some argued that learning can be made more effective by mastering content featuring familiar things (Ikeda & Kurokawa, 2020; Maruyama, 1932; Shimada, 1935). In particular, science, Chinese, and home economics were taught using only Manchuria's supplementary textbooks instead of the national textbooks from the Japanese mainland (Takenaka, 2000a). It can be inferred that the textbooks for each subject were accurately selected.

Now, a series of studies by Kenichi Takenaka examine the educational system, facilities, and trends for both Japanese and Chinese students in Manchuria from multiple perspectives. In one of them, Takenaka (2000a) examined the textbooks used in Manchuria. Here he argues that science was the most needed subject for supplementary textbooks in Manchuria. It was difficult for the students who grew up in Manchuria to understand the living and natural environment that appeared in the national textbooks from the Japanese mainland; therefore, early on, there were calls for textbooks unique to Manchuria. The science textbook shown here is *Manchuria Science Learning Notebooks* (*Manshu rika gakushu cho*, [Figure 2]), for Japanese fourth, fifth, and sixth graders in primary elementary school as well as first and second graders in higher elementary school (the table of contents of this textbook is shown in Appendix 1).

Takenaka (2000a) points out that just under half of the total content of *Manchuria Science Learning Notebooks* is

similar to that of Japan's national textbook *Elementary Science Textbook* (*Jinjo Shogaku Rika Sho*). He then describes the characteristics of the Manchuria textbook as follows. For example, the "cabbage butterfly," which can be seen everywhere in the fields in Japan during spring, is rarely seen in Manchuria. The "insects that chirps in autumn" (e.g., crickets) are also only seen in a limited area in arid Manchuria. Although it is rare to see these species in Manchuria, the author does not exclude them from the teaching materials; rather, students are taught about the Japanese "cabbage butterfly" and the "insects that chirps in autumn" by referring to butterflies and grasshoppers that are native to Manchuria. In addition, soybeans, which are familiar to people in Manchuria, are used to elaborate on the content, and the "germination of soybeans" is taken as a subject. Corn and "kaoliang" are also representative products of Manchuria and are thus used as teaching materials (Takenaka, 2000a).

In other words, Takenaka's claims that this was an ingenious way to incorporate the natural elements with which students in Manchuria were familiar into the textbooks. However, Takenaka's study does not cover the entire textbook, fails to provide specific numbers, and has not resulted in a detailed analysis at the textbook's descriptive content. For example, when aiming for a textbook in Manchuria that is adapted to the local situation, the question is what kind of material is being dealt with. Furthermore, the following questions arise: what are the differences in the plants that appear in the textbooks used in Manchuria versus those used in Japan? In addition, geographically and vegetatively (i.e., biogeographically), Manchuria and Japan are relatively close; how did the textbook editors identify the uniqueness of Manchuria?

Several previous studies on the treatment of plants in colonial education have dealt with Korean textbooks. For example, as Inoue (1998) points out, to the Korean people, "the rose of Sharon (Mugunghwa)" is a flower with strong Korean national connotations, and when the colonial textbooks teach about "the cherry blossom," it is more than a teaching tool and a symbol of invasion; it can therefore be said that plants had a special meaning that led to a kind of ideological generation. A few recent studies on the history of Japanese colonial education (Inoue, 2016; Iwasaki, 2007; Nagata, 2000) have focused on science textbooks in colonial Korea. These previous studies point out that the treatment of "rice" in colonial Korea was heavily related to economic policy as the administration of the Government-General of Chosen had a bias toward modernizing agricultural policy (Nagata, 2000). However, studies covering the textbooks used in Manchuria and examining the characteristics of all the plants described in the colonial textbooks have not been fully developed.

Here, we focused on plant species in the science textbooks used in Manchuria during the colonial period. This study aims to elucidate the characteristics of the science textbooks compiled locally in Manchuria and, by extension, shed light on the ideology of colonial education. It is also expected to provide suggestions for modern education by clarifying what kind of ingenuity was used to achieve "using students' familiar objects as teaching materials," which is considered important even today. To this end, we counted all the land plants cited in the textbooks and categorized them based on their distribution and/or usage.

MATERIALS AND METHODS

Basic Information for the Science Textbooks

The *Manchuria Science Learning Notebooks* were published in 1927 in Dalian, Manchuria, and used until 1942, when their replacement, *Observation of Nature* (*Shizen no kansatsu*) was published. The editors of the textbooks were all Japanese: Hirata, I., Yagi, H., Ono, K., Yamagishi, E., Sudo, S., and Kinubuchi, E.—all of whom were teachers at Japanese schools in Manchuria—and Urata, S.—the resident editor (Takenaka, 2000b). The number of Japanese students in Manchuria was about 35,000 in 1930 (Shimada, 1935), and about 120,000 in 1942 (Kwantung Bureau of Academic Affairs, 1943). Almost all Japanese children in Manchuria were enrolled in school (Shimada, 1935). These textbooks were used by fourth graders and higher graders of primary elementary school, first and second graders of higher elementary school.

Taxonomic Classification for Plant Species and Data Analysis

Focusing on the plant species that appeared in science textbooks, we conducted a quantitative analysis and qualitatively examined the specifics of the results. First, we extracted all the land plants that appeared in all five volumes of *Manchuria Science Learning Notebooks*. Next, after extracting the plant species cited under their Japanese names, we assigned the currently accepted scientific name to each plant taxon, following the Japanese scientific name index (Y-list, Available from: http://bean.bio.chiba-u.jp/bgplants/ylist_main.html). Finally, we investigated the distribution range of the cited plant species and defined four distribution types for all taxa: Type A, endemic to the Japanese archipelago; Type B, distributed in the Manchuria region and/or on the Korean peninsula; Type C, distributed across both the Manchuria region and the Japanese archipelago; and Type D, non-native and useful plant species, such as edible, garden, medicinal, and economically important plants. Naturalized species as well as native species were included in Types B and C. The distribution range of each taxon was defined with reference to three pictorial books of Japanese flora (Kitamura & Murata, 1957, 1964a, 1964b, 1971, 1979; Ohashi et al., 2015, 2016a,

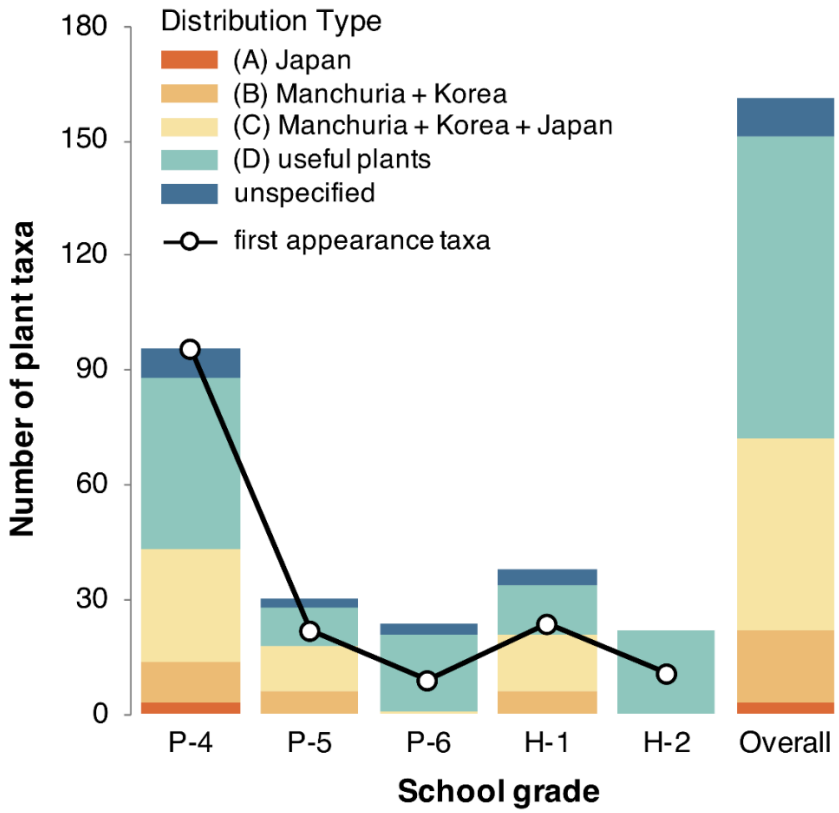


Figure 3. Summary of cited plant taxa in science textbooks for Japanese students in Manchuria. The stacked bar graphs indicate the number of taxa, shown by school grade (see Appendix 2). The plant species were categorized into four types based on geographical distribution and usage. The line graph represents the number of taxa introduced in each grade

2016b, 2017a, 2017b; Satake et al., 1981, 1982a, 1982b, 1989a, 1989b) and Komarov's *Flora of Manchuria* (Komarov, 1901). Komarov's book was published in nine volumes translated into Japanese between 1927 and 1933. Hence, it is considered suitable for exploring the vegetation of Manchuria at that time. We discussed the plants in terms of distribution, cultural background, and the number of species appearing in textbooks. In examining the cultural background, based on the previous studies mentioned above, we focused on the features of the flowers as agricultural and export products and the special meanings found in flowers in Manchuria and Japan.

RESULTS

We found a total of 161 plant taxa in the textbooks (see Appendix 2). The numbers of taxa and distribution types are summarized in Figure 3. In terms of the grade in which each of the 162 plant taxa was first introduced, 96 taxa (59.3%) appeared in Grade 4 (P-4), 22 taxa (13.6%) in Grade 5 (P-5), 9 taxa (5.6%) in Grade 6 (P-6), 24 taxa (14.8%) in the Higher Elementary Grade 1 (H-1), and 11 taxa (6.8%) in Higher Elementary Grade 2 (H-2). From the perspective of distribution type, 79 taxa (48.8%) were classified as useful plants (Type D), which was the largest number. Fifty taxa (30.9%) were common to both Japan and Manchuria (Type B). Only 19 taxa (11.7%) were not seen on the Japanese mainland; that is, these were only found in Manchuria and on the Korean peninsula (Type C). Surprisingly, there were only three Japanese endemic species (Type A), accounting for 1.9%: *Lilium longiflorum* (Liliaceae), *Cerasus jamasakura* (Rosaceae), and *Vincetoxicum matsumurae* (Apocynaceae).

An examination of distribution type by grade and school type revealed that the number of useful plants (Type D) increased as the grade for each type of school did. The ranking of the number of times the species appeared is shown in Appendix 3. It is clear that edible plants, such as garden peas, kaoliang, and soybeans, appear frequently in textbooks.

DISCUSSION

Distribution of Plants' Appearances in Textbooks

The question of whether the distribution of plants treated in textbooks is limited to those seen only in Manchuria or in Japan is of great educational significance because it is related to where (i.e., Manchuria or Japan) the students are raised to play an active role. There were conflicting opinions on what kind of education should be developed in Manchuria at that

time. For example, Maruyama (1932), a middle school principal in Manchuria, saw the environment surrounding education in Manchuria at that time as problematic. He claimed that there were 220,000 Japanese in Manchuria; most were employed by the South Manchuria Railway Company or its related companies, the Kwantung Territorial government, the army, or the tradesmen who benefited from them. Most were constantly moving due to personnel changes and the economy and were forced to return to the Japanese mainland in the near future. For this reason, he pointed out that Japanese children and their parents in Manchuria also had a strong desire to return to their home countries, and education was not unique to Manchuria, but it prepared them to attend schools in mainland Japan. In other words, there were calls from ordinary families for access to the same kind of education that was available in Japan. In contrast, Takano (1932), an elementary school teacher in Manchuria, held that by experiencing, recognizing, and understanding the nature and culture of Manchuria, people came to love Manchuria as their homeland and developed insight and character in the interest of improving it, leading to the development of the Manchuria citizen for whom Japan had been waiting. In other words, the argument was that Manchuria should develop its own learning content—an opinion that many educators have held. It was hoped that educating students from this position would produce citizens active in Manchuria's future. Manchuria's textbooks were then developed with these motivations in mind.

In light of this, it could be expected that many species unique to Manchuria would be addressed in science textbooks because of the educational emphasis on Manchuria-centric learning content. However, our results indicate that a very large number of species that are also seen on the Japanese mainland (Type C) are listed (Figure 3). In other words, while the learning content seems to have been ostensibly specific to Manchuria, given the small number of plants found only in Japan, it is in fact applicable to Japan as well. This means that the students were provided with knowledge that would be useful even after they returned to the Japanese mainland.

In addition, the order in which the topics were studied (i.e., the order in which they appeared in the textbook) suggests the intention to study species that can be found in both Manchuria and on mainland Japan before moving on to studying species that are only seen in Manchuria (or only in Japan). For example, in chapter 9 of P-4, after explaining the Star lily (*Lilium concolor*), Type C, the author explains the Easter lily (*Lilium longiflorum*), Type A, as its companion and asks the reader to compare the Star lily with the *Iris lactea*, Type B.

Moreover, for Types A and B, Type B is studied first, and Type A is then introduced. For example, in chapter 3 of P-4, after the chapter on apricots (*Prunus armeniaca*), which are Type B, the Japanese cherry (*Cerasus jamasakura*), Type A, is introduced with a clear statement that it is the national flower of Japan. The author tried to make it easier to understand the Type A flower by addressing the Type B flower, which students in Manchuria are likely to come in contact with, as an example: "The Japanese cherry, like the apricot flower, has many stamens and one pistil."

However, these characteristics do not apply to the higher elementary school, where most of the plants that appeared were Type D or Type C. This suggests that the idea of using familiar plants as teaching materials was an educational consideration for younger students.

Cultural Characteristics of the Listed Species

So far, we have determined that most of the textbooks on Manchuria were dominated by what could be found there. However, why were species found only in Japan also included? Because they were important for understanding the culture and economy of Japan.

Among the Japanese endemic species that are cited in the textbooks, the Easter lily (*Lilium longiflorum*) and the Japanese cherry (*Cerasus jamasakura*) are indispensable for understanding Japanese culture. The *Lilium* species of flowers are symbolic of Easter in Europe and America. At that time, Japan was a major producer and exporter of lilies to Europe and America, and the Easter lily was known to be a major source of foreign currency in Japan (Matsuo, 2017). Similarly, the cherry tree has been the most familiar flower among the Japanese since the ancient times. The textbooks state that "the cherry tree is so beloved by Japanese people that when you think of flowers, you think of cherry blossoms, and when you think of cherry blossoms, you think of flowers" (P-4 chapter 3). For the cultural reasons given here, it can be assumed that students studying in Manchuria, where they were unable to see these plants in person, were taken into consideration in terms of the study content. The fact that the textbook teaches students not only about plants that can be seen in Manchuria but also about plants that can only be seen in Japan, suggests that the textbook was also trying to foster students' awareness of the Japanese mainland.

The ranking of the number of chapters that appear in the textbooks shows that agricultural crops, such as garden peas, kaoliang, soybeans, and potatoes, were at the top of the list (Appendix 3). In particular, as students advanced in grades, agricultural crops began to appear in the textbooks more frequently (Figure 3). This is the same feature that was highlighted in a previous study on colonial Korea, as mentioned earlier. In other words, our results suggest that the aim of agricultural policy was to include many agricultural products in the textbooks. In addition, kaoliang, which appears frequently in textbooks, is a famous product of Manchuria; for

example, it was deliberately used as teaching material for folk tales in Japanese language arts textbooks in Manchuria (Ikeda & Kurokawa, 2021). Additionally, soybeans were also a major export of the area (Miki, 2013). In other words, it is possible to see how the government's agricultural policy was aimed at encouraging students to become farmers in Manchuria. Takeji Kinoshita (1932), a leading figure in prewar Japanese education, discussed the education required in Manchuria and suggested that students needed guidance to live there; further, he argued that students and teachers should sometimes work together to improve agriculture because the purpose of education in Manchuria was to develop human resources who would live there permanently and take charge of colonial projects (Takenaka, 2000a). Thus, it was critical for the students to gain agricultural knowledge with the aim to live in the area. On the other hand, apricots, which are also frequently cited, are a species that can be seen both on the Japanese mainland and in Manchuria, but in the latter, it is a native plant that heralds the arrival of spring and has been regarded as a representative beautiful flower (Inoue, 1998; Kita, 2003). In fact, several apricot species are distributed across Manchuria, and they can be found in everyday life. The fact that many of these apricots have been adopted in this manner can be seen as a reflection of the cultural background.

The Number of Plant Taxa that Appear in Textbooks

The large number of species in Manchuria's textbooks is evident in comparison with the number of plant species in the textbooks used on the Japanese mainland. The standard national science textbooks used in mainland Japan at the same time were *Textbook of Elementary Science* (*Jinjo Shogaku Rika Sho*) (for Grades 4–6, published in the period 1929–1931) and *Textbook of Higher Elementary Science* (*Koutou Shogaku Rika Sho*) (for Grades 1 and 2, published in the period 1925–1926)—both of which cite 51 plant taxa. In comparison, the number of plant species used in Manchuria's textbooks is impressive and may even be excessive. In fact, 16 out of 21 schools answered "too much" when asked by textbook editing department about the content of the textbooks used in Manchuria at that time (South Manchuria Education Association, 1930), implying that almost all the schools acknowledged that the textbook had an excess of learning content. Apparently, the editors of the *Manchuria Science Learning Notebooks* thought that Japanese students in Manchuria needed to familiarize themselves with the species found in Manchuria as well as those in Japan.

Alternatively, the treatment of such a large number of species may simply be part of the nature of education in Manchuria, in which, for example, the emphasis is said to have been on having the students read many books (Funakoshi, 2017; Ikeda & Kurokawa, 2020); thus, it was not an approach that focused on a small number of books. In our results, in terms of the grade in which each species appeared for the first time, more than half of the species were introduced in Grade 4, indicating a strong intention to provide a lot of information at once from the beginning. In light of this, in combination with this study's results, it can be said that the abundance of plants in Manchuria's science textbooks is another characteristic of Manchurian education that aims to expose students to as much of what they are learning as possible in their immediate surroundings.

CONCLUSIONS

This paper has examined the reality of colonial education in Manchuria from the viewpoint of what kinds of plants were the subject of the science textbooks used in Manchuria. By doing so, what previous studies have failed to show concretely so far, we have clarified from the perspective of plants.

The science textbooks used in Manchuria were intended to give a distinctly Manchurian flavor to the texts, with many references to crops such as kaoliang and apricots. The frequent references to agricultural products in the textbooks suggest that colonialists were trying to promote agricultural policies; furthermore, it is clear that they intended to nurture students who would be successful in Manchuria. However, this does not mean that the colonialists did not pay attention to the Japanese mainland. Overall, it can be said that they dealt with many plants that were also seen there. In addition, the plants that are important to learn about as Japanese citizens, such as the cherry blossom tree, which is a symbol of Japan, were addressed. Therefore, there was also an attempt to prepare students who would succeed in mainland Japan.

We conclude that the colonialists in Manchuria were trying to nurture students who would be successful in both Manchuria and Japan, which meant that the amount of required learning was inevitably high. The richness of plant species presented in the textbooks, as revealed in this study, mirrors this idea. In Manchuria, at that time, the educational trend was to expose students to a wide range of learning content, and the conclusions drawn from this study align with this trend. The kind of science education practiced in Manchuria incorporated both internal extensionism and local adaptationism—two ideas emerging from educational thought in the colonies. Education in Manchuria did not choose between these two currents of thought; rather, it attempted to find a way to educate students so that they would be adequately prepared for both Manchuria and mainland Japan. As we considered in the case of Manchuria, the learning style and philosophy of "letting students acquire learning content through familiar objects" can be positioned as an important suggestion for modern science textbooks and, ultimately, science education.

Finally, more research must be conducted to clarify whether textbook content was unique to the colony. Nevertheless, our first practicable approach based on the nature of plant flora cited in textbooks provided valuable insights into the substance of colonial ideology and education in Manchuria. As many former colonies exist worldwide, we must apply this approach to textbooks in other colonies and face the past and consider the content of education in the coming era in order to bring our desire for a peaceful world to fruition.

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APPENDIX 1

Chapters of *Manchuria Science Learning Notebooks*

P-4	Chap.	P-5	Chap.	P-6	Chap.	H-1	Chap.	H-2	Chap.
1	Chicken	◎	Observation of Sunrise and Sunset, etc.	1	The Weight of Things	1	Mammals	1	Carbohydrates (I)
○	Hen's Egg	◎	Silkworm Breeding Diary	2	Shrimps	2	Birds	2	Carbohydrates (II)
2	Duck	1	Granite	3	Inertia	3	Reptiles and Amphibians	3	Alcohol
3	Apricot Flower	2	Soil and Rocks	4	Rubbing	4	Fishes	4	Fat
○	Cherry Blossom	3	Fountains and Wells.	5	Scales	5	Insects	5	Mold and Bacteria
4	Dandelion	○	Water Journey	◎	Independent Research	6	Root Function	6	Rot and Preservation
5	Screw Iris	4	Tree Sprouts	6	Clams	7	Leaf Function	7	Infectious Disease
◎	Independent Research	○	Horsetail	7	Snail	8	Plant Respiration	8	Blood Lymph and Immunity
6	Pea	○	Pasqueflower	○	Octopus-Squid	9	Direction of Stem and Root Growth	9	Protein
7	Root	5	The Crucian Carp and The Goldfish	8	The Function of Running Water	10	Plant Growth and Sunlight	10	Fertilizer
8	Pieris Rapae	○	Turtle	9	Aqueous Rocks and Strata	11	Moss	11	Soil
9	Morning Star Lily	6	Soybean Germination	10	Volcanoes and Igneous Rocks	12	Cell	12	Pressure of The Liquid
10	Frog	◎	Independent Research	○	Earthquake	13	Unicellular Organism	13	Specific Gravity and Floating And Sinking
11	Mimela Splendens	7	Pine Tree	◎	Independent Research	14	Chlorine and Iodine.	14	Atmospheric Pressure
○	Dung Beetle	8	Wheat	11	Sea	15	Sodium (Nan)	15	Calorific Value, Specific Heat, Heat of Fusion, Heat of Vaporization
◎	Independent Research	9	Silkworm	12	Salt	16	Potassium (K)	16	Atmospheric Temperature and Humidity
12	Apricot	10	Swallow	○	Little Animals on The Beach	17	Magnesium (Mg)	17	Weather
13	Cucumber	○	Tree Sparrow	13	Seaweed	18	Calcium (Ca)	18	Lens
14	Dragonfly	11	Silkworm Cocoons and Moths	◎	Independent Research	19	Types of Sulfuric Acid Salts	19	Microscopes and Telescopes
○	Cicada	◎	Independent Research	14	Clock	20	Phosphorus	20	Eye
◎	Independent Research	12	Summer Solstice	○	The History of Watches	21	Skeletal and Muscular	21	Photo
15	Eggplant	13	Snake	15	Pump	22	Circulatory Organ	22	Breathing and Air
16	Morning Glory	○	Earthworm	16	Steam Engine	23	Digestive Organs	23	Voice
17	Soybean	14	Fly	◎	Independent Research	24	Useful Non-Metallic Minerals	24	Ear
18	Cricket (Esp. The Japanese Cricket)	○	Mosquito	17	Mirror	25	Jewel	25	Gramophone
○	Autumn Insect	◎	Corn and Kaoliang	18	Lens	26	Ore	26	Nervous System
19	Spider	15	Rice-Plant	○	The Color of Things	27	Glass	27	Oil Engines and Steam Turbines
◎	Independent Research	16	Lactarius Hatsudake	19	Sound	28	Cement	28	Electrolysis
20	Potatoes	17	Oxygen	○	Gramophone	29	Ceramics	29	Faradaic Current
21	Impatiens Balsamina and Pinus Densiflora	18	Bracken	◎	Independent Research	30	Power and Movement	30	Engines and Electric Motors

P-4	Chap.	P-5	Chap.	P-6	Chap.	H-1	Chap.	H-2	Chap.
○	How the Seeds are Scattered	19	Autumn Equinox	20	Magnet	31	Action-Reaction	31	Earth
22	Chrysanthemum	◎	Independent Research	21	Electricity	32	Force Synthesis	32	Sun and Moon
○	Autumn Leaves and Fallen Leaves	20	Persimmon	○	Thunder	33	Planes and Airships	33	Solar and Lunar Eclipses
◎	Free Inquiry	○	Chestnut	22	Batteries and Current	34	Center of Gravity	34	Stars and Planets
23	Horse	21	Hydrogen	23	Electric Light	35	Wheel and Axle	35	Mutation and Heredity Of Organisms
24	Cow	22	Carbon Dioxide (Gas)	○	The Development of Light	36	Slope and Screw	36	Biological Evolution
○	Pigs And Sheep	23	Carbon	24	Telegraph and Telegraph Bells	37	Instruments and Work	S1	Magic Lantern and Moving Picture
○	Mouse	24	Sulphur	◎	Independent Research	S1	Pests and Beneficial Insects	S2	Heating System
25	Air	◎	Independent Research	25	Telephone Instrument	S2	Forest	S3	Electromagnetic Induction
26	Water (Esp. Cool)	25	Coal	○	Radio	S3	Medicinal and Toxic Plants		
27	Fever	○	Oil	◎	Independent Research	S4	Rubber		
◎	Free Inquiry	26	Iron	26	The Human Body	S5	The Manchurian Mines		
28	Water Vapor and Ice	27	Tin and Lead	○	Foodstuffs	S6	Manchurian Iron Mountain		
○	Thermometer	○	Zinc and Aluminum	27	Digestion	Attached List			
29	Wind and Rain	○	Speed of Iron Rusting	28	Blood Circulation				
30	Fire	◎	Independent Research	29	Breath				
◎	Independent Research	28	Copper	○	Piss and Sweat				
31	Crystal	○	Copper Rust	◎	Independent Research				
32	Calcite	○	Gold and Silver	30	Nerve				
33	Pyrite And Chalcopyrite	29	Hydrochloric Acid, Sulfuric Acid and Nitric Acid	○	Optical Illusion				
◎	Independent Research	30	Caustic Soda and Sodium Carbonate	31	Health				
○	The Contents of Learning Continues	◎	Independent Research	○	Human Body Parasites				
		31	Lime	○	Major Inventions and Discoveries				
		32	Ammonia	○	Animal Classification				
		33	Alcohol	○	Classification of Plants				
		○	Soap	○	The Contents of Learning Continues				
		◎	Independent Research						

APPENDIX 2

List of Land Plants Cited in *Manchuria Science Learning Notebooks*

Family	Taxon Name	Cited Name	Textbook Chapters*					Distribution†
			P-4	P-5	P-6	H-1	H-2	
BRYOPHYTA								
Polytrichaceae	*Polytrichum juniperinum* Hedwig	"Sugigoke"	-	-	-	11	-	C
Marchantiaceae	*Marchantia polymorpha* L.	"Zenigoke"	-	-	-	11	-	C
PTERIDOPHYTA								
Equisetaceae	*Equisetum arvense* L.	"Tsukushi", "Sugina"	-	4	-	-	-	C
Gleicheniaceae	*Diplopterygium glaucum* (Houtt.) Nakai	"Urajiro"	-	18	-	-	-	C
Dennstaedtiaceae	*Pteridium aquilinum* (L.) Kuhn	"Warabi"	-	18	-	-	-	C
Aspleniaceae	*Asplenium ruprechtii* Kurata	"Kumonosushida"	-	18	-	-	-	C
Athyriaceae	*Anisocampium niponicum* (Mett.) Y.C.Liu, W.L.Chiou et M.Kato	"Inuwarabi"	-	18	-	-	-	C
Polypodiaceae	*Pyrrosia petiolosa* (Christ) Ching	"Kohitotsuba"	-	18	-	-	-	B
GYMNOSPERMAE								
Ginkogoaceae	*Ginkgo biloba* L.	"Ichou"	22	-	-	-	-	D
Pinaceae	*Pinus* spp.	"Matsu"	22, 23	6, 7	23	S2	-	-
	Pinus tabuliformis Carrière	"Manshukuromatsu", "Manshuakamatsu"	-	6, 7	-	S2	-	B
Cupressaceae	*Platycladus orientalis* (L.) Franco	"Konotegasiwa"	22	-	-	-	-	D
ANGIOSPERMAE								
Liliaceae	*Lilium* spp.	"Yuri"	3	-	-	-	-	-
	Lilium concolor Salisb.	"Himeyuri"	9	-	-	-	-	C
	Lilium lancifolium Thunb.	"Oniyuri"	9	-	-	-	-	C
	Lilium longiflorum Thunb.	"Teppouyuri"	9	-	-	-	-	A
	Lilium pumilum Redouté	"Itohayuri"	9	-	-	-	-	B
Iridaceae	*Iris* spp.	"Irisu"	5	-	-	-	-	-
	Iris domestica (L.) Goldblatt et Mabb.	"Hiougi"	5	-	-	-	-	C
	Iris ensata Thunb.	"Hanashoubu"	5	-	-	-	-	C
	Iris lactea Pall.	"Nejiayame"	5, 9	-	-	-	-	B
	Iris ruthenica Ker Gawl. var. *uniflora* (Pall. ex Link) Baker	"Koayame"	5	-	-	-	-	B
Amaryllidaceae	*Allium cepa* L.	"Tamanegi"	-	-	26	-	-	D
	Allium fistulosum L.	"Negi"	-	-	-	12	-	D
Asparagaceae	*Convallaria majalis* L.	"Suzuran"	9	-	-	-	-	C
	Polygonatum odoratum (Mill.) Druce	"Amadokoro"	9	-	-	-	-	C
Arecaceae	*Cocos nucifera* L.	"Kokoyashi"	-	-	-	-	4	D
Poaceae	Bambusoideae, Bambuseae spp.	"Take"	-	-	23	-	-	-
	Oryza sativa L.	"Hakumai", "Kome", "Genmai", "Ine", "Uruchimai"	-	10, 15	26	-	3	D
	Oryza sativa L. Glutinosa group	"Mochigome", Mochiine"	-	15	-	-	1	D
	Saccharum officinarum L.	"Satoukibi"	-	-	-	-	1	D
	Setaria italica (L.) P.Beauv.	"Awa"	-	10	-	-	-	D
	Sorghum bicolor (L.) Moench Nervosum group	"Kouryan"	21	6, 10, 14	-	9	3	D
	Triticum aestivum L.	"Komugi"	-	8	26	-	9	D
	Zea mays L.	"Toumorokoshi"	-	6, 14	-	-	-	D
Papaveraceae	*Chelidonium majus* L.	"Kusanoou"	-	-	-	S3	-	C
	Papaver somniferum L.	"Keshi"	-	-	-	S3	-	C
Ranunculaceae	*Aconitum* sp.	"Torikabuto"	-	-	-	S3	-	-
	Pulsatilla cernua (Thunb.) Berchtold et J.Presl	"Okinagusa"	-	4	-	-	-	C
	Pulsatilla chinensis (Bunge) Regel	"Hirohaokinagusa"	-	4	-	-	-	B
Nelumbonaceae	*Nelumbo nucifera* Gaertn.	"Renkon"	-	4	-	-	-	C
Paeoniaceae	*Paeonia suffruticosa* Andrews	"Botan"	3	-	-	-	-	D
Vitaceae	*Ampelopsis glandulosa* (Wall.) Momiy. var. *heterophylla* (Thunb.) Momiy.	"Nobudou"	21	-	-	-	-	C
	Parthenocissus tricuspidata Planch.	"Tsuta"	22	-	-	-	-	C
	Vitis vinifera L.	"Budou"	-	33	26	-	3	D
Fabaceae	*Arachis hypogaea* L.	"Nankinmame", "Rakkasei"	17	-	26	-	4	D
	Glycine max (L.) Merr. subsp. *max*	"Daizu"	17	6	26	10	5, 9	D
	Glycyrrhiza glabra L.	"Kanzou"	-	-	-	S3	-	D
	Gueldenstaedtia verna (Georgi) Boriss.	"Inugenge"	-	4	-	-	-	B
	Lablab purpurea (L.) Sweet	"Fujimame"	17	-	-	-	-	D

	Phaseolus vulgaris L.	"Ingenmame"	17	-	-	-	-	D
	Pisum sativum L.	"Endou", "Endoumame"	6, 12, 17	-	26	8	5, 35	D
	Pueraria lobata (Willd.) Ohwi	"Kuzu"	-	-	26	-	-	C
	Robinia pseudoacacia L.	"Akashia"	6, 26	-	-	-	-	C
	Vicia faba L.	"Soramame"	17	-	-	9	-	D
	Vigna angularis (Willd.) Ohwi et H.Ohashi var. *angularis*	"Azuki"	17	-	-	-	-	D
	Vigna unguiculata (L.) Walp.	"Sasage"	18	-	-	-	-	D
Rosaceae	*Agrimonia pilosa* Ledeb. var. *japonica* (Miq.) Nakai	"Kinmizuhiki"	21	-	-	-	-	C
	Cerasus spp.	"Sakura"	3	-	-	12	-	-
	Cerasus jamasakura (Siebold ex Koidz.) H.Ohba	"Yamazakura"	3	-	-	-	-	A
	Cerasus pseudocerasus (Lindl.) G.Don	"Mizakura"	7	-	-	-	-	B
	Cerasus Sato-zakura Group	"Ukonzakura"	6	-	-	-	-	D
	Cerasus x *yedoensis* (Matsum.) Masam. et S.Suzuki	"Yoshinozakura"	4	-	-	-	-	D
	Crataegus cuneata Siebold et Zucc.	"Sanzashi"	21	-	-	-	-	D
	Crataegus pinnatifida Bunge	"Misanzashi"	21	-	-	-	-	B
	Malus domestica Borkh.	"Ringo"	-	-	26	-	-	D
	Prunus armeniaca L.	"Anzu"	3, 12	7, 20	-	S3	-	B
	Prunus mume Siebold et Zucc.	"Ume"	12	-	-	-	-	D
	Prunus persica (L.) Batsch	"Momo"	3	-	-	-	-	D
	Prunus tomentosa Thunb.	"Yusuraume"	3	-	-	-	-	B
	Rosa spp.	"Bara"	3	-	-	-	-	-
Rhamnaceae	*Ziziphus jujuba* Mill. var. *jujuba*	"Yamanatsume"	21	-	-	-	-	D
Cannabaceae	*Humulus lupulus* L. var. *lupulus*	"Hoppu"	-	-	-	-	3	D
Moraceae	*Ficus elastica* Roxb. ex Hornem.	"Indogomunoki"	-	-	-	S4	-	D
Fagaceae	*Quercus acutissima* Carruth.	"Kunugi"	-	-	-	S2	-	C
	Castanea crenata Siebold et Zucc.	"Kuri"	-	20	-	-	-	C
	Quercus dentata Thunb.	"Kashiwa"	22	-	-	-	-	C
Cucurbitaceae	*Benincasa hispida* (Thunb.) Cogn.	"Tougan"	13	-	-	-	-	D
	Citrullus lanatus (Thunb.) Matsum. et Nakai	"Suika"	13	-	-	-	-	D
	Cucumis melo L.	"Meron"	13	-	-	-	-	D
	Cucumis melo L. var. *makuwa* Makino	"Makuwauri"	13	-	-	-	-	D
	Cucumis melo L. var. *utilissimus* (Roxb.) Duthie et Fuller	"Shirouri"	13	-	-	-	-	D
	Cucumis sativus L.	"Kyuri"	13	-	26	-	-	D
	Cucurbita spp.	"Kabocha"	13	-	-	-	-	D
	Ecballium elaterium (L.) A.Rich.	"Teppouuri"	21	-	-	-	-	D
	Lagenaria siceraria (Molina) Standl. var. *siceraria*	"Hyoutan"	13	-	-	-	-	D
	Luffa aegyptica Mill.	"Hechima"	13	-	-	-	-	D
	Momordica charantia L. var. *pavel* Crantz	"Tsurureishi"	13	-	-	-	-	D
Celastraceae	*Celastrus orbiculatus* Thunb.	"Tsuruumemodoki"	21	-	-	-	-	C
	Euonymus alatus (Thunb.) Siebold	"Nishikigi"	22	-	-	-	-	C
Oxalidacea	*Oxalis stricta* L.	"Tachikatabami"	21	-	-	-	-	C
Euphorbiaceae	*Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg.	"Baragomunoki"	-	-	-	S4	-	D
	Ricinus communis L.	"Tougoma", "Himashi"	-	-	-	S3	4	D
	Vernicia cordata (Thunb.) Airy Shaw	"Aburagiri"	-	-	-	-	4	D
Salicaceae	*Populus simonii* Carrière	"Terihadoro"	-	-	-	S2	-	B
	Populus suaveolens Fisch.	"Doronoki"	22	4, 10	-	S2	-	C
	Salix spp.	"Yanagi"	21, 22	-	-	-	-	-
Violaceae	*Viola mandshurica* W.Becker	"Sumire"	-	4	-	-	-	C
Linaceae	*Linum usitatissimum* L.	"Ama"	-	-	-	-	4	D
Geraniaceae	*Geranium sibiricum* L.	"Ichigefuro"	21	-	-	S3	-	C
	Geranium thunbergii Siebold ex Lindl. et Paxton	"Furosou"	-	-	-	S3	-	C
Anacardiaceae	*Rhus javanica* L.	"Nurude"	22	-	-	-	-	C
	Toxicodendron succedaneum (L.) Kuntze	"Haze"	-	-	-	-	4	D
	Toxicodendron vernicifluum (Stokes) F.A.Barkley	"Urushi"	-	-	-	-	4	D
Sapindaceae	*Acer* spp.	"Kaede"	21, 22	-	-	-	-	-
	Acer negundo L.	"Negundokaede"	-	4	-	-	-	D
	Acer truncatum Bunge	"Manshuitaya"	21	4	-	-	-	B

Rutaceae	*Citrus* spp.	"Mikan"	-	29	26	-	-	-
Simaroubaceae	*Ailanthus altissima* (Mill.) Swingle	"Shinju"	21, 22	-	-	S2	-	C
Brassicaceae	*Brassica* spp.	"Na"	8	-	-	6	-	-
	Brassica oleracea L. var. *capitata* L.	"Khabetsu"	7	-	26	-	-	D
	Brassica rapa L. var. *glabra* Regel	"Hakusai"	7	-	26	-	-	D
	Brassica rapa L. var. *rapa*	"Kabu"	7		-	-	-	D
	Raphanus sativus L. var. *hortensis* Backer	"Daikon", "Nerima", "Shougoinn", "Shinaakadaikon", Shinaaodaikon"	7, 8	-	26	-	-	D
	Raphanus sativus L. var. *sativus*	"Hatsukadaikon"	7	-	-	-	-	D
Santalaceae	*Viscum album* L. subsp. *coloratum* Kom.	"Yadorigi"	21	-	-	-	-	C
Amaranthaceae	*Beta vulgaris* L.	"Satoudaikon"	-	-	-	-	1	D
	Spinacia oleracea L.	"Hourensou"	-	-	26	-	-	D
Nyctaginaceae	*Mirabilis jalapa* L.	"Oshiroibana"	-	-	-	-	35	D
Balsaminaceae	*Impatiens balsamina* L.	"Housenka"	21	-	-	-	-	D
Ebenaceae	*Diospyros kaki* Thunb.	"Kaki"	-	20	-	-	-	D
Ericaceae	*Rhododendron micranthum* Turcz.	"Kogometsutsuji"	22	-	-	-	-	B
Rubiaceae	*Cinchona officinalis* L.	"Kina"	-	-	-	S3	-	D
Gentianaceae	*Swertia japonica* Makino	"Senburi"	-	-	-	S3	-	C
	Swertia pseudochinensis H.Hara	"Murasakisenburi"	-	-	-	S3	-	C
Apocynaceae	*Vincetoxicum matsumurae* (T.Yamaz.) H.Ohashi	"Himeiyokazura"	21	-	-	-	-	A
Convolvulaceae	*Calystegia pubescens* Lindl.	"Hirugao"	16	-	-	-	-	C
	Convolbulus chinensis Ker Gawl.	"Yahazuhirugao"	16	-	-	-	-	B
	Ipomoea batatas (L.) Poir.	"Satsumaimo"	20	-	26	-	-	D
	Ipomoea nil (L.) Roth	"Asagao"	16	6	-	-	-	C
Solanaceae	*Datura metel* L.	"Chousenasagao"	-	-	-	S3	-	D
	Hyoscyamus niger L.	"Hiyosu"	-	-	-	S3	-	B
	Solanum lycopersicum L.	"Tomato"	-	-	26	-	-	D
	Solanum melongena L.	"Nasu"	15	-	26	-	-	D
	Solanum tuberosum L.	"Jagaimo"	20	-	26	S3	5, 6	D
Oleaceae	*Fraxinus rhynchophylla* Hance	"Ootoneriko"	-	-	-	S2	-	B
	Olea europaea L.	"Olibu"	-	-	-	-	4	D
Pedaliaceae	*Sesamum indicum* L.	"Goma"	-	-	26	-	4	D
Lamiaceae	*Perilla frutescens* (L.) Britton var. *crispa* (Benth.) W.Deane	"Shiso"	12	-	-	-	-	D
	Perilla frutescens (L.) Britton var. *frutescens*	"Egoma"	-	-	-	-	4	D
Paulowniaceae	*Paulownia tomentosa* (Thunb.) Steud.	"Kiri"	22	-	-	-	-	C
Asteraceae	*Bidens biternata* (Lour.) Merr. et Sherff	"Sendangusa"	21	-	-	-	-	C
	Bidens tripartita L.	"Taukogi"	21	-	-	-	-	C
	Calendula officinalis L.	"Kinsenka"	22	-	-	-	-	D
	Callistephus chinensis (L.) Nees	"Ezogiku"	22	-	-	-	-	B
	Chrysanthemum indicum L.	"Aburagiku"	22	-	-	-	-	C
	Chrysanthemum morifolium Ramat.	"Kiku"	22	-	-	-	-	D
	Chrysanthemum zawadskii Herbich subsp. *naktongense* (Nakai) Y.N.Lee	"Chousennogiku"	22	-	-	-	-	C
	Cosmos bipinnatus Cav.	"Kosumosu"	22	-	-	-	-	D
	Cyanus segetum Hill	"Yagurumagiku"	3	-	-	-	-	D
	Dahlia pinnata Cav.	"Daria"	22	-	-	-	-	D
	Helianthus annuus L.	"Himawari"	22	-	-	-	-	D
	Lactuca sativa L.	"Chisya"	-	-	26	-	-	D
	Sigesbeckia pubescens (Makino) Makino	"Menamomi"	21	-	-	-	-	C
	Taraxacum officinale Weber ex F.H.Wigg.	"Tanpopo"	4, 21, 22	4	-	-	-	C
	Xanthium strumarium L.	"Onamomi"	21	-	-	7	-	C
Caprifoliaceae	*Valeriana fauriei* Briq.	"Kanokosou"	-	-	-	S3	-	C
Araliaceae	*Panax ginseng* C.A.Mey.	"Chousenninjin"	-	-	-	S3	-	B
Apiaceae	*Cicuta virosa* L.	"Dokuzeri"	-	-	-	S3	-	C
	Daucus carota L. subsp. *sativus* (Hoffm.) Arcang.	"Ninjin"	-	-	26	-	-	D
	Foeniculum vulgare Mill.	"Uikyou"	-	-	-	S3	-	D
	Oenanthe javanica (Blume) DC.	"Seri"	-	-	-	S3	-	C

†Distribution type for each taxon: A, endemic to Japan; B, distributed in the Manchuria region and/or Korean peninsula; C, distributed across the Manchuria region from Japan; D, useful plant species. It is noteworthy that the distribution categories B and C include naturalized as well as native species. *Each textbook chapter is detailed in Appendix 1

APPENDIX 3

Rank Order for the Appearance Frequency of Species in the Textbooks

Taxon Name	Common Name	Number of appearances
Pisum sativum L.	"garden pea"	7
Sorghum bicolor (L.) Moench Nervosum group	"sorghum", "kaoliang"	6
Glycine max (L.) Merr. subsp. *max*	"soya bean"	6
Pinus spp.	"pine"	6
Prunus armeniaca L.	"apricot"	5
Solanum tuberosum L.	"potato"	5
Oryza sativa L.	"rice"	4
Populus suaveolens Fisch.	"mongorian poplar"	4
Taraxacum officinale Weber ex F.H.Wigg.	"dandelion"	4