Aligned Instructional Systems:

Japan

Written by
Tina Isaacs and Brian Creese, with Alvaro Gonzalez

With contributions from:

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History and background

Japan has been open to Western countries since 1854, after which it began to modernize and industrialize. In the late 19th and early 20th centuries it asserted its authority over China, Russia, Korea, Taiwan and southern Sakhalin Island, occupying the last three. It occupied Manchuria in 1931-32 and in 1937 invaded China. The attack on Pearl Harbor in Hawaii brought the US into World War II; after its defeat, Japan was able to recover and became an economic power and an ally to the West. After three decades of economic growth, Japan’s economy has slowed down since the 1990s, publishing its largest trade deficit in modern history in 2013. The economic sector is highly dependent on imports. It remains, however, the world’s fourth largest economy; GDP per capita in 2012 was $35,900.

Japan is slightly smaller than the state of California, occupying 377,915 square kilometers with a population of over 127 million in 2013. Ethnic Japanese comprise 98.5% of the population. The official language is Japanese and Shintoism is the largest religion with 84% of the population following it. Many people also consider themselves Buddhists – approximately 71.4% of the population – Shintoism and Buddhism are complementary rather than separate. There is a small (2%) Christian community. Life expectancy at birth is high – 81 years for men and 88 years for women and it has a negative population growth rate (-0.1%). While the capital, Tokyo is by far the largest city with 13.2 million people; Japan has four other substantial sized cities (CIA, 2014).

Because it has so few natural resources, Japan is highly dependent on human capital in order to remain competitive with the rest of the world. To ensure that as many of its citizens as possible get a good education Japan has introduced a national curriculum and textbooks, as well as a relatively equal distribution of educational facilities and resources, the outcomes of which are that most students perform at a higher level than other countries and family background has less impact on student results than elsewhere. The government does not take for granted high educational achievement and many reforms have taken place over the last twenty years, as the emphasis has shifted from traditional rote learning to a more open ended system.

The foundations of today’s school system are a post-war phenomenon, enshrined in the Basic Act on Education and the School Education Law of 1947, the basic principle of which was to offer equal opportunity.

Current era of reform

Japan is now in the midst of an age of educational reform. Since the start of the new century the Japanese government has enacted several waves of educational reform, including a revision of the Fundamental Law of Education set alongside decentralization of administration. The once universal 6-3-3 system (six years of elementary education, three of lower secondary
and three of upper secondary) of education has broken down with local governments experimenting with 4-3-2 or 5-4 or 4-2-3.

For the purposes of this study it is interesting to note that Japan’s reaction to dissatisfaction with traditional education was to focus on the school curriculum (Motani, 2005). In 2002 the New Courses of Study\(^1\) (NCS) for primary and lower secondary schools was enacted, followed by upper secondary in 2003. NCS emphasized Ikiru Chikara (Living Power, Passion for Life) or ‘Zest for Life’ as the primary objective (MEXT 2008b). This had three aims: promoting solid academic prowess; to be rich in humanity; and health and fitness. Although these Courses of Study were subsequently reformed in 2008 and 2009, the emphasis of Ikiru Chikara is still the basis of the contemporary Japanese education system\(^2\).

Another element of these reforms was Yutori (relaxed learning). The aim of Yutori was to reduce the overloaded curriculum and decrease the intense competition in Japanese education, principally through the use of project teaching methods, introducing elements of choice into the curriculum and a decrease in teaching hours. However, this phrase disappeared with the 2011 reforms following intense criticism (Asanuma, 2014). A third element was Kokoro no Kyoiku (Education for Mind) which continues to be a part of the latest round of reforms although perhaps without the focus it had in previous waves of reform.

The 2002 NCS emphasized key competencies, independent thinking and problem solving skills. Mathematics and science education were also stressed, but the aim was to approach them in a less didactic fashion. As part of the reform, the curriculum content was reduced by 30% and cross curricular, problem-based approaches introduced; local Boards of Education were given the freedom to supplement the national curriculum with their own, and the number of credits necessary to graduate from upper secondary school decreased from 80 to 74 (with credits from mandatory courses reducing from 38 to 31). Similarly, the school week was reduced from six to five days\(^3\).

Greater responsibility for budgets and personnel were given to schools and new teacher evaluation measures introduced. Boards of education were allowed to introduce parental choice, but in reality only 15% of Boards of Education actually let parents choose schools.

The reaction to the program was not entirely positive, and some teachers were unprepared to introduce inquiry-based, student-centered learning. A backlash developed, which was

\(^1\) Each revision is termed ‘new’, so the Japanese reform program has repeated “New” Courses of Study in each curriculum review or reform.

\(^2\) The NCS for primary and lower secondary schools were released in March 2008 and that for upper secondary schools were released in March 2009. The NCS for primary was completely implemented in April 2011, while for lower secondary it was in April 2012 and for upper secondary was in April 2013. See the following section “Revision of National Curriculum 2008.”

\(^3\) This started in 1992 when the second Saturday of each month became a school holiday, and continued in 1995 when the fourth Saturday of each month also became a school holiday.
exacerbated by Japan’s 2003 PISA results, in which Japan did well in mathematics and science but less well in reading, but that also reflected the deep seated belief among many in Japan that individuality is not inherent in Japanese culture and that the reforms flew in the face of tradition.

The 2002 reforms can be seen as neoliberal in tone, and changed the organizing principle of the school system from equal opportunity to individual choice. The introduction of ability grouping (shujyukudo) was a particular challenge to traditional Japanese education, and together with a greater choice of private and privileged public schools\(^4\) has altered the way the Japanese view and use the education system (Park, 2013). There is evidence that the introduction of choice in the schools sector has led to a rise in inequality in the student population, with falls in both reading and mathematical performance being show by those with greater disadvantage; those from the more elite cohorts have continued to improve. The previous homogeneity of Japanese education appears to have been changed by these reforms (Park and Lee, 2013).

**Subsequent reforms**

The 2001-2006 Koizumi administration promoted the special zone system, and a small number of local governments used this to trial 4-3-2 or 5-4 form systems experimentally. However, legally, all schools are under a 6-3 form. In December 2006, under the first Abe cabinet, Japan amended its Fundamental Law of Education (MEXT, 2006a). The current Abe administration is again discussing the introduction of flexibility into 6-3 form\(^5\).

In 2007 the National Assessment of Academic Ability was introduced for Grade 6 and Grade 9 students, designed to provide accountability measures (Abiko, 2014). Other reforms decreed that educators should consider the first nine grades (1-9) as a unit, rather than separating the first six as elementary and the next three as lower secondary school. This was again to encourage flexibility from the traditional structure.

**Revision of National Curriculum 2008**

After three years of research and consultation, the Central Education Council (CEC) produced a report “Improvement of National Curriculum in Kindergartens, Elementary, Lower Secondary and Upper Secondary Schools and Special Schools” (Yochien, shogakko, chugakko, kotogakko oyobi tokubetsushiengakko no gakushusidoyoryo no kaitei ni tsuite) on which the 2008 revision of national curriculum was based (MEXT 2008b). This was strongly influenced by globalization and the OECD approach to comparative testing. Indeed, PISA is mentioned 17 times in the report, knowledge based economy 15 times and globalization 14 times. The report identified that Japanese students had difficulty in making use of their knowledge and skills (as opposed to acquiring that knowledge) and that Japanese results for reading were comparatively low.

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\(^4\) As there is no voucher or other support scheme, these are only open to children from affluent households.

\(^5\) According to NHK news, the prime minister’s council handed its recommendation on the flexibility of 6-3 form to Prime Minister Abe on the 3\(^{rd}\) July 2014. [http://www3.nhk.or.jp/news/html/20140703/k10015718831000.html](http://www3.nhk.or.jp/news/html/20140703/k10015718831000.html)
The CEC response was to recognize that the *Ikiru Chikara* reform was similar in content to the OECD concept of ‘key competences’ – acting autonomously, using tools interactively and functioning in socially heterogeneous groups (OECD 2005). The report also recommended improving language activities, not only in Japanese but also in other languages.

These reforms were enacted by MEXT from 2008 – 2012; the curricula of elementary and junior high schools were revised in 2008 and they were partly implemented from 2009; the curriculum of elementary schools was completely implemented in 2011 and that of lower secondary schools in 2012. They re-introduced some of the older, more knowledge-based curriculum by re-emphasizing the building of a solid knowledge base without abandoning creative thinking. Foreign language (English) was introduced from Grade 5, elementary school textbooks increased in page length and the number of lessons at the elementary and lower secondary levels was increased in order to cover the expanded curriculum (OECD, 2012; Pearson, 2013).

**Overall pattern of reform**

The decade after the 2002 reforms saw a gradual return to the traditional curriculum framework. The 2011 reform increased the time to teach basic skills, extending the annual hours from around 945 to 980 in the upper elementary schools. The entire ethos shifted to a ‘back to basics’ approach.

After the reduction in teaching hours under the ‘relaxed’ reforms of 2002, hours have slowly crept up. In 2003 when the national standards were partly revised, the number of school hours became only a recommended minimum for schools. In 2008 at the next revision of standards, the number of school hours per week was increased from 28 to 29 for lower secondary schools. This increase was intended to focus on learning that permits enhancement of thinking abilities and that moves away from Japanese traditional emphasis on memorization and test preparation (Abiko, 2014). Similarly there has been considerable teacher resistance to the Integrated Studies, which was fully introduced in 2002; the time allocated to Integrated Studies was reduced in 2011 (Abiko, 2014).

Much of the motivation behind these reforms has been the desire to shift Japanese education away from its common stereotype of a highly centralized and achievement driven system that fails to foster creativity. When MEXT implemented the first National Assessment in 2007, it was in the belief that Japanese students were good at Japanese and mathematics knowledge but not good at Japanese and mathematics application, PISA style. However, even in the problem-solving element of PISA, Park (2013) points out that Japanese students outperform both US and German students, both at the top end of achievement and at the bottom.

**Structure of the school system**
In 2012 Japan had 57,312 schools (including 13,170 kindergartens, 21,460 elementary schools, 10,699 lower secondary schools and 5,022 upper secondary schools. Together they educated more than 1.6 million kindergarteners, almost 7 million elementary school students, over 3.5 million lower secondary school students and almost 3.4 million secondary school students (MEXT 2013b).
The chart below shows the type of schooling available and the ages of transition from one type to the next:

**Japanese school structure (simplified)**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Year</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-K</td>
<td></td>
<td>Kindergarten</td>
</tr>
<tr>
<td>Grade 1</td>
<td>6 yrs</td>
<td>Elementary school</td>
</tr>
<tr>
<td>Grade 2</td>
<td>7 yrs</td>
<td>Elementary school</td>
</tr>
<tr>
<td>Grade 3</td>
<td>8 yrs</td>
<td>Lower secondary</td>
</tr>
<tr>
<td>Grade 4</td>
<td>9 yrs</td>
<td>Lower secondary</td>
</tr>
<tr>
<td>Grade 5</td>
<td>10 yrs</td>
<td>Lower secondary</td>
</tr>
<tr>
<td>Grade 6</td>
<td>11 yrs</td>
<td>Upper secondary</td>
</tr>
<tr>
<td>Grade 7</td>
<td>12 yrs</td>
<td>Upper secondary</td>
</tr>
<tr>
<td>Grade 8</td>
<td>13 yrs</td>
<td>Upper secondary</td>
</tr>
<tr>
<td>Grade 9</td>
<td>14 yrs</td>
<td>Upper secondary</td>
</tr>
<tr>
<td>Grade 10</td>
<td>15 yrs</td>
<td>Upper secondary</td>
</tr>
<tr>
<td>Grade 11</td>
<td>16 yrs</td>
<td>Upper secondary</td>
</tr>
<tr>
<td>Grade 12</td>
<td>17 yrs</td>
<td>Upper secondary</td>
</tr>
<tr>
<td>University</td>
<td>18 yrs</td>
<td>University</td>
</tr>
<tr>
<td>College</td>
<td></td>
<td>College</td>
</tr>
<tr>
<td>Specialized training</td>
<td></td>
<td>College</td>
</tr>
</tbody>
</table>

As outlined above, the rigid system of six years elementary school, followed by three years lower secondary and three years upper secondary is increasingly being broken down to provide greater choice for parents. School boards may have transitions at Grade 4 or 5 and again at Grade 8 or indeed there may be no break between upper and lower secondary. Attendance is only compulsory for grades 1–9; legally all students graduate elementary school after six years of schooling and lower secondary school after three years of schooling.

Although kindergarten (yochien) in not compulsory in Japan, by the age of 5 the vast majority of Japanese children are in some form of pre-elementary education. In Japan, there are mainly two kinds of institutions involved in preschool education and care: kindergartens (yochien) and day nurseries (hoikujo). Historically, kindergartens and day nurseries have existed under the separate systems of the education sector and welfare sector, respectively.
Number of children in Japanese Kindergartens and Day Nurseries (2008)

<table>
<thead>
<tr>
<th>Age of children</th>
<th>Kindergartens</th>
<th>Day Nurseries</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>—</td>
<td>47,575 (4.3%)</td>
</tr>
<tr>
<td>1</td>
<td>—</td>
<td>231,316 (21.3%)</td>
</tr>
<tr>
<td>2</td>
<td>—</td>
<td>316,459 (29.4%)</td>
</tr>
<tr>
<td>3</td>
<td>427,135 (40.6%)</td>
<td>397,696 (37.8%)</td>
</tr>
<tr>
<td>4</td>
<td>602,105 (55.1%)</td>
<td>456,750 (41.9%)</td>
</tr>
<tr>
<td>5</td>
<td>644,923 (57.8%)</td>
<td>454,245 (40.7%)</td>
</tr>
</tbody>
</table>

(Abumiya 2011)

As shown above, day-care for children under the age of one is not popular, and the service is mainly for working mothers who do not take the full amount of parental leave at home. The enrolment numbers and rate increase as the children get older; more than 80% of three-year-olds, more than 90% of four-year-olds, and 98% of five-year-olds are enrolled either in kindergartens or day nurseries in Japan.

Japanese early childhood education begins with core assumptions that are quite different from those of programs in the West. It is based on the notion of preserving and supporting childishness and not on producing outcomes. It views preschool not as a ‘mother’ but as a traditional neighborhood or village square emphasizing social complexity. High student-teacher ratios (i.e. large class sizes) encourage peer interactions and an emphasis on emotion and empathy (Hayashi & Tobin 2013).

Once children turn six they must attend elementary school (Shogakko) for six years and lower secondary school (Chugakko) for three years, until the end of the school year that they reach 15. After nine years of compulsory education students may go on to upper secondary school; there is normally an entrance examination to enter these schools. Upper secondary education is also almost universal in Japan, with graduation rates in 2011 reaching 96% – the third highest in the OECD and considerably higher than the OECD average of 83%. Since 2010, all students can attend state upper-secondary schools without cost (MEXT 2014b).

Upper secondary schools offer general, specialized or integrated curricula. The general course provides the necessary background for those who want to proceed to higher education as well as to those wishing to transition to work but do not have a specific vocational area they want to pursue. Specialized courses are mainly intended to provide vocational or other specialized education for those students who have chosen a particular vocational area. These courses include: agriculture, industry, commerce, fishery, home economics, nursing, information, welfare, science-mathematics, physical education, music, art, English language and other courses. Integrated courses were introduced in 1994 and offer a wide variety of subject areas and subjects from both the general and the specialized courses, in order to satisfy adequately students’ diverse interests, abilities and aptitudes and future career plans.

Unified lower and upper secondary schools that take students from grades 7–12, known as six-year schools, have been popular in the private sector for some time. These schools are seen to
have been particularly effective at preparing students for entry to prestigious universities, and have been increasingly successful in recruiting students away from the public sector. In line with the reforms introduced in 2002, many local authorities have now created their own six-year unified lower and upper secondary schools. In some areas these have emerged as elite schools, with stiff entrance criteria (Nomi 2013).

In addition Japan also has specialized training colleges and “miscellaneous schools”, which offer a variety of practical vocational and technical education programs in response to diverse demands of people in a changing society. The great majority of these schools are privately controlled. Courses provided in specialized training colleges may be classified into three categories: upper secondary, postsecondary and general courses. Each course gives at least 40 students systematic instruction, lasting not less than one year, for 800 class hours or more per year. Specialized training colleges offering upper secondary courses are called upper secondary specialized training schools (Koto-senshu-gakko) and those offering postsecondary courses are called professional training colleges (Senmon-gakko).

Professional training colleges require for admission the completion of compulsory education, while specialized training schools accept those who have graduated from the upper secondary schools or upper secondary courses of specialized training colleges and award the title, ‘technical associate’ (Senmonshi) to those who complete post-secondary courses that fulfill certain criteria, including a study period of at least two years. Students who have completed an upper secondary course lasting three years or more of specialized training colleges designated by the Minister are entitled to apply for a university place.

Specialized training colleges provide progression for lower secondary school graduates, but miscellaneous schools do not. Instead, they provide students with vocational and practical training such as dressmaking, cooking, book keeping, typing, automobile driving and repairing, computer techniques, etc. Most courses in miscellaneous schools require for admission the completion of lower secondary schooling. These courses normally last one year or more with at least 680 class hours per year, but there are also shorter courses of three months or more (MEXT 2014a).

Teachers in Japan work longer hours than in most OECD countries – 1883 hours per year in contrast with the OECD average of approximately 1670 hours. However, their net teaching hours are shorter than the OECD average – 731 hours at elementary (OECD 790); 602 hours at lower secondary (OECD 709); 510 hours at upper secondary (OECD 664). The difference is accounted for by teacher involvement with other school related responsibilities such as extracurricular activities, counseling students and administration. Class sizes are large, but shrinking. In 2011 the average elementary class had 30 students and the average lower secondary class had 33 students, the second highest in the OECD (OECD 2013a).
The school year is at least 35 weeks and the school year runs from April to March with holidays in the summer, winter and spring and is divided into three terms – although some local government areas have recently experimented with a two-term system (INCA 2011).

**Policy aims and vision**

Japanese culture places a great value on education and skills, but also on group and social relations. “In Japan, there is a shared belief that if the individual works tirelessly for the group, the group will reciprocate. But if one flouts the group, one can expect very little from society” (OECD 2010, 138).

Article 26 of the Japanese Constitution states:

“All people shall have the right to receive an equal education correspondent to their ability, as provided by law”, and that “all people shall be obligated to have all boys and girls under their protection receive ordinary education as provided for by law. Such compulsory education shall be free.”

According to the *Basic Act on Education Act No. 120, 2006* the aims and principles of education in Japan are as follows:

- article 1: education shall aim for the full development of personality and strive to nurture the citizens, sound in mind and body, who are imbued with the qualities necessary for those who form a peaceful and democratic state and society.

- article 2: to realize the aforementioned aims, education shall be carried out in such a way as to achieve the following objectives, while respecting academic freedom:
  - to foster an attitude to acquire wide-ranging knowledge and culture, and to seek the truth, cultivate a rich sensibility and sense of morality, while developing a healthy body
  - to develop the abilities of individuals while respecting their value; cultivate their creativity; foster a spirit of autonomy and independence; and foster an attitude to value labor while emphasizing the connections with career and practical life
  - to foster an attitude to value justice, responsibility, equality between men and women, mutual respect and cooperation, and actively contribute, in the public spirit, to the building and development of society
  - to foster an attitude to respect life, care for nature, and contribute to the protection of the environment
to foster an attitude to respect our traditions and culture, love the country and region that nurtured them, together with respect for other countries and a desire to contribute to world peace and the development of the international community (MEXT 2006a).

21st Century skills

Japan is generally perceived to have a demanding curriculum, which is quite narrow in scope and delivered through very traditional didactic pedagogies. Many of the reforms detailed in this paper have had as an objective the need to open up a more questioning approach leading to greater understanding of concepts over traditional techniques of memorization.

Perhaps the most relevant of these objectives to the OECD concept of 21st century skills is the introduction of the Period of Integrated Study. This was aimed to “...actively introduce experiential learning such as experience in nature, social life experience, observations, experiments, field study and investigation as well as problem-solving learning to learn about cross-sectional, comprehensive subjects like the environment, international understanding, information, health and welfare as well as subjects that interest students” (MEXT 2002).

Many teachers and schools have not responded whole-heartedly to this innovation, and the time allocated for it has been subsequently reduced, although the 2013 TALIS report does provide evidence of more enhanced teaching and experiential learning in Japan.

The 2008 reforms recognized a need to foster greater enthusiasm for mathematics and science, and the resulting course of study aims to put more emphasis on experiential, problem-solving learning through observations, experiments and project studies and to reach out to universities, research institutes and museums for help in engaging students’ interest in science. The current reforms are looking to encourage the development of individual self-expression and independence, and to emphasize a range of 21st century competencies including collaboration and creativity.

Information Education has been part of the school curriculum of Japanese education since 1985. The aim of Information Education is to bring up abilities to use information that is called “Information Utilized Abilities” taught in every related subject and activity systematically through all stages of school education. The 2013 TALIS report shows that this does not seem to be happening to a great extent in the classroom, where Japan lags well behind the TALIS average for ICT use in the classroom. Indeed, Vallance (2008) suggests that despite being a nation whose image is that of high technology, robotics and creative media, the actual uptake of technology in education in Japan, “remains comparatively low, and ICT does not appear as a priority in national education policy” (UNESCO, 2007 in Vallance, 2008, p.279).
While both 21\textsuperscript{st} century skills and ICT education are prioritized in national policy documents, it seems that these are not easily being translated into actual approaches in the classroom. To really create a shift to emphasize such new skills and pedagogies, there will need to be a more coherent and systematized approach to these competencies within Japanese education, which takes into account their implementation within teaching and assessment.

\textit{Innovation in education}

The OECD “Measuring Innovation in Education” (OECD 2014b) offers a way of measuring educational innovation using outcomes from TIMSS, PIRLS and PISA. It should be noted that using these data means that any innovations identified will tend to be only in the subjects or age sectors tested in these studies.

The OECD report suggests the following as Japan’s five most significant organizational innovations:

1. \textit{Enrichment education in primary and secondary schools}
   Between 1999 and 2007 the percentage of Japanese students in Grade 8 enrolled in schools with enrichment mathematics and science education programs rose by 37\% and 30\% points respectively. Similarly, between 2003 and 2007 the percentage of 4th grade students enrolled in schools with mathematics and science enrichment increased by 26\% and 10\% points respectively.

2. \textit{More remedial education in secondary schools}
   The data suggest that between 1999 and 2007 the percentage of Japanese 8th grade students in schools that offered remedial mathematics programs increased by 21\% points, while those offering remedial science education increased by 19\% points.

3. \textit{Incentives for recruitment and retention of secondary teachers}
   Schools in Japan are increasingly using incentive structures to recruit and retain quality teachers. The number of schools using incentive programs rose by between 6\% and 13\% points between 2003 and 2007.

4. \textit{More information for parents}
   Between 2006 and 2009 there has been a very large rise in the number of schools that provide parents with information on their child’s academic performance. As we have seen above, this is from a low starting base.

5. \textit{More use of assessments for national or district benchmarking}
   The OECD suggests that between 2000 and 2009, the percentage of Japanese 15-year olds in schools where assessments are used for comparing school to district or national performance increased by 14\% points. This finding should be read in the context of the continuing debate about use of national assessments as outlined above.
In terms of pedagogic innovation the OECD reports suggests that Japan’s main innovations are:

1. **More group work in secondary mathematics classroom**
   The use of group work in mathematics classrooms in Japan has increased enormously between 2003 and 2007, with a 73% point increase in the percentage of students working together in small groups in 8th grade mathematics.

2. **More use of answer explanation in secondary mathematics**
   Grade 8 students self-reported a 44% point increase in the number of teachers who ask students to explain their answers in their mathematics lessons. However, over the same period, Japanese teachers reported only an 8% point increase in this metric.

3. **More relating of secondary mathematics lessons to everyday life**
   Both students and teachers suggest that there has been a significant increase in the number of teachers who ask students to relate what they learn in mathematics to everyday life and experience. This can be seen as a 21st century skill.

4. **More data interpretation in secondary mathematics lessons**
   The period 2003–2007 saw an increase in the number of teachers asking students to interpret data in tables, figures and graphs.

5. **More explanation in science lessons**
   For the period 2007–2011, teachers in Japan reported significant increases in the extent to which students explain what they are studying during primary and secondary science lessons.

The above evidence provides some support to suggest that the program of Japanese reform over recent years, in particular the policy of Zest for Life and more a more relaxed approach to education are having a real impact at classroom level.

**Governance**

Administration of education is shared between national and local government at prefectural (the upper tier of local government) and municipal levels, but the educational agencies are independent of each other. Each of them participates in the administration of the education system and policymaking is on a consensus basis. Central government, through the Ministry of Education, Culture, Sports, Science and Technology (MEXT), formulates national education policy through the courses of study, which are synonymous with national education standards (which in Japan are viewed as the same as the curriculum); it administer public schools, sets salary scales for teaching staff, and establishes supervisory services.
Responsibility for school budgets, specific educational programs, school appointments and the supervision of schools is the responsibility of local Boards of Education (INCA, 2011). Each of the country’s 47 prefectures has a board of education that is responsible for the establishment and management of upper secondary schools and special needs schools. In addition, there are approximately 1700 municipalities that have their own Municipal Boards of Education that are responsible for the management of elementary and lower secondary schools. Boards of education are independent from government, and decide on the fundamental direction on education administration. They are intended to be guarantors of political neutrality and provide long-term continuity and stability (OECD 2012). However, an amendment to the Local Education Administration Law passed in 2014 is likely to mean that political influence over the Boards of Education will become stronger.

The teachers themselves have a great deal of influence over how the curriculum is taught and schools are able to set local curricula and assessments within the national curriculum framework. In response to questions in the PISA 2012 assessments, principals reported that 98% of Japanese students go to schools whose principals and teachers have considerable responsibility for establishing assessment policy, 90% attend schools that decide which courses to offer and 89% go to schools that choose their own textbooks from the approved list (OECD 2013a).

Public/private

There is a thriving private education sector in Japan that receives considerable public subsidy. Private schools generally follow the same curriculum as public schools, although private schools may include religious education in their curriculum. Only organizations approved by the government can establish and manage these schools, they must not be for-profit, pay no tax and they have to return their property to the government if they close the school. Private sector education is most prominent in pre- and post-compulsory education; the majority of compulsory education is in the public sector (INCA, 2011). Up to 29% of 15 year olds in Japan are in private upper secondary schools, some of which are government funded. Interestingly, once socio-economic backgrounds are taken into account, public school students out-perform their privately schooled peers on PISA assessments (OECD 2012).

Around 24,000 students are also educated in 200 schools for foreigners (gaikokujin gakko), which are classified as Miscellaneous Schools. Full time schools that cater to one non-Japanese nationality are not approved by the national Ministry of Education as mainstream schools, and have a variety of legal statuses. The most privileged status (ichijoko) is granted to schools that follow the Japanese courses of study.

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6 http://www.japantimes.co.jp/opinion/2014/01/13/editorials/keep-power-in-boards-of-education/
**Cram schools (Juku)**

Many Japanese students are privately tutored, outside of school hours. *Juku* or cram schools are common venues, but some tutoring is at home or through distance learning. The extent of the influence of *Juku* on Japanese student achievement is hotly contested, with many commentators suggesting they are a major factor in the success of Japanese students in comparative testing. Although not unusual in the culture of Eastern countries, Japanese families do use intense *Jukus* to an extent which is surprising to most Westerners. Bray (2009; 2006) suggests that 65% of 9th grade students attend *Juku*, 73% of lower secondary students and 83% of elementary students. However, MEXT surveys suggest the figures are 55% for 9th Grade and 41% for 6th grade (NIER no date, in Japanese). Typically parents might pay between $1,000 and $2,000 a year on each child’s *Juku* (Tsuneyoshi 2013).

The OECD claims that 53% of lower secondary students have some sort of private tutoring. The rate of upper secondary students attending *Juku* is affected by the competitive university entrance system, and the main reason why the rate of lower secondary students attending *Juku* is high is usually that they aim to pass the upper secondary school entrance exams (OECD 2012). *Juku* are also increasingly being used to bolster entrance to lower secondary schools, and may be a reason for increasing inequality of achievement in the country (Tsuneyoshi, 2013).

**Textbooks**

School textbooks are the main instructional material in Japanese classrooms. In accordance with the provisions of the *School Education Law*, Japanese schools are required to use textbooks in the classroom teaching of each subject. The content of the course of study is reflected in textbooks, teachers' manuals and programs of work. Ministry-approved textbooks are provided free to all elementary and lower secondary schools. The central government provides all students in compulsory education a complete set of new textbooks at the beginning of each school year, no matter whether they are being educated in Japan or in another country. Upper secondary school students have to buy their own textbooks (INCA, 2011).

Japanese textbooks are succinct compared to their counterparts in other OECD countries. They are inexpensively produced paperbacks of around 200 to 300 pages. The same textbook is used throughout a year (sometimes two or three years) in some subjects. As noted above, the number of textbook pages is increasing because the content of curriculum was increased in the 2008-2009 revision. The materials within them must align with the core concepts underlying the course. MEXT approves the textbooks, but the policies established in the 1980s reduced the Ministry’s role to ensuring textbooks’ neutrality and that they cover the correct topics for their grade. Textbook publishers produce books that adhere very closely to the courses of study.

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7 The following websites list currently available textbooks (in Japanese):
The list of primary school textbooks:
Accountability

According to the OECD, Japan’s accountability system is different from most other OECD nations’, a distinction it shares with Finland. There is accountability, but it is not a system of administered accountability, and it is not test-based. Japan introduced assessments of 6th and 9th grade students in 2007 (having dropped a national assessment system 40 years prior to that); the assessments were administered to whole cohorts between 2007 and 2009, and then they were based on sampling only until 2013, when they reverted to whole cohorts again. Additionally, there are entrance tests for upper secondary schools and universities and a student’s future rests heavily on the outcomes of those. Magazines frequently publish the results, which may be considered a form of public accountability. The rankings of upper secondary schools attract considerable attention, but there is less interest in which lower secondary schools send more students to prestigious upper secondary schools, since only 15% of municipalities have introduced school choice.

Instead of accountability through the results of frequent testing, in Japan there is an understood group accountability consisting of the student, the family, teachers and other educators and other students in the year group. Teachers’ reputations are wrapped up in their former students’ success, and each student has a homeroom teacher who might be with him or her for a number of years and will be involved in the student’s life outside the classroom. Communication with parents is frequent and Japanese society holds the mother responsible for her children’s success to a far greater extent than elsewhere. Students are under intense pressure to succeed since the reputations of the adults in their lives depend on it. Students routinely take difficult courses and study very hard in (and outside of) school. Even without a formal test-based accountability system, the OECD argues that there is strong accountability in Japan with students accountable to teachers and parents, teachers accountable to each other, and success in getting students placed in the right upper secondary school or university a matter of public knowledge (OECD, 2010).

Setting standards

The Japanese national government is responsible for creating the framework of educational systems and standards, through the courses of study, and for ensuring equal opportunities for
all to receive an education. Local government is responsible for the implementation of this policy and most of the day-to-day activities.

The five year education plan developed in 2008 included standard setting activities through fostering children’s ‘solid academic abilities’ including fundamental knowledge and skills, abilities to think logically as well as critically, to pass fair judgments and to express themselves well and motivation to learn’ (MEXT, 2008a). The plan promotes the following for students:

- fundamental and basic knowledge and skills
- abilities to think logically as well as critically, to pass fair judgments and to express themselves well which are needed to solve problems, with the use of knowledge and skills
- an attitude of learning voluntarily with motivation to learn.

The National Assessment of Academic Ability (see below) was reinforced, with the government using the outcomes to gauge learning conditions in schools. Schools themselves were to use the outcomes to address any problems, give the public successful examples of school improvement and to ensure their accountability to parents. In order to assist schools in these efforts, the government would support flexible class-formation standards, the introduction of small-group education, the use of special teachers, the introduction of school choice and the development of original teaching materials (MEXT, 2008a).

One clear way of maintaining standards is ensuring that what is taught follows closely on from the intended curriculum. The national curriculum is revised about every 10 years and is a fundamental link in the standards chain. MEXT sets the curriculum, using university professors and ministry staff as writers. The prefectures follow the national curriculum closely. Until recently most of the school day was taken up by the national curriculum, which emphasized the essential subjects of Japanese, social studies, mathematics, science and foreign language (mainly English). Teachers teach based on the national curriculum standards, going over the entire textbook for that term in each subject. According to the OECD (2012) the fact that everyone covers the curriculum no matter what school they are in or what region they are located in makes it easier to hold the system accountable. While teachers adapt, they do not change the curriculum. Despite recent liberalization, Japan’s curriculum contains less choice than in typical Western systems.

Although Japan does not make achievement data public, the OECD suggests there is no relationship between this (lack of) reporting of student achievement and student performance itself. However, some data are available to parents, including comparing students in one school to students in another. Seventy-nine percent of Japanese students attend schools that provide student performance data relative to national or regional achievement and/or as a group relative to other students in the same cohort (OECD, 2012).
Performance data used to monitor teachers are common in just over half of Japanese schools, generally complemented by direct principal/senior staff observation.

**Teacher training**

*Initial teacher training*

To become a qualified teacher in Japan, there is an academic and a practical element that have to be completed. While teacher training is centered at teacher training universities, pre-service training (ITE) can also be undertaken at general colleges, other universities and junior colleges, if their courses are authorized by MEXT. There are set numbers of credits that must be obtained based on the level of teaching qualification.

**Basic Requirements and Minimum Number of Credits for a Teaching Certificate**

<table>
<thead>
<tr>
<th>Type of Teaching Certificate</th>
<th>Basic Requirements</th>
<th>Minimum Number of Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Teaching Subjects</td>
</tr>
<tr>
<td>Kindergarten</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced</td>
<td>Master’s Degree</td>
<td>6</td>
</tr>
<tr>
<td>Type I</td>
<td>Bachelor’s Degree</td>
<td>6</td>
</tr>
<tr>
<td>Type II</td>
<td>Junior College Associate’s Degree</td>
<td>4</td>
</tr>
<tr>
<td>Primary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced</td>
<td>Master’s Degree</td>
<td>8</td>
</tr>
<tr>
<td>Type I</td>
<td>Bachelor’s Degree</td>
<td>8</td>
</tr>
<tr>
<td>Type II</td>
<td>Junior College Associate’s Degree</td>
<td>4</td>
</tr>
<tr>
<td>Lower Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced</td>
<td>Master’s Degree</td>
<td>20</td>
</tr>
<tr>
<td>Type I</td>
<td>Bachelor’s Degree</td>
<td>20</td>
</tr>
<tr>
<td>Type II</td>
<td>Junior College Associate’s Degree</td>
<td>10</td>
</tr>
<tr>
<td>Upper Secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced</td>
<td>Master’s Degree</td>
<td>20</td>
</tr>
<tr>
<td>Type I</td>
<td>Bachelor’s Degree</td>
<td>20</td>
</tr>
<tr>
<td>Special Needs Education</td>
<td>Advanced</td>
<td>Master’s Degree + a general teaching certificate</td>
</tr>
<tr>
<td></td>
<td>Type I</td>
<td>Bachelor’s Degree + a general teaching certificate</td>
</tr>
<tr>
<td></td>
<td>Type II</td>
<td>General teaching certificate</td>
</tr>
</tbody>
</table>

In addition to the above, each student is required to complete two credits of coursework in subjects involving the Japanese constitution, physical education, foreign language...
communication and ICT. Students who aspire to earn teaching certificates for primary or lower secondary schools are also required to participate in nursing, assistance services, or communication with the elderly and/or people with disabilities for more than seven days at an institution for social welfare and/or special needs (NIER, 2010).

Teaching practice is an important element of courses, with students working under the guidance of an experienced teacher for around four weeks. Most students at teacher training universities conduct their practice at schools attached to the institutions, but some students may also go to unattached local schools. Courses for Teacher training are 4 years for a Bachelor route and 2 years for a Masters route.

On completion of a pre-service teacher training course, students receive a teaching certificate which may be:

- **regular** - the regular teaching certificate is the most popular and is issued by the prefectural Boards of Education upon a student's completion of the necessary training programs in a teacher-training course. A regular teaching certificate is valid for all prefectures in Japan, is valid for 10 years and can be renewed by taking certificate renewal courses given mainly by universities. Regular teaching certificates are further categorized into Advanced, Type I, and Type II certificates, depending on the teacher's academic background.
- **advanced** - a master’s degree is the basic qualification for an advanced certificate.
- **special teaching certificate** - this aims to provide certificates through teacher examinations in each prefecture, in order to employ a variety of people with superior knowledge, experience, technique, social prestige, ambition, and insight in education. The special teaching certificate is issued based on employer recommendation (adopting Board of Education, school, etc.) after an interview with specialists. This certificate is valid only in the prefecture that provides it. The valid period of the certificate is for 10 years, and can be renewed just like a regular certificate, by taking a certificate renewal course.
- **temporary teaching certificates** - these are given when an employer cannot employ a person with a regular teaching certificate. The valid period is three years in general, and the certificate is only valid only in the prefecture that awards it. Very few temporary teaching certificates have been issued in recent years.

There are three divisions of regular certificate classification, schoolteacher, nurse teacher and teacher for food and nutrition. The certificate is awarded for the phase of education i.e. kindergarten, primary, lower secondary or upper secondary. There are yet further types of teaching, including special needs education and for secondary teachers, by specialist subject area.

Obtaining the teaching certificate is not a guarantee of a job. Teaching is very popular occupation among young people in Japan today, with an average of six applications for every job. To become a school teacher, a person is required to pass a “hiring examination”
implemented by the board of education in one of the 47 prefectures and 19 specified major
cities. While the details of the hiring process will vary between prefectures / cities, candidates
are in general judged for suitability through written examination, interview and practical tests
(which may include physical exercise, music, arts and crafts, foreign language performance)
and aptitude. The examinations are held only once a year.

Teachers then begin a year of probation during which they undertake induction training. This is
intended to develop practical ability and a sense of the mission of teaching. Public school
teachers (in prefectoral and municipal schools) are appointed by the prefectoral board of
education and teachers in specified major city schools are appointed by specified major city
Boards of Education. Once accepted, teachers are likely to remain with that prefecture for life,
and they will be rotated around schools in the prefecture. Though teacher assessment is used
by the board of education in the 47 prefectures and 19 specified major cities, dismissal is a rare
and serious occurrence.

Continuous professional development

Teachers are expected to study continually to improve their knowledge and teaching skills.
Training might be self-training, school-based training, training by other organizations, training
offered by the education boards or through universities. Courses run by Boards of Education
are often aimed at those with different experiences, for example, newly qualified teachers, those
with five, 10 or 20 years of teaching experiences. Specific training for teachers with 10 years
experience is a statutory requirement (Murata & Yamaguchi 2010).

Darling-Hammond et al (2010) describe a powerful type of continuous professional development
led by Japanese teachers – the lesson study or lesson research (jugyou kenkyuu) – in which
groups of teachers collaborate not only to produce excellent lessons but to improve each others’
pedagogy. Teachers work in large study groups and sub-groups to plan, observe and comment
on lessons. This process culminates in study or research lessons (kenkyuu jugyou).

Each teacher prepares an outstanding lesson in collaboration with his or her colleagues and
then teaches that lesson while other teachers (and sometimes outsiders) observe. When the
lesson is finished the teachers discuss its strengths and weaknesses and offer suggestions for
improvement. A typical research lesson can take 10-15 hours of group planning over the
course of three or four weeks, largely after students leave for the day. Planning, implementation
and feedback all encourage self and collaborative reflection and learning and feed into a culture
that emphasizes continuous improvement.

Almost all teachers in Japan receive formal appraisals from their principals and senior
managers, using a variety of methods, including classroom observation. A large majority – 80%
– of teachers find these appraisals positive and report benefits arising from this feedback
(OECD, 2014a).
Teachers in Japan are more likely than those in most TALIS countries to have participated in observation visits to other schools and in education conferences and seminars. Despite this, they feel the need for more professional development in the areas of knowledge and understanding of their specialist subject (51%) and pedagogical competencies in teaching their specialist subject (57%). Despite this high level of participation, 90% of Japanese teachers feel that professional development activities conflict with their work schedule and would like greater support from their employers to remove these barriers.

Teachers in Japan do not appear to integrate new technologies into the classroom. Only 10% reported using ICT in general class work frequently (compared to an average 37% for all TALIS countries). However, this does increase when classes include higher numbers of students with special needs.

While teachers in Japan generally show low levels of self-efficacy, this is markedly higher for those who often collaborate with other teachers in activities such as team teaching or observing other teachers’ classes to provide feedback. This suggests that encouraging more collaboration among teachers may help enhance the confidence they have in their own abilities.

Japanese teachers work longer hours than the TALIS average (54 hours per week compared to 38 hours per week) and the great majority of their lesson time is spent on teaching, with only 15% on keeping order. Teachers in Japan report spending more hours performing a variety of other work-related tasks compared with the TALIS average. As an example, Japanese teachers spend eight hours on average for extracurricular activities compared with the TALIS average of two hours (OECD 2014a).

Japan’s curriculum

Japan’s curriculum is set out logically, with information on the content that is to be covered each year in a step by step manner. The content is highly demanding and sets out what students need to understand in order to progress. There is a great deal of concentration on essential subjects, considered to be Japanese, mathematics, science, social studies and foreign language (generally English). Emphasis in mathematics and science is on conceptual understanding. The curriculum is organized by subject and contains considerable amounts of factual matter that students have to master.

MEXT prescribes, through the courses of study, what subjects, and the topics within those subjects, students must be taught. As noted in previous sections, schools, both private and

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OECD consider self-efficacy (teacher confidence in their ability to master professional tasks) as closely linked with their instructional practices, their general level of classroom engagement, and their overall well-being, teachers’ evaluations of their own professional experiences, such as their satisfaction with their teaching performance or their well-being, are predictors of teachers' professional behaviours and their students' outcomes. OECD 2013
public, organize their own curricula around the courses of study, which were last revised in 2008 for implementation in 2011 for elementary schools and in 2012 for lower secondary schools. Official textbooks were revised in tandem with the curriculum revisions.

The main elements of the 2008 revisions\(^9\) were:

- for Japanese, the enhancement of record-keeping, explanation, critique, statement and debate
- for mathematics and science, introducing more mathematical concepts, enhancing teaching through spiral (repetition) learning, ensuring statistics is taught in upper secondary school
- for cultural education, learning more proverbs and the oral tradition, emphasizing religion and cultural heritage and Japanese inventions such as the abacus. Martial arts became compulsory in lower secondary
- more experiential learning particularly in moral education and Integrated Studies
- for foreign language education, the introduction of activities in elementary schools, ensuring the balance of the four main language areas (reading, writing, listening and speaking), increases in the number of words that must be taught and teaching English in the medium of English for upper secondary school students
- for vocational education, changes to what is taught to develop knowledge, skills and abilities that are required in the workplace and introducing moral and ethical factors
- introduction of internship programs for upper secondary school vocational students.

Elementary students must study Japanese, mathematics, social studies, science, music, arts and crafts, home economics, foreign language (introduced in 2011) and physical education. Moral education, special activities and the period for Integrated Studies are also included in the curriculum. Students also study calligraphy and home economics.

The following table gives an indication of the amount of time spent on the core subjects in elementary schools each year. A unit in this table equals 45 minutes.

**Elementary School (from 2011)**

<table>
<thead>
<tr>
<th></th>
<th>Grade 1</th>
<th>Grade 2</th>
<th>Grade 3</th>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese Language</td>
<td>306</td>
<td>315</td>
<td>245</td>
<td>245</td>
<td>175</td>
<td>175</td>
</tr>
<tr>
<td>Social Studies</td>
<td></td>
<td></td>
<td>70</td>
<td>90</td>
<td>100</td>
<td>105</td>
</tr>
<tr>
<td>Arithmetic</td>
<td>136</td>
<td>175</td>
<td>175</td>
<td>175</td>
<td>175</td>
<td>175</td>
</tr>
<tr>
<td>Science</td>
<td></td>
<td></td>
<td>90</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Living Environment Studies</td>
<td>102</td>
<td>105</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Music</td>
<td>68</td>
<td>70</td>
<td>60</td>
<td>60</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

\(^9\) In Japan they refer to revisions by when they are “noticed” rather than when they are implemented; so here we refer to 2008 revision (“noticed”) rather than 2011 revisions (implemented).
Lower secondary students must study Japanese, social studies, mathematics, science, music, art, physical education, technology and home economics and foreign languages (usually English). Moral education, special activities and Integrated Studies are also offered.

The following table gives an indication of the amount of time spent on the core subjects in lower secondary schools each year. A unit in this table equals 50 minutes.

### Lower Secondary School (from 2012)

<table>
<thead>
<tr>
<th></th>
<th>Grade 7</th>
<th>Grade 8</th>
<th>Grade 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese Language</td>
<td>140</td>
<td>140</td>
<td>105</td>
</tr>
<tr>
<td>Social Studies</td>
<td>105</td>
<td>105</td>
<td>140</td>
</tr>
<tr>
<td>Mathematics</td>
<td>140</td>
<td>105</td>
<td>140</td>
</tr>
<tr>
<td>Science</td>
<td>105</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>Music</td>
<td>45</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Art</td>
<td>45</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Health and Physical Education</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Technology and Home Economics</td>
<td>70</td>
<td>70</td>
<td>35</td>
</tr>
<tr>
<td>Foreign Languages</td>
<td>140</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>Moral Education</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>The Period for Integrated Studies</td>
<td>50</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Special Activities</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1015</strong></td>
<td><strong>1015</strong></td>
<td><strong>1015</strong></td>
</tr>
</tbody>
</table>

#### Language of instruction

The official language by custom and practice is Japanese, which is the language of instruction.

#### Assessment processes

Until 2013, Japan had no whole-cohort national assessment system, which meant that the system relied heavily on teacher-based assessment, both formative and summative. Since 2013, there has been a national Assessment at Grade 6 and Grade 9. There are no formal
Assessment for Learning policies, however. There are entrance examinations that students must pass in order to get into upper secondary programs and universities, but individual institutions design and write these tests. For upper secondary schools, there are two types of entrance processes, general entrance exams and admission on recommendation. In general entrance exams, those who establish and manage a school devise a common academic entrance examination. For example, Prefecture Boards of Education offer a common entrance exam to applicants to their schools, so many Grade 9 students who want to go to public upper secondary schools in Tokyo take an entrance exam offered by Tokyo Board of Education. However, some (competitive) state schools can offer their own (more challenging) exams to recruit excellent students. Each state upper secondary school decides who can enter their school based on academic examinations and other elements. Private upper secondary schools offer their own exams.

At the end of upper secondary, successful students receive a Certificate of Upper Secondary Education, issued by the school itself. This certificate is one of the requirements for entry to higher education. Students are assessed continuously by their teachers and are frequently assessed in class, especially in Japanese and mathematics, either through teacher-created or off-the-shelf tests. Promotion and certification of completion decisions are based on teacher assessment and year-to-year promotion is almost automatic (INCA 2011).

The lack of national testing does not mean that students are relieved from examination pressures. Lower secondary students have four or five regular exams every year. For example, schools that have three-term systems offer midterm and term-end exams (first and second terms) and final exams in the third term. Teacher-based assessment, mainly based on these exams, is recorded on a student study report that each upper secondary school uses in its admission process, so all of these regular exams are very important for students. Upper secondary students spend much of their time preparing for university entrance examinations that emphasize the learning of a great deal of factual information. Almost all national and public universities require students to take a common exam, the National Center Test for University Admissions, and offer their own exams to applicants in addition. Each university can decide which subjects applicants need. Some private universities offer only their own exams, some use the results of National Center Test for university Admissions, and others use both (MEXT 2010, in Japanese).

Recently a government panel has been convened to make recommendations about reforming the university entrance system; any reforms are due to be put in place by 2018. At the moment the panel is considering replacing the standardized test with one that better reflects achievement and that can be available a number of times each year. The panel also is interested in the universities themselves reforming their individual entrance examinations to de-emphasize recall of factual information. It also is looking into the possibility of expanding the elements that comprise the decision making to include things such as interviews, debates and short essays as well as extra-curricular activities undertaken by upper secondary school students (Osaki 2013).
New national assessments were introduced in 2007, known as the national academic achievement test (\textit{zenkoku gakuryoku gakushuu joukyou chousa}). They assess students in 6\textsuperscript{th} and 9\textsuperscript{th} grade in mathematics, literacy and science.\textsuperscript{10} While schools’ participation in these tests is voluntary, almost 99\% of schools participated in the first year. However, Takayama (2013) argues that the prefectures are not really interested in these national assessments and that there is on-going debate about whether or not the tests should be mandatory or sample based. The test shifted from whole-cohort to sampling (30\%) in 2010 on the theory that this would both save money and provide sufficient data necessary for student achievement monitoring. Starting in 2013, the testing became mandatory again, as MEXT believed that the outcomes could be linked with schools’ planning cycles.

There is a similar debate about whether to make the test results public or not. Currently prefectures have been told not to publish results, even though some wanted to do so in the name of public accountability (Takayama 2013). “Statistics Japan” published a rank order of prefectures based on the results from 2007 to 2009 on its website; for those years high achievement correlated with home ownership and households in which two parents worked (Statistics Japan 2012).

The tests are divided into two types – one for academic achievement and the other for ‘learning conditions’. The former tests students’ basic knowledge and their ability to apply that knowledge in real-life situations (as in PISA items); the latter consists of survey questions about students’ everyday lives. MEXT conducts statistical analyses to gauge the correlations between the first and second parts of the test, again, much like PISA, TIMSS and PIRLS assessments do.

The assessment for Grade 6 students includes the following:

- 20-minute test on reading and writing and general knowledge about Japanese
- 20-minute arithmetic test on fundamental calculation and general subject knowledge
- 40-minute test in Japanese in which students write about what they have learned from reading an article
- 40-minute arithmetic test involving diagrams and graphs so that students can demonstrate their ability to utilize information
- 40-minute science test. This test measures both knowledge and application integrally (only in 2012).

The assessment for Grade 9 includes the following:

\textsuperscript{10} MEXT plans to implement science exams every three years. (http://www.mext.go.jp/b_menu/shingi/chukyo/chukyo3/047/siryo/icaFiles/afielddfile/2012/12/07/1328509_02.pdf)
45 minute test on Japanese knowledge
45 minute test on Japanese usage
45 minute test of mathematics knowledge
45 minute test of mathematics application
45 minute science test. This test measures both knowledge and application integrally (only in 2012).

Previously there were no questions related to social class or parental education and income, which are a feature in the international testing questionnaires; however in 2013, MEXT implemented a survey for sample parents and asked them to answer a questionnaire (15 pages) including their education and income. MEXT then correlates the results with the tests’ outcomes and reports back to schools, municipal boards and prefectural boards. Schools are required to integrate results into their planning cycles.

Takayama (2013) argues that these tests introduce regulation into the Japanese education system that has not been seen for 40 years. He believes that schools will narrow their curriculum and pedagogies as a result of the feedback, especially low performing schools, pressuring them to adopt the strategies featured in the questionnaires. MEXT also requires schools and school boards to publish their improvement plans partly on the basis of data drawn by the national assessments. This, Takayama argues, is de-facto centralized policymaking by the back door without having to conform to the market-driven model of assessment for accountability.

**International testing**

Arguably, Japan is one of the countries in which the PISA tests have had their greatest impact. The shock of the declining scores seen in 2003, even though by international standards were quite high, led to a fundamental rethink of a system that had only recently been through a radical series of reforms. Japanese policy makers appear to take the results of PISA and other comparative rankings exercises very seriously.

<table>
<thead>
<tr>
<th>PISA 2012</th>
<th>Score</th>
<th>Rank</th>
<th>Point difference highest (95%)/ lowest (5%) achievers</th>
<th>Below level 2 (basic skills for life and work)</th>
<th>Levels 5 &amp; 6 (top performers)</th>
</tr>
</thead>
</table>

Although TIMSS and PISA all have a mean score of 500 and a standard deviation of 100, because different countries participate in the assessments, the scores cannot be compared across instruments, i.e. a 570 in TIMSS does not equal a 570 in PISA. The same, obviously, is true for rank order – coming in 4th in TIMSS does not equal coming in 4th in PISA.
Japan is an all around high achieving country as shown in the table above. The points differences between its highest and lowest achievers, which the OECD uses as a measure of educational equity, i.e., the lower the point difference, the closer educational opportunities are for all students, is slightly higher than the OECD average, though. Around 9% of test takers achieved a level 5 or 6 in all three main tests in 2009. 62.9% of top performers in problem solving were also top performers in mathematics (for the other two subjects it was around 50%). Japan has participated in PISA since 1995; its scores in mathematics increased by 2 points between 2000 and 2012, in reading by 16 points and in science between 2006 and 2012 by 16 points\(^{12}\) (OECD 2013b; OECD 2013c; OECD 2013d; OECD 2014b).

### TIMSS 2011

<table>
<thead>
<tr>
<th></th>
<th>Score</th>
<th>Rank</th>
<th>Advanced International Benchmark (625)</th>
<th>Low International Benchmark (400)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIMSS math 4(^{th}) grade</td>
<td>585</td>
<td>4th of 57</td>
<td>30% International Median = 4%</td>
<td>99% International Median = 90%</td>
</tr>
<tr>
<td>TIMSS math 8(^{th}) grade</td>
<td>570</td>
<td>8th of 56</td>
<td>27% International Median = 3%</td>
<td>97% International Median = 75%</td>
</tr>
<tr>
<td>TIMSS science 4(^{th}) grade</td>
<td>559</td>
<td>4th of 57</td>
<td>14% International Median = 5%</td>
<td>99% International Median = 92%</td>
</tr>
<tr>
<td>TIMSS science 8(^{th}) grade</td>
<td>558</td>
<td>5th of 56</td>
<td>18% International Median = 4%</td>
<td>97% International Median = 79%</td>
</tr>
</tbody>
</table>

Between 1995 and 2011 Japan’s average score has increased in 4\(^{th}\) grade mathematics, 4\(^{th}\) grade science and 8\(^{th}\) grade science by 18, 6 and 4 points respectively; its 8\(^{th}\) grade mathematics score decreased by 11 points (Martin et al 2012; Mullis et al 2012). Japan did not participate in PIRLS.

### Detailed analysis of curriculum

In this section, the following key areas of the Japanese curriculum have been analysed: Primary Japanese language, mathematics, general science and history, and secondary

\(^{12}\) As a rule of thumb, the OECD equates 40 points with approximately one year of schooling.
Japanese language, mathematics, earth science, biology, chemistry, physics, social science and geography and vocational education. The areas of the analysis are:

- **Orientation**: the aims, goals and rationale for the subject/content area.
- **coherence and clarity**: the extent to which the curricula contain clear and specific goals for each grade and whether the suggested learning activities and pedagogical materials support those goals.
- **Scope**: the scope of material coverage, the number or amount of items or goals in the curriculum versus the depth of mastery proposed of each one.
- **levels of difficulty**: to what extent the curricula items can be judged to be at the appropriate levels of difficulty. An appropriate level of difficulty should be defined as one that builds sequentially on prior and existing knowledge and presents an achievable challenge to the average student.
- **Integration**: how the different subjects within each grade of the curriculum is internally aligned.
- **progression**: how smoothly and coherently the learning goals and proposed content of a given curriculum in a given subject progress from one grade level to the next.
- **key competencies**: the level of development of a number of key competencies in the current curriculum and textbooks (such as problem solving, teamwork, self-learning, creativity, critical thinking competencies)

**Primary: Japanese language**

**Orientation:**
The overall objectives are centered on enabling students to properly express and accurately comprehend the Japanese language. Overall objectives should not only lead to the development of the students’ communication skills, but also support their ability to think within the language. An emphasis on deepening an interest in the language and encouraging respect for the language are also stressed.

The revision of the language curriculum programs of study in 2006 responded to Japan’s decline in the PISA ranking between 2003 and 2006. The response was to adapt the programs of study with greater emphasis on verbal activities, particularly with verbal activities for record keeping, explanation, critique, dissertation and debate. This revision recognized the need for students to apply the language skills they were learning creatively, and move beyond learning them to understand the work of others through memorization.

**Coherence and Clarity:**
The program of study groups two grades into each section, for example Grade 1 and Grade 2. Each section has three overall objectives, one each of the three language areas: speaking and listening, writing and reading.
The content for each of the language areas is then expanded in discrete sections for each language area. The content is divided into two parts. The first part covers the objectives (items) that the students need to be able to do to develop their abilities and on which instruction should be given.

A second section follows the objectives for each language area. This outlines the language activities to be used to support the students to achieve the objectives. This section includes the types of texts that need to be read or written about, and type of contexts for the development of speaking and listening.

In addition to the three language areas, there is also a specific section to highlight items related to traditional linguistic culture and characteristics of the Japanese language. It is stressed that the instruction for this section is given through speaking and listening, reading and writing. This section has two parts, one linked to the language and one to penmanship.

The language part of the section divides items into three aspects:

- traditional linguistic culture, for example folktales
- the characteristics and rules of language
- the characters themselves.

Throughout the programs of study the objectives are clearly expressed. The supporting documents linked to syllabus design emphasize the inter-relationship of the three language areas.

**Scope:**
Each grade covers each of the three language areas. For each grade there is only one objective for each language area. The content section that follows for each language area exemplifies what needs to be included for each grade.

**Speaking and listening:**
There are five content items for speaking and listening for Grades1/2, Grades 3/4, and Grades 4/5.

In each grade, the scope of these covers the ability to speak about students’ own ideas linked to context and information, and also linked to the development of retelling and structuring oral story. There is an emphasis on speaking in a manner most appropriate to audience and with clear pronunciation. For the older students there are specific content items linked to standard Japanese and dialect. Listening on a individual basis and linked to discussion is identified in specific content items in each grade.

**Writing:**
Calligraphy is an important part of Japanese written culture. Japanese characters are difficult to form, and children are instructed in both the printed and cursive versions. Over the years there has been a steady import of Chinese characters, to replace and simplify the Japanese characters. Children are taught how to incorporate these characters and to move between the two systems.

There are five content items for writing in Grades 1/2, and six content items for writing in Grades 3/4, and G4/5.

Students need to be able to select information and create sentences to express this information. Forming sentences into paragraphs and developing text cohesion for an audience are emphasized from Grade 3 upwards. The purpose for writing also develops from Grade 3 to include writing to explain and give reasons as well as to create story. This widens in scope with the inclusion of figures and tables within text from Grade 5 upwards.

Students are required to review and edit their own work from Grade 1 to Grade 6, and to develop the ability to respond to the work of others, exchanging advice by taking on the role of audience.

Using research skills as a basis for finding information to create text is less explicitly stated than in programs of study from other jurisdictions, although using text to form views and collect information is clearly stated for example in Grade 3/4 where the students are required to write sentences of explanation having effectively collected information from documents. There are also, in the additional comments about the design of the syllabus, statements highlighting the use of ICT for creating texts, but these are not included in the actual items for writing.

Reading:

There are six content items for reading in Grade 1/2, Grade 3/4, and Grade 4/5. The scope of these requires students to read aloud, and to comprehend overall content from Grade 1 to Grade 6. There is requirement to extend the imagination of the context and make connections to their own experience. Reading is also seen as a source of information to enable creation of presentations for other purposes. The scope includes a clear content item linked to reading for enjoyment and the personal development of knowledge, although the wording of this item changes from Grade 3 to emphasize choosing books for purpose rather than for enjoyment.

There is one item for Grade 1/2 and two for each of Grade 3/4 Grade 5/6 linked to traditional linguistic culture. These emphasize the types of traditional literature to be covered in particular age groups, and in Grade 5/6 also include the need to be able to understand the viewpoints about text held by people in previous eras.

There are seven items for Grade 1/2, eight for Grade 3/4, nine for Grade 5/6 linked to the characteristics and rules of language. The scope of these covers the difference between spoken and written language; sentence structures and the impact and selection of particular words for meaning, and punctuation. In Grade 5/6 the use of specific language devices is also included for example metaphor.
For each grade there are sets of characters to be learned. Lists are provided and the item statement for each grade refers the teacher to the set of characters to be learned. For Grade 1/2 there is also an item linked to understanding Hiragana (words of Japanese origin) and Katakana (words of Western and modern origin).

Items focus on the ability to write characters correctly, and to understand the types of strokes to be used when writing. In Grade 5/6 students are also required to assess which type of pen or brush to use for a particular task, and to select the size of the characters and layout.

Levels of Demand:
All aspects of home language build on prior knowledge. The items are organized so that threads can be seen across the grade boundaries. There are clear examples where the design of the program of study has considered the demands of the subject. For example: learning characters is a continuing process throughout the grades. The sets of characters assigned to each grade need to be covered within that grade. These are initially learned as individual characters, and are then put into context within sentences read by students. The students then apply these into sentences by writing their own sentences and within the content of composition texts. Within each grade a set of characters will be covered, but this coverage of new characters is taught within the context of characters from previous grades within reading and writing, and so there is constant review. This supports the level of demand required for learning the characters year on year.

The objectives span two grades and so the syllabus design information provides guidance for teachers stating that each item can be taught in an elementary manner in the earlier grade and then in a more advanced manner in the higher grade. However, it is also stated that there can be flexibility and that instruction can be adjusted to support the level of demand required by the students.

Similarly the sets of characters, although they are grade specific, can also be taught in preceding or following grades. This can allow for links to be made to context of texts used, and as a response to the students’ abilities.

Learning a character based language such as Japanese means that there is not direct equivalence to learning English (or indeed Finnish). There is a clear progression and expectation in the Japanese curriculum for the introduction of what in English we might term as vocabulary / with links into writing / reading and spelling. Character learning happens with characters learned as individual units of meaning and then put into context of larger units of language. But although there are these similarities in the way that the introduction of characters happens to letters / words and vocabulary in English, it is difficult to give a clear equivalence in the level of demand across the curricula.

Reading:
The level of demand in the items for reading builds the students’ abilities to understand with accuracy the main themes and interrelationships within texts, and to organize their thoughts as readers, in order to give a viewpoint on what makes the text effective.

From the earlier grades where the children are listening and responding to text and commenting on what they have liked about what they have read, the level of demand in content expands the breadth of text types, and includes specific text types for example autobiography, and more sophisticated authorial viewpoint for example newspaper editing.

**Writing:**
The level of demand builds sequentially from study of shorter text in Grade 1/2 to the demands of writing longer texts to meet purpose and audience Grade 5/6. Students are provided through the language activities for writing with a basis for writing narrative and poetry, alongside non-fiction for a variety of purposes and this demand for variety builds across the grades. Text types with more sophisticated viewpoint demands are included in the higher grades.

Support for the teaching of writing is outlined in the syllabus design and the number of hours of instruction is made clear here. For example in Grade1/2 100 school hours need to be provided for composition. This declines to 85 hours in Grade 3/4 and 55 in Grade 5/6.

**Speaking and listening:**
The emphasis on oral communication is established throughout the program of study. It is also connected very explicitly across into the reading and writing content items for example where students in Grade 5/6 should be able write a recommendation for a book, which is connected with the speaking and listening item that requires them to be able to give and listen to a recommendation. This connectivity supports the level of demand for all students.

Speaking and listening are also allocated an approximate number of hours within the curriculum: 35 hours for Grade 1/2; 30 hours for Grade 3/4 and 25 hours for Grade 5/6.

**Language:**
The demands of the language standards build a sequence to show command of the conventions of Japanese grammar in both speaking and writing.

Comment about the level of demand linked to the learning of characters has already been made. Within the syllabus design it is made clear that the level of demand within the language aspect can be supported by integrating the specific items but also by teaching these separately where required for a focus on learning.

**Progression:**
It is clear from the wording of specific outcomes that progression is considered and supported through the organization of the areas of language and the items within these areas.
In general, across the aspects of language there is a smooth and coherent approach to the articulation of content and standards from grade to grade. Connections can be seen between items for different areas of learning within the same grade and this supports connectivity within the body of study.

For all items it is considered that there will be an elementary level and an advanced level so that elementary understanding can build into a deeper level from grade to grade. There is no explicit advice on what elementary or advanced looks like within the program of study.

There is a clear statement that for the lower grades consideration must be made of pre-school education.

Assessment:
At the beginning of Grade 6 the students may be part of the national assessment sample, which is used to support the Ministry to develop the curriculum. There are two tests for Japanese language (Test A and Test B). Test B is similar to PISA, in order to begin to give students experience in the style of testing.

Test A
Test A focuses on the knowledge and understanding of the Japanese language. Most of the questions are multiple choice, and there would appear to be no issues with construct irrelevant variance for these questions. Some questions require students to write answers but these questions are focused on the ability to show an understanding of how words are represented in Chinese characters and so are quite closed in their form. For example: initial questions focus on students’ knowledge of characters and words. They have to transfer Hiragana words into Chinese characters accurately.

Within the test students do need to read text in order to answer some questions, for example students are required to choose a sentence to complete a missing paragraph in an advert. They are also required to read two conversations about the same poem and then identify what the conversations say the purpose of the poem is. Both these questions mirror the curriculum. The final question on the paper requires the students to underline the specific sentences and phrases used in a speech for getting meaning across to the audience. Again this question links to the curriculum items linked to understanding viewpoint and opinion.

Test B
This test is structured in a similar way to the PISA test. Some questions are multiple choice, some are written answers within a word limit.

Examples of text, for example a leaflet about fireworks, are used as the basis for a number of questions linked to different reading skills.

Students are presented in the first question with a paragraph that a ‘student’ has written about fireworks, followed by a paragraph of research information. The student taking the test has to
adjust the original paragraph in order to respond to the new facts gained from the research, synthesizing their reading into writing. Other questions require selection of relevant sentences from a piece of text, and the completion of the concluding paragraph of the leaflet giving appropriate information.

Recommendations of text are a key feature of a number of items in the Grade 5 program of study, and the final question in the test draws on students’ experience of this. Two recommendations of a piece of traditional Japanese literature are presented to the students, and the students need to retrieve information about the text from the two recommendations and complete a table to compare and contrast the viewpoints.

Longer writing assessments are not used as part of the national testing.

**Key competencies:**
‘Zest for Life’ is the Japanese conceptualization of key competencies. This encompasses the principles of independent decision making, and problem solving. The curriculum for home language does present some potential for these principles through the decision-making the students are required to do when responding to text and writing their own texts.

Development of creativity is promoted to some extent through the program of study as the students incorporate new learning into creating their own writing for a range of purposes, although a core focus within the home language is the memorization of Chinese characters.

Collaboration as part of a team or small group is not particularly shown as a thread within the Japanese home language curriculum. There are no specific statements that indicate that students will collaborate, although there are items where the students are required to read to one another, to present and to listen and debate. The sense from the curriculum here, though, is that these activities, linked to audience and purpose, are constructed by individuals and presented to an audience, rather than co-constructed as a group.

**Primary: Mathematics**

**Orientation:**
There are four stated objectives for elementary mathematics. The acquisition of basic skills and knowledge is listed first and this reflects the content. The other objectives are about linking mathematics to everyday life, enjoying mathematics and being willing to use mathematics in daily life and studies.

**Coherence and Clarity:**

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13 What follows is based on the March 2008 English translation of the Japanese mathematics curricula, unless otherwise stated.
Goals at each grade are generally clear. There is a good match between objectives, content and mathematical activities, although especially at lower grades the activities do not necessarily add much to the content. At some grades there are ‘remarks concerning content’ at the end and these help clarify what is and is not included at each grade.

**Scope:**
For each of the elementary school grades 1-6, four objectives are listed followed by the content arranged under four headings. The four headings are the same across the primary years and are:

a) numbers and calculations  
b) quantities and measurements  
c) geometric figures  
d) quantitative relations.

Of these, a), b) and c) are fairly standard across countries. d) is more unusual and includes what could be seen as relational aspects of number, together with some data handling. There is also introductory algebraic work in higher grades.

The four objectives at each grade relate to these four content areas, but are worded differently for different age groups. The wording of the objectives sometimes indicates the possible approach to activities (for example all the Grade 1 and 2 objectives contain the phrase ‘through activities such as those involving concrete objects’). The content for each grade is followed by a list of suggested mathematical activities and then appropriate language and mathematical symbols. Grade 1 is described as for six year olds and grade 6 as 11 year olds, but it is not clear from the documents whether this is the age at the start or end of the academic year.

At Grade 1 the objectives indicate that children lay the foundations for understanding of number, measure, geometry and relations, through activities such as those involving concrete objects. The detailed content suggests that activities will also go beyond the use of objects. The number and calculations strand at Grade 1 is further divided into two aspects. The first of these involves counting and understanding number and the second is about addition and subtraction. Understanding of numbers includes counting objects correctly, ordering numbers including representing them on a number line, representing two digit numbers and starting to represent some three digit numbers and starting to understand place value. Addition and subtraction at this grade includes finding the sum and difference of single digit numbers, developing to some simple two digit numbers. There is mention of becoming aware of situations that addition and subtraction apply to, of understanding difference as the inverse of addition and adding and subtracting accurately and reliably.

The quantities and measurement strand at Grade 1 has two aspects, the first is comparison of length area and volume using non-standard units and the second is reading clock times in relation to their daily lives. The Geometric figures strand at Grade 1 is about starting to learn about the properties of shapes and objects and about the language of position. Quantitative
Relations has a strand about using mathematical expressions to represent addition and subtraction and one about representing numbers using pictures and diagrams.

At Grade 2, children develop their understanding of the base ten system and are also introduced to simple fractions. They develop their understanding and use of addition and subtraction, including using two digit and some three digit numbers. Students are introduced to multiplication, including number facts for single digit multiplication and starting to multiply some simple two digit numbers by single digit numbers. Measurement at Grade 2 is about linear measurement including use of standard metric units, being introduced to metric units for volume and developing understanding of time. Geometry at Grade 2 includes recognizing triangles and quadrilaterals (including some special cases) and objects that have the shape of a box. The quantitative relations strand includes understanding the relationship between addition and subtraction, understanding situations in which multiplication applies and using simple tables and graphs.

At Grade 3 children develop their understanding of numbers up to ten thousand and add and subtract reliably, including three and four digit numbers. They extend their understanding and use of multiplication, including to higher numbers and are introduced to division. They are introduced to one place decimals; develop their understanding of fractions, including simple addition and subtraction. They are introduced to representation of numbers on a soroban (2008 version). Measurement at Grade 3 includes standard measures for length and mass and developing understanding of elapsed time. Geometry includes isosceles and equilateral triangles, angles, circles and spheres. Quantitative relations is about relationships between expressions, representing unknowns with boxes and gathering and representing data in a range of ways including bar graphs.

At Grade 4 the number and calculation strand has seven subsections, many of which are further divided. Number work includes developing understanding of large numbers, working with approximations and developing understanding of whole number computation, especially division. Children also add and subtract decimals, develop their understanding of fractions including some addition and subtraction with like denominators and addition and subtraction with a soroban. Measurement at Grade 4 includes calculating areas and measuring angles. Geometry includes parallel and perpendicular lines and some named quadrilaterals and 3D shapes. They also learn to represent positions in space. Quantitative relations is about understanding relationships, including through line graphs, understanding expressions using brackets, understanding the idea of a formula and using boxes for two unknowns. They develop understanding of commutative, associative and distributive properties. They collect organize and represent data in a range of ways.

At Grade 5 there are now four subsections to number (i.e. fewer than in Grade 4). Children are introduced to odd and even numbers and factors and multiples and develop their understanding of the whole number system. Most of the number work at this grade is about decimals and fractions. Students deepen their understanding of multiplication and division of decimals and add and subtract fractions with different denominators. They are introduced to fractions as
division, compare fractions and convert fractions to decimals and vice versa. They multiply and divide fractions by whole numbers. Measurement includes calculating areas and volumes and being introduced to average and using ratio to compare quantities. In geometry they are introduced to a range of polygons and some 3D shapes, to the idea of congruence, to construction and to the ratio between the circumference and diameter of circles. Relations at this grade is about proportional relations and percentages. Data are organized and represented in a range of ways including circle graphs (presumably pie charts).

At Grade 6 there is less work on number. The two subsections of number and calculations at this grade are about multiplication and division of fractions and about calculating with fractions and decimals in appropriate situations. Measurement includes more work on area and volume, including exploring ways to find the area of circles and the volume of prisms and cylinders. Geometry includes scale drawing and symmetry. Quantitative relations include understanding of ratio and proportional relations. Unknowns are represented with letters as well as boxes. Students investigate the distribution of data and work with averages and frequency distribution. They analyze all possible outcomes of actual events.

Levels of Demand:
There appear to be appropriate levels of challenge throughout and work generally builds on preceding grades. The number content increases over the age range and seems to reach a maximum at Grade 4. After that the number work gradually decreases in favor of other aspects of mathematics. Assuming they are taught by generalist primary teachers then some of the Grade 6 content could be seen as demanding, for example frequency distribution, volume of prisms and speed. There is some scope for differentiation, including through revisiting previous work (see progression below), but expectations seem basically the same for all children.

Progression:
Content for each grade generally builds on previous grades. This is helped by the remarks at the end of some grades clarifying what is and is not included. There is also a statement at the end of the primary section of the 2008 document that talks about the content from each grade being revisited in subsequent grades if necessary.

Assessment:
The Grade 6 tests available appear to match the curriculum. The tests cover a range of aspects of mathematics, for example measures, geometry and data. There are also calculations not in context and there appear to be some problems in context.

Key competencies:
There is less obvious focus on process skills such as problem solving than in many other countries, for example, there are no process strands and the overall objectives do not mention problem solving, though they do mention mathematics in everyday life. However, it could be argued that in a way process skills are integrated throughout, with, for example, frequent mentions of understanding mathematical principles such as connections between operations and of recognizing situations in which various mathematical operations apply. At the end of the
primary section there are some general comments that include links between moral education and mathematics (these links are, however, not clear) and the importance of logical thinking and mathematical reasoning.

**Primary: Science**

**Orientation:**
Science for Grades 1 and 2 is incorporated into the curriculum for Living Environment Studies. This incorporates elements of science, geography and social studies. For this early phase of primary education the emphasis is on fostering children’s relationships with the natural world through “concrete and activities and experiences” and developing dispositions and skills “essential for life” and for independence.

In Grades 3–6, science is presented as a separate subject. The overall objectives for science education for Grades 3–6 also refer to the development of children’s skills, processes and positive attitudes to the natural world but there is a greater focus on the development of scientific knowledge and understanding. The objectives indicate children should be enabled to carry out observations and experiments, develop problem solving abilities and “affection for the natural world" as well as becoming familiar with nature and developing understanding of natural phenomena and scientific perspectives and ideas.

Concern for the environment “fostering an attitude of respecting life and nature, and contributing to the protection of the environment” is also identified as one of the critical issues to be addressed in achieving the overall aims of education as set out in the Approach to the Curriculum and Vision. Importance is also given to ‘development of the abilities of individuals, fostering a spirit of autonomy and independence’, although these dimensions do not feature strongly in science curriculum content for the later grades in primary education.

**Coherence and clarity:**
Common objectives and content set out for Living Environment Studies at Grades 1 and 2 reflect the overall objectives for early primary schooling. The objectives concentrate on children’s relationships between themselves, the environment and wider society. There is an emphasis on fostering dispositions such as curiosity, self-confidence and enjoyment alongside children's recognition of their roles and responsibilities as members of a group. Content is related to developing experience and understanding of their immediate environment including natural phenomena, living things, events and people around them in the wider community.

Suggestions regarding syllabus design and the handling of content underline the importance of concrete experience, the importance of children caring for animals and plants across the two years of Grades 1 and 2 to deepen their involvement. There is an emphasis on the need to make connections with other curriculum subjects such as Japanese language, arts and crafts, music and moral education.

In the requirements for science for Grades 3 -6, objectives and content are set out for each
grade. General objectives for each phase refer to the development of perspectives and ideas through investigating and comparing phenomena and fostering interests and protective attitudes to living things and the environment. This reflects principles behind revisions to the courses of study in 2008 that referred to:

“Poor implementation of the gradual link between knowledge/skill attainment in each subject and exploratory activities/problem-solving lessons in the period of Integrated Study” [and] “There are not enough classes to cultivate application-based learning within each subject such as observation, experimentation, reporting, and dissertation.”

While there are some limited references to investigations and developing respect for living things in the preamble to the content specified for each grade, the focus is largely on the development of knowledge and understanding of scientific concepts in relation to a) matter and energy, b) life/the Earth. Specific ideas to be developed are set out for each grade, for example “The weight of an object remains unchanged even when the shape changes” or “Shade is created by blocking sunlight and the position of shady spots moves as the sun moves” (for Grade 3). The section that follows on Handling the Content provides some additional clarification to aid interpretation of objectives – for example, in relation to the range of materials or depth of treatment.

Guidance regarding syllabus design across Grades 3-6 suggests some consideration should be given to provision of experience both in and outside school (including museums, science centers and the local environment). Opportunities for observation, experimentation and connections with everyday life are mentioned. There are no specific references to the developing an understanding of the nature of science but the need to consider connections with curriculum requirements for Moral Education is highlighted. However, these elements are little integrated into the objectives and content for each grade.

Scope:
In Grades 1 and 2 curriculum content is centered on the children and their interactions with their immediate environment. There is a strong emphasis on their relationships with the natural world and places and people in their locality. Science related requirements refer to developing interest and enjoyment in learning. Science content is focused mainly on developing familiarity with seasonal patterns, recognition of the needs of plants and animals and ways of looking after their health.

In the curriculum for Grades 3 to 6 there is a much greater focus on subject content. There are detailed demands in terms of subject content for each grade with a large number of specific requirements to be addressed across biology, physics, chemistry and earth sciences. Expectations in terms of the development of scientific skills and processes and understanding of scientific procedures are limited. There is a focus on developing scientific ideas and recognizing patterns and relationships in the natural world but little reference to formulating and evaluating explanations based on evidence.
**Level of demand:**
The level of subject demand at Grades 1 and 2 is modest. The concentration in this phase of primary education is on developing skills and attitudes for learning and engagement with the natural environment (related to life/the Earth). There are no specific requirements related to matter / energy.

In Grades 3 to 6 the volume and specificity of subject content is demanding, involving the introduction of a wide range of scientific terminology and factual knowledge. At Grade 6 this includes engagement with a range of abstract ideas and complex processes associated with, for example, combustion, properties and functions of aqueous solutions, energy transfer and photosynthesis. As suggested in the previous section, demands in terms of cognitive and social processes associated with scientific inquiry, such as raising questions, testing out ideas, communicating explanations, critical evaluation of ideas are limited. Opportunities for autonomy, independence and problem solving, discussed briefly in the overall aims for the curriculum, are little emphasized.

**Progression:**
Curriculum requirements at Grades 1 and 2 provide some foundation for conceptual development related to life/the Earth in Grades 3-6. There are no requirements related to matter/energy that might provide experiences or the development of vocabulary to support learning in Grades 3-6. There is therefore a sharp transition at Grade 3 with a strong shift in emphasis towards conceptual content.

Progression is evident in content from Grades 3 to 6 in terms of both depth and breadth of content. Key topics are revisited and new content introduced. However, the mode of presentation makes it hard to identify progression in big ideas of science and to recognize and build connections between the individual content requirements across topics and grades.

**Assessment:**
There are no references to formative or summative assessment within the science documentation nor is there any guidance on assessment approaches in the more general information available.

The regulations for teachers indicate they need to ensure that assessment instruments are consistent with the requirements, techniques and conditions of the Japanese syllabus and the implementation year.

There are no final tests for science at the end of Grade 6.

**Key competencies:**
There is some general reference to the development of key competencies within the overall objectives for living environmental studies at Grades 1 and 2 for example in the emphasis on acquiring "basic habits and skills essential for life and develop the foundation for independence." There are limited links to key competencies in the overall objectives for the science curriculum.
for Grades 3 to 6 that include the development of “problem solving abilities” but objectives and content for each grade do not make reference to the development of specific competencies related to problem solving, to team-working, self learning, creativity or critical thinking. There are no references to opportunities for development of literacy, numeracy or ICT within science education.

The table below sets out the range of curriculum content and number of goals below. Overall objectives for each grade refer (as indicated above) to developing perspectives and ideas through investigation and fostering interest and respect for environment/living things. There are no specific statements against which these might be assessed.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Content related to Matter/Energy</th>
<th>Content related to Life/The Earth</th>
<th>Total content statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 2</td>
<td>2/9 science related content objectives within Living Environment Studies –seasons, habitats, living things</td>
<td>2/9</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Object and weight (2) Functions of wind and force of rubber (2) Properties of Light (2) Properties of Magnet (2) Pathway of Electricity (2)</td>
<td>Insects and plants (2) Observation of familiar environment (2) The sun and the ground (2)</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>Properties of air and water (2) Metal, water, air and temperature (3) Function of electricity (2)</td>
<td>Structure and movement of the human body (2) Seasons and living things (2) Weather conditions (2) Moon and stars (3)</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>Dissolution of substances (3) Movement of pendulums (1) Function of electric currents (2)</td>
<td>Germination, growth and fruition of plants (4) Birth of animals (3) Function of running water (3) Weather change (2)</td>
<td>18</td>
</tr>
<tr>
<td>6</td>
<td>Mechanism of combustion (1) Properties of aqueous solutions (3) Regularity of a lever (3) Use of electricity (4)</td>
<td>Structure and functions of the human body (3) Nutrition of plants and pathway of water (2) Living things and the environment (2) Formation and change of land (3) The Moon and the sun (2)</td>
<td>23</td>
</tr>
</tbody>
</table>

**Primary: Social studies / history**

**Orientation:**
In the “Revision of the Courses of Study (March 2008/2009)” policy aimed to boost the attention
given to social studies and other subjects in primary and lower secondary schooling and, in upper secondary to achieve an ‘enhancement of cultural/traditional education’ and:

- to enhance the learning of proverbs, Japanese/Chinese classics, and oral reading/recitation (Japanese)
- to enhance the learning of history hunter-gatherer lifestyle and country formation; emphasis on modern history, etc., religion, cultural heritage (national and world treasures, etc.(social studies)
- to emphasize the abacus, Japanese musical instruments, choir, art culture, and the handling of Japanese clothing (arithmetic, music, art, technical skill / household)
- to add lessons on local culture and traditions to Integrated Lessons curriculum (primary).

The Program of Study for Social Studies (History, Geography, Civics) Primary Grades 3-6 identifies the aims of Social Studies in civic / citizenship terms as follows:

To help students cultivate a fundamental awareness of what it means to be citizens of a peaceful democratic nation and society in the international community through achieving an understanding of social life and fostering an understanding and an affection for the land and history of our nation.

History is understood as one component of a wider social studies program, rather than as an independent subject or discipline, and its aims are framed in a national and traditional context, where the focus is on the assimilation of national culture and tradition.

The curriculum objectives for Grades 3-4 are community focused and present-centered. History figures in the second learning objective for these grades tacitly and as follows:

To enable students to understand... changes in people’s lives, and the commitments their predecessors have made to the development of the local community, and to cultivate in them pride and affection for the local community.

The Grade 5 curriculum largely consists of geographical topics (such as natural disasters and the transport system). At Grade 6, history has a significant and explicit presence, eclipsing geographical and environmental issues (of the three learning objectives, one is explicitly historical and another is political and most of the Grade 6 content is historical). The history learning objective is the following:

To have students deepen their interest and understanding about the achievements of predecessors who have contributed to the development of the nation and society and to foster an attitude of valuing the history and traditions of our nation, as well as a sentiment of love for the country.

History is understood in the document in a patriotic sense and as having affective objectives (‘love’) and a celebratory intent (‘achievements of predecessors’). This is history understood as identity – engineering / affirming, celebratory and narrative.
Coherence and Clarity:
The Grade 3-4 history content objectives are as follows:

- to observe, study and compile the chronology of the following items concerning the lives of the local people and to consider changes in the lives and the desires of the people, as well as the struggles of the predecessors committed to the improvement of the lives of the local people:
  - traditional utensils associated with the living and lives of the days they were used
  - local cultural heritages and annual festivals that have been handed down to the local people
  - concrete examples of the predecessors who have contributed to local development.

No pedagogical suggestions are provided in relation to this content other than the recommendation that examples of ‘predecessors’ be local.

From Grade 6 onwards explicit, clear and specific historical goals are present and there is good match between these and what pedagogic suggestions are made. Within Grade 6 the learning objectives for history are explained in some detail. These objectives relate to substantive matters in the main:

- to understand the emergence of…
- to understand the process of…
- to understand the flourishing of…

Some of these objectives go beyond the substantive in that they require students to learn an interpretation of history as if it were a matter of fact, suggesting that history is understood as an accepted narrative:

- to understand that Japan’s national power has been enhanced and its international position has improved, through the study of the promulgation of the Constitution of the Empire of Japan.

There are some hints about pedagogic approaches in the description of content for Grade 6, as follows:

To learn about the significance of studying history by investigating the major historic events of Japan, through the utilization of remains, cultural properties and learning resources concerning the functions of the people and major cultural heritages, and to gain a deeper understanding and interest in the historic background of the people’s lives and the functions of the of the history and the predecessors of Japan.
Teachers are expected to utilize resources of various kinds. There are suggestions on handling content, but many of these relate to choices of specific content. Some, however, do not, and provide some pedagogic guidance on how to adjust content in ways that are developmentally appropriate and/or foreground the substantive learning that it is hoped will take place:

- to devise a way to prioritize the individuals and cultural heritages to be covered by emphasizing the interest of the students so as to help them accurately understand the topics through careful selection. In doing so, the developmental stages of the students should be considered
- to have students notice, through study of history as a whole, that Japan has a long history and has fostered traditions and cultures and that the history of Japan can be divided into various periods according to the central location of the government as well as to the conditions of the society.

Scope:
The history to be covered in Grade 3-4 is local and/or focused on material culture. The history covered at Grade 6 is extensive, in volume and temporal range, but narrow, in terms of the type of history covered and also in the understanding of historical learning expressed. There is a great deal to cover – a millennium and a half – in less than 100 45 minute lessons (there are 105 lessons and two other aspects to the social studies curriculum apart from history).

Levels of Demand:
The content for Grade 6 is large – in effect requiring a complete history of Japan, from the 6th to the 20th centuries, to be covered in one year, as one aspect of the social studies curriculum to be delivered in 105 lessons of 45 minutes each. It is possible that this will not yield depth learning or significant historical understanding. The content itself is political in nature and patriotic in tone.

Secondary: Japanese language

Orientation:
The Ministry of Education lays down fundamental standards for all educational curricula so that a standardized education is available anywhere in Japan. Text books are centrally produced. The overall objectives are stated as:

To develop in students the ability to properly express and accurately comprehend the Japanese language, to increase the ability to exchange their own ideas and opinions clearly, to develop cognitive and imaginative capacity and a sense of language, to deepen interest in the Japanese language and to cultivate an attitude of respect for the Japanese language.
The general curriculum aims for:

1. an emphasis on basics together with careful, student centered instruction
2. use of the subject to develop individual personalities
3. involve problem solving in all subjects
4. encourage creativity
5. involve ethical considerations.

Specific to the teaching of the Japanese language is the requirement to:

1. properly express and accurately comprehend the language
2. exchange ideas and opinions
3. develop imaginative capacity and a sense of language
4. be interested in the language
5. respect the language.

There has been a conscious movement in recent years from rote learning to a more open ended system. This involved a Zest for Life policy in 1996, aimed at preparing students to be more autonomous and think more creatively and emphasizes, as key competencies, independent thinking and problem solving skills. However in 2011 there was something of a return to a more knowledge based system, but also with an increased emphasis on the enhancement of record-keeping, explanation, critique, dissertation and debate.

Achievement is generally high.

Coherence and Clarity:
The programs of study identify the major skills as reading, writing and understanding. The goals for primary and lower secondary are clearly and precisely articulated. The requirement for respect lends a conservative tone to the program of study. The traditional linguistic culture and characteristics of the Japanese language are emphasized. So, for example, detailed specifications are given for traditional writing skills:

“Consideration should be given to enabling students to write letters correctly, neatly and quickly, as well as to fostering an attitude of harnessing their penmanship abilities in their studies and lives.”

“Instruction on penmanship. Using a pen or pencil and writing brush should be provided in every grade. Instruction for penmanship using a writing brush should cultivate a foundation for the ability to write characters using a pen or pencil. The school hours devoted to being instrumental in deepening awareness of the Japanese language and developing an attitude of respect for the Japanese language, to be instrumental in developing the ability to exchange students’ own ideas and opinions clearly, cognitive and imaginative capacities and a sense of language, to be instrumental in developing the ability to make fair and proper judgments and a creative mentality, to be instrumental in
developing an attitude to have scientific and logical views and ideas and to broaden perspectives, to be instrumental in deepening thinking about life, fostering a rich sense of humanity and cultivating a robust will to live and to be instrumental in deepening thinking about humanity, society, nature.”

Calligraphy is an important part of Japanese written culture, and hence the emphasis on penmanship above. Japanese characters are difficult to form, and children are instructed in both the printed and cursive versions, “[T]o write a character correctly, paying attention to length, direction, border and intersection of strokes, and to the orthodox order of writing”. Over the years there has been a steady import of Chinese characters, to replace and simplify the Japanese characters. Children are taught how to incorporate these characters and to move between the two systems.

**Scope:**
The scope of the specifications is both wide and inclusive. There is a strong emphasis on functionality. The program of study for lower secondary (Grade 7) starts with speech: to enable students acquire the ability to speak about what they are familiar with in their daily lives, the ability to devise structures in accordance with the objectives and occasion, the ability to listen while thinking about the speaker’s intentions, and the ability to converse while grasping the topic and direction of the conversation, as well as to develop an attitude of striving to organize one’s thoughts while speaking and listening.

As is consistent throughout the program of study the syllabus starts from the context which students find familiar, but moves quickly to function and structure, with an emphasis on clarity. Listening, interpreting intentions, grasping, and the interaction with thinking are advanced and aspirational skills at lower secondary. In writing, too, there is a link between structure, intent and thought:

“Write accurately about what they are familiar with in their daily lives while thinking about structures in accordance with objectives and intent, as well as to develop an attitude of readily striving to organize one’s thoughts while writing.”

An important part of the program of study in speaking looks at the conversation. This important aspect of human interrelationship is given far more emphasis in the Japanese system than within other advanced systems:

- to structure conversations by paying attention to the relations between the whole and its parts and between facts and opinions, and speak based on the responses from the conversation partner
• to apply students’ knowledge of speaking rate and volume, the tone and pacing of words, selecting phrases which are easy to understand for the conversation partner, phrasing that is suitable for the partner and the occasion and so on.

There are important elements here, in terms of structure, fact and opinion and sensitivity to the listener, which are fundamental but complex skills. The close articulation between language and thinking is consistent: such as the requirement to comprehend while asking questions as needed, and arrange the similarities and differences between students’ own thoughts.

For example the program of study for writing in lower secondary states:

1. instruction should be given on the following items in order to develop writing abilities:
   
a) to decide on topics from the students’ daily lives and organize their thoughts through collecting materials
b) to organize the collected materials such as by arranging it and make a composition while considering the role of paragraphs
c) to write about facts and matters that they would like to convey while clearly expressing students’ own ideas, feelings as reasons
d) to reread the compositions that have been written and confirm the use of orthography and phrases and means of description in order to produce compositions which are easy to read and understand
e) to read each other’s writings, state their opinions on matters like how the theme was perceived, how materials were used and the clarity of their reasoning, and use them to improve students’ own compositions.

Instructions on the items listed in (1) above should be given through, for example, the following linguistic activities:

2. to write a composition about appreciating an artistic piece which they are interested in
3. to write expository and descriptive texts by using diagrams
4. to write compositions which inform and report on events.

This is consistent with the assessments seen whereby material is taken from students’ daily lives and immediate experience. There is an emphasis on clarity and the way that structure underpins this. This included both redrafting, and the reading of peer texts to ensure clarity. Styles range from artistic pieces to reports, and involve the use of diagrams for clarity. Similarly, in reading, the program of study emphasizes an accurate grasp and understanding of phrases in context. It asks students to distinguish between fact and opinion, central and supplementary sections. Where appropriate it calls for a sense of how a character is established. It asks for an appreciation of the technicality of a text: organization; development and expression; ways of looking at and thinking about what is expressed in the text and a clear
emphasis on the value of communication; that students should acquire the ability to gather the necessary information from books and written works; and the ability to apply them and read into the necessary information according to the purpose.

There is an interesting mix of the traditional, a requirement to read aloud from and recite various types of written works, and the more contemporary requirement for functional expository and descriptive texts. This includes considering the relation between the text and diagrams, and reading books to identify issues and make book reports including quotation from books.

Much of this emphasis on the functional, communicative nature of language, both spoken and written, would resonate well with employer complaints, in for example the UK, that there is an over emphasis on literary form, and insufficient instruction in functional English.

Literary and cultural forms are not neglected. There is a requirement to understand the rules for the written language and how the Japanese readings of characters work, and to have an opportunity to be exposed to the world of classic literature by reading Japanese and Chinese classic literature aloud to get a taste for the unique rhythm of such literature. Issues of calligraphy and the relationship with the Chinese language permeate. In addition students should be able to read about 900 of the Chinese characters and to write and use them in sentences and compositions. Instruction should be given on penmanship, to write in a printed style by arranging the character forms with an understanding of character size and layout.

Levels of demand:
The level of demand is consistently high. By Grade 8 (lower secondary), the requirement for speaking has become “[T]o enable students to acquire the ability to speak about issues like those pertaining to their social lives based on differences in their position and thinking, the ability to listen while comparing ideas and the ability to converse while respecting the listener’s position in accordance with the objectives and occasion, as well as to develop attitude of striving to broaden one’s thinking while speaking and listening.” Based again on the direct experience of the student, there is considerable challenge here in terms of developing thought, listening and sensitivity which deal directly with the cognitive aspects of language.

This aspiration is reflected in the general statement about writing, “to enable students to acquire the ability to write in an easy to understand manner about issues like those pertaining to their social lives while devising structures in accordance with the objectives and intent, as well as to develop an attitude of attempting to write compositions while broadening one’s thinking” and in reading also, “striving to use reading to benefit one’s life.”

Language is seen as central to thinking and social engagement at a level of sophistication at lower secondary that would challenge the functioning of some graduates elsewhere: “organize one’s thoughts while envisioning different positions and ideas, and talk while thinking about logical structure and development by paying attention to things like central and supplementary parts of the conversation.” Or, for example, in reading, “[T]o think about the relations between
the whole and its parts, the effect of examples and depictions and the significance of the words and actions of the characters and use these to aid in understanding the content."

There remains, at Grade 8, an emphasis on correct use, but this is set in relation to dialectical and cultural differences, and requires a high level of understanding of language and register:

To understand the differences between spoken and written language, the role played by a common language and dialects and the function of honorific expressions. To understand phrases which express abstract concepts, synonyms and antonyms, homonyms and phrases which express an equivocal meaning, and refine the students’ sense of language and enhance students’ vocabulary.

The instructions to teachers regarding the selection of material reflect the high level of sophistication required. They should:

- be instrumental in deepening awareness of the Japanese language and developing an attitude of respect for the Japanese language
- be instrumental in developing the ability to exchange students’ own ideas and opinions clearly, cognitive and imaginative capacities and a sense of language
- be instrumental in developing the ability to make fair and proper judgments and a creative mentality
- be instrumental in developing an attitude to have scientific and logical views and ideas and to broaden perspectives
- be instrumental in deepening thinking about life, fostering a rich sense of humanity and cultivating a robust will to live
- be instrumental in deepening thinking about humanity, society, nature and so on
- be instrumental in deepening interest in and understanding of Japanese traditions and culture and to develop attitude which respects these
- be instrumental in deepening international understanding from a broad perspective, raising self-awareness as Japanese citizens and cultivating a spirit of international cooperation.

This progresses from respect for the traditional, through thinking processes and judgment, to social engagement and international awareness. No mean ask for a lower secondary student.

*Progression:*
Progression is by age, with clear program of study for primary, lower and upper secondary. Progression to university is by competitive examination, set by individual universities.

*Assessment:*
As noted above, Japan has no whole-cohort national assessment system. Students are assessed continuously by their teachers and are frequently assessed in class, especially in Japanese language, either through teacher-created or off the shelf tests. New national
assessments were introduced in 2007. They assess students in 6 and 9 grade in mathematics, literacy and science. While schools’ participation in these tests is voluntary, almost 99% of schools participated in the first year (MEXT 2007).

Those assessments seen at lower secondary use a variety of methods, but with an emphasis on multiple choice and Cloze procedure. This is accompanied by stimulus material which is both literary and practical, often relating to school and other aspects of a student’s immediate experience. In one paper studied, there is a passage relating to Spring, and a choice of four answers to identify an accurate and sensitive reading. This is followed by questions testing a student’s ability to follow a discussion, presented in cartoon form, and accurate comprehension of a report written in response to a graph. There is an emphasis on letter forms (Japanese and Chinese) which reflects other systems’ concerns over spelling. A further question on this paper relates to register, with a reported dialogue involving a visitor using inappropriate familial language, as seeking a more respectful formulation. The final question prints the lyric of a traditional song written in old fashioned complex language, and asks questions to elucidate meaning.

The paper covers the program of study well, escalating through simple comprehension and accuracy through to more sensitive skills around register and respect for the old forms.

The relative success of school devised testing is testimony to teacher led assessment and challenges the preoccupation of other systems with national testing and benchmarks. However, this is in the context of a fiercely competitive social attitude towards education, with both state and newspaper reporting of school success, particularly in terms of achieving entry to elite universities.

*Key competencies:*
The emphasis throughout is on speaking and listening, reading and writing, accuracy and effective communication, respect for literature and tradition, and accurate penmanship. The balance of emphasis tends towards effective thought and communication.

*Secondary: Mathematics*

*Orientation:*
The curriculum aims for “fundamental knowledge and skills regarding numbers, quantities and geometrical figures” alongside an ability to reason logically about everyday phenomena, a joy in mathematical manipulation and a willingness to use mathematics in studies and daily life. These curriculum goals treat mathematics as contributing to intrinsic values for an individual child.

The stated vision is ‘to fully develop the personality of each and every child’ and ensure that children to lead happy lives in the future (MEXT website). There is a statement relating specifically to uncovering and cultivating students’ talents in mathematics that also refers to the human resources of the future. This is the closest that the curriculum (or MEXT website) comes
to the economic justification for mathematics prioritized in US and UK jurisdictions. Outside the curriculum documents, however, there are indications that Japan is concerned with promoting participation in science and technology among the younger generation. There is concern that progressively fewer students are choosing the scientific pathway in upper secondary school, and since 2002 MEXT has been funding initiatives such as Super Science high schools with an enriched science and mathematics curriculum.

There is no mention of different mathematics curricula for different groups of students at Grades 7-9 but there are different schools and vocational routes at 16+ and 18+. Entry-level exams for undergraduate courses and technical colleges are similar in expecting fluent and extended algebraic manipulation, but technical college exams have a narrower focus on algebra and functions, with less application within worded proofs, less geometry and little to no probability.

**Coherence and Clarity:**
The curriculum is set out grade by grade until the end of lower secondary (Grade 9). Each of the Grades 7-9 contains three or four overall objectives, then the specified content, indications of new terminology, a list of mathematical activities that should be included within this content and some remarks on content. There are no specified pedagogic materials.

The content is set out in four topic areas per grade. The overall grade objectives appear to be less useful and less detailed rewordings of this content. The remarks on content are sparse and indicate particular subtopics to include or connections between topics to make. There is no obvious rationale for including these as remarks rather than listing them within the subtopics.

The intended mathematical activities are the same for each of the Grades 6-9:

- identifying and extending properties of numbers and geometric figures based on previously learned mathematics
- applying mathematics in everyday and community situations
- communicating and explaining mathematical ideas clearly and logically by using mathematical representations.

This differs from the primary curriculum where the activities change between grades and specify in more detail the representations and processes involved (for example construct…, estimate…). The curriculum does not address how these activity goals influence classroom teaching or learning of specific content.

The curriculum (at least in translation) does not specify completely what should be taught and assessed. Teachers would need external sources, knowledge or training in order to operationalize it. For example, Grade 7 number includes:

- 2b to be able to multiply and divide *mathematical expressions with letters*
- 2c to be able to add and subtract *simple linear expressions* (p19-20, our italics).
Addition and subtraction (in 2c) are more straightforward than multiplication and division (2b), yet they are specified for the simpler subcase of linear expressions (2c). No such detail is included in 2b although it is surely implied (and the specification for later grades confirms this interpretation as it progresses from monomial to polynomial operations). Here we see the curriculum taking for granted the pedagogic knowledge of experienced mathematics teachers, who would certainly find it unusual for Grade 7 students to multiply or divide non-linear expressions (unless they were single term monomials) and hence are unlikely to misinterpret 2b despite its generality. The Japanese curriculum thus relies heavily on teachers using their professional knowledge of what is standard practice and progression.

There are further examples that indicate that teachers must rely on other knowledge to know the intended scope and demand of the curriculum. Grade 8 probability calculations are given as ‘determine probability in simple cases’, with no detail of ‘simple’. The Grade 8 Functions text specifies the study of linear functions including how they represent concrete phenomena; however, only the inclusion of ‘slope’ and ‘rate of change’ in the vocabulary section suggests that teachers could – maybe should – treat this explicitly as a pre-calculus topic by drawing attention to the constant rate of change.

Another way in which the curriculum is sparse is that it does not make explicit connections between the four topic areas, even those as similar as algebraic expressions and linear functions. A few of the remarks are used to allocate certain topics to certain areas so that – unusually – standard index notation appears in data handling. This lack of commentary suggests either a compartmentalized curriculum or that Japanese teachers have an external knowledge-base concerning pedagogic and mathematical connections.

Content is connected between grades only so far as the same four topic areas (number and expressions, geometric figures, functions and data handling) recur throughout. The specifications at each grade are presented as if they form distinct content, based on a mathematical classification (for example separating linear functions in Grade 8 and quadratic functions at Grade 9) rather than based on pedagogic knowledge about which examples are harder to learn. The ambiguity of phrasing identified above means that some of the specifications in number and expressions and in geometric figures could be interpreted as overlapping between grades, although presumably teachers’ professional knowledge would clarify this. Mastery is assumed for most of the material at each grade, although in the final section there is extra guidance that teachers should consider revisiting prior topics to aid learning of new material, implicitly acknowledging a constructivist perspective. This section also states the acceptability of individual teachers either promoting a later topic or deferring a thorough treatment of certain topics until the next grade, as long as overall performance is not affected.

**Scope:**
In Grades 7 to 9 the mathematical content is ordered at four levels: grade, topic area, statement (of what students will be able to do) and sub statement. There are four common topic areas per
grade (numbers and mathematical expressions; geometric figures; functions; data handling) and six to eight statements, extended to 17 to 25 sub statements. The sub statements give information related to both breadth and depth. It is the relatively small number of statements that is notable in the curriculum itself. These focus the curriculum onto the study of a small number of mathematical concepts (for example polynomial expressions, linear functions, similarity, and probability).

Each of these is multi-faceted and the assessment materials show they are studied in depth. The statements within each cluster permit a broad interpretation and do not themselves define the depth of mastery required, or the richness of the connections to be made. For example Grade 9 number includes the study of square roots and algebraic ways of solving quadratic equations of the type \(x^2 + 2px + q = 0\), and numeric ways of solving \(ax^2 + bx + c = 0\), while Grade 9 functions is based on the study of ‘functions of the form \(y=ax^2\).’ It seems likely that teachers would extend the function topic to all quadratic graphs i.e., to the form \(y=ax^2 + bx + c\), but this is not specified.

It is not suggested that statements are equally weighted.

It is notable that the curriculum does not include transformation geometry in a co-ordinate plane, and that it does not mention data handling in the context of students collecting data for their own enquiries. Probability is not included until Grade 8 (age 13-14). There is an unusual emphasis on the geometry of solids and their planar transects.

In Grades 7-9 there are no examples given of the real-life situations in which student are expected to apply mathematical ideas; and there are no connections made to explicit scientific or statistical uses. However, both everyday and scientific contexts feature in the Grade 9 (and 6) sample assessments.

Grades 10-12
There are three pure mathematics courses in Grades 10-12, Mathematics I, II and III, one per grade with increasingly more credits. Mathematics III is the most demanding, intended for students pursuing a STEM subject at university. There are also three electives that broaden rather than deepen mathematics study, Mathematics A, B and Use of Mathematics. The content for all these courses is a modified version of the pre-2011 content (with old Basic, I II and III courses becoming new I, II, III). There is a new emphasis on conceptual understanding and application as well as procedural skills. The possible progression is shown below.

<table>
<thead>
<tr>
<th>Grade (credits)</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compulsory I (3)</td>
<td></td>
<td></td>
<td>III (5)</td>
</tr>
<tr>
<td>I (3)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>A (2)</td>
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<tr>
<td>Applied (2)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>B (2)</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
‘Mathematics I’ includes numbers, enumerations, set notations, standard quadratic identities and inequalities; trigonometry from an introduction to sine, cosine and tangent (angles 0° to 180°) to the sine and cosine rules in geometric figures; further work with the quadratic formula including completing the square, graphing and solving quadratic equations of the form \( y = ax^2 + bx + c \); data handling including descriptive statistics; task-based learning in which students solve real-life problems and combine the mathematical areas studied, for example studying the golden ratio in geometric figures.

‘Mathematics II’ includes further algebraic manipulations such as standard cubic identities, simplifying rational expressions and some higher-order equations (for example in even powers of \( x \) only); co-ordinate geometry, coordinates of points, equations of straight lines and circles; exponential and logarithmic functions, graphs and equations; further trigonometry including radians and solving equations using \( \cos \theta + b \sin \theta = \sqrt{a^2 + b^2} \sin(\theta + \alpha) \); introduction to differential through rates of change, and integral calculus as anti-differentiation and area under a graph.

‘Mathematics III’ includes further co-ordinate geometry and focus–directrix properties of the parabola and ellipse, parametric curves, polar co-ordinates, complex numbers and the Argand diagram, de Moivre’s theorem; limits of sequences and functions, convergence, the infinite geometric series, rational functions, differentiation from first principles, derivatives of sum, difference, product, quotient and composites of polynomial, trigonometric, exponential and logarithmic functions, a discussion of \( e \) as a limit, applications of derivatives to graphs and motion; definite and indefinite integration of polynomial, rational, irrational (i.e., involving \( \sqrt{x} \)) trigonometric logarithmic and exponential functions, integration by parts and by substitution, volumes of revolution.

‘Mathematics A’ is an elective focusing on theory and applications of pure mathematics and its use in solving problems. The content includes elementary and conditional probability, Euclid’s division algorithm, integer equations and decimal notation; geometry of triangles, quadrilaterals and circles and their relations (inscribed, circumscribed, tangents, split in ratios), angles between planes or lines in solids, problem solving in various contexts.

‘Mathematics B’ is an elective focusing on statistics and vector tools that support more advanced mathematics. The content includes probability distributions, binomial and normal distributions, sampling, random variables, concepts of statistical inference; proof by induction; vectors in a plane, operations on vectors, scalar product, vectors in space, coordinates in space.

‘Use of Mathematics’ is an elective that is recommended for all. It has two main areas: mathematics as a human, cultural activity and mathematics as a way of thinking in social life. Suggested content includes topics from history of mathematics, analysis of games, classic puzzles and problems, graph theory, modelling of real-life problems such as traffic flow, using calculators and computers to get efficient solutions.
This revised curriculum puts a high value on two aspects of learning: fluency with abstract concepts/techniques and developing a curiosity with mathematics. The document spells out in detail how the new curriculum relates to the old and where continuities and differences lie. There is room for teachers’ innovation in the electives and teachers are encouraged to introduce concepts through activities that stimulate curiosity and engage critical thinking. In the assessments however, for senior high and degree level courses the entrance examinations do not introduce contexts apart from standard probability models (cards, dice). Word problems at that level concern logical reasoning rather than modelling from the description of a situation.

**Levels of Demand:**
The level of demand assumes mastery of material from previous grades; although revisiting is acceptable to aid learning. It is not a spiral curriculum as each grade introduces substantially new topics. The level of abstraction is also challenging, for example:

- covering the arc length and area of a sector of a circle in Grade 7: relying on knowledge of the area and circumference of a circle, \(\pi\), and proportional reasoning
- solving systems of 2-variable linear equations in Grade 8; relying on fluent algebra of linear expressions and equations, substitution and solution
- starting deductive proof (logical analysis) in year 8 geometry developing to more extended proofs in Grade 9 (logical analysis and foresight)
- modelling quadratic relations in Grade 9 (although this was not found on the assessment materials).

The assessment materials for senior high school and university/technical college entrance (and hence for high-attaining mathematics students) suggest that a high level of algebraic fluency is demanded along with attention to precise geometric reasoning. Questions involve multiple solution steps and require investigation to decide on the correct approach, even in a 60 minute examination. In the Grade 10-12 examinations, questions involve algebraic constants and parameters rather than numeric coefficients.

**Progression:**
Progression is indicated by grouping learning goals within topic areas. Numbers and mathematical expressions is largely concerned with algebraic manipulations at Grades 7-9, and functions with exploring relationships between variables starting from concrete situations. Both show progression based on the mathematical hierarchy and increasing the complexity of examples. This is coherent in terms of algebraic and graphical fluency, although the demand suggests it is not necessarily smooth. There is no suggestion of considering other rationales for progression such as conceptual awareness or motivation (for example no mention of first modeling a non-standard functional relationship to appreciate the regularity of proportional, linear or quadratic models).

Geometric figures is concerned mainly with the progression from construction to proofs of Euclidean properties. The progression is coherent and smooth via congruence and similarity.
Data handling appears discontinuous, moving from descriptive statistics to probability to sampling.

At Grade 10-12 the common and elective courses are carefully planned, with each content specification laying out the connections and progression from related courses. The demand increases rapidly through these three grades.

**Assessment**

Two kinds of assessment materials are current: the National Assessment at Grade 9 taken by a sample of the population and entrance examinations produced by different senior high schools, colleges and universities. Both include a variety of short answer, multiple choice and longer answer questions, as well as formal written mathematical statements with gaps for students to complete. Tests tend to last sixty minutes and the number of questions is high, suggesting the need for fluency.

The Grade 9 National Assessment has a paper B where questions are worded to explain an everyday or scientific context. Students are expected to interpret these and to recognise when models are appropriate. This paper also has a large number of questions where students are expected to agree/disagree/comment on mathematical reasoning statements. All four curriculum areas are covered in the tests, although geometric reasoning is the dominant focus, followed by algebraic reasoning.

Entrance examinations at Grade 10 and 12 are almost entirely dominated by algebraic problems and geometric proofs. There are no longer any context problems at these grades. Problems are substantial and situated in pure mathematics.

**Key competencies:**
The key mathematical practices set out in the curriculum are:

- identifying and extending properties of numbers and geometric figures based on previously learnt mathematics
- applying mathematics in everyday and community situations
- communicating and explaining ideas clearly and logically by using mathematical representations.

These are phrased in primarily mathematical terms. Enjoyment, motivation, problem solving and sharing also appear in the remarks associated with these mathematical activities.

There are few connections or details given within the curriculum document so it is not evident how these activities are developed in teaching. Communication is implicitly revisited via verbs such as ‘explain’ in geometric reasoning and data handling. Problem solving is revisited through fairly broad statements that students should be able to examine, represent and use mathematics in real life situations. The National Assessment of Academic Ability at Grade 6
and 9 do have a strong emphasis on students’ explanations and worded context problems, but this is not evident in the influential entrance examinations.

In Grades 7-9 teachers are encouraged to use technological tools as appropriate, such as abacus, calculator, computer. No further references are made, nor any notion of student entitlement.

In Grades 10-12 the curriculum becomes more abstract, but problem solving and proof are both explicitly included in the common modules. There is attention throughout to extending knowledge based on previously learnt mathematics.

**Secondary: Earth science**

This report is based on the lower secondary science curriculum document.

**Orientation:**
The orientation of the curriculum is understated, but there is clarity on what the curriculum sets out to achieve, nonetheless. The opening statements and the whole curriculum lean toward the ‘scholar-academic’ with elements of a child-centered curriculum ideology. The curriculum document is noticeably non-instrumental, in comparison to other jurisdictions. In other words, there is no reference to skills for employability, nor explicit reference to changing values with the aim of economic growth. Conservation and people living with nature (notably, living with tectonic hazards) is a feature, however. Implicitly, the curriculum seems to be encouraging values of respect for nature and for futures which help Japanese society to live in harmony with nature.

An unusual feature is that the words ‘knowledge’ and ‘know’ are not mentioned. Rather ‘understanding’, ‘interest’ and ‘skills’ are emphasized. Possibly this is due to translation and ‘understanding’ may be synonymous with ‘knowledge’, but this may indicate a healthy critical awareness that ‘knowledge’ is a problematic term, in terms of assessment, for example (though, understanding is also problematic!).

Lower Secondary School science (Grades 7-9) has a clearly defined curriculum laid down by MEXT. The overall objectives for science, including earth science are stated as:

1. to enable students to take an active interest in natural things and phenomena, and to carry out observations and experiments with a sense of purpose, while also fostering foundations for the ability to perform investigations scientifically and their positive attitude for doing so
2. to enable students to deepen understanding of natural things and phenomena, and to cultivate scientific ways of looking and thinking.
Coherence and Clarity:
The curriculum is clear and coherent in content which links well and provides scope for teachers to build progression in earth science through school. The absolute focus on content (without prescription of how pedagogy should be used) could either be interpreted as clear thinking, or as a lack of concern for wider curriculum arrangements (such as pedagogy, inclusion and assessment. The former is probably true, given the trust and status accorded to teachers.

There is much content specified, but little attention to over-arching subject themes and concepts of earth science, which could be seen as a weakness of coherence.

Scope:
Earth science in the science lower secondary curriculum includes:

- energy resources
- conservation of the natural environment
- volcanoes and earthquakes
- geology
- weather (focus on Japan)
- living things and the environment- balance in nature and environmental conservation
- (natural) disasters and people.

These areas are broken into more detailed content and are supported by an additional guidance section:

“with regard to content-(x) the following items should be dealt with...”

This gives an expectation of detailed content and a steer toward approaches. There is further earth science in the geography curriculum but there is good earth science scope in the lower secondary science curriculum.

Level of Demand:
From the lower secondary curriculum document, the indication is that expectations of students are high, providing challenge and demand (in particular from the ‘with regard to content-(x) the following items should be dealt with...’ section).

Progression:
The precise design, for timings and ordering of content is left to teachers. There is scope for strong progression through earth science, but there is some challenge for teachers to devise progression through coherent themes and concepts. A non-subject specialist, or a less knowledgeable teacher/ department might tend toward teaching content by covering discrete sections, without attention to how they tie together, thus weakening progression.
Assessment:
No assessment materials for earth science were available but the clear curriculum content gives scope for clear assessment.

Key competencies:
Competencies are implicit in ‘objectives’, rather than being referred to explicitly as ‘competencies’, ‘key skills’ or the like. They are given (within ‘objectives’) as ‘abilities’ to:

- take an active interest in things and phenomena
- observe and experiment in ‘scientific ways’
- think scientifically
- analyze, interpret, and express
- understand (the relevant processes & phenomena)
- view nature in a comprehensive manner.

These stated ‘abilities’ are built upon by the content, which suggests much skill development. But there is not great attention paid to ‘competencies’, as a separate goal – this is, however, not necessarily an overall weakness of the earth science curriculum.

Secondary: Biology

Orientation:
Lower secondary school science is divided into two themes (fields 1 and 2). The first is a mix of chemistry and physics, the second a mix of biology and earth science.

The objectives for field 2 are stated as:

- to enable students to take an active interest in living things and the natural things and phenomena surrounding them, and to acquire methods for discovering diversity and regularity and resolving problems by conducting activities which seek out and actively explore issues from among these things and phenomena
- to enable students to acquire skills for observation and experimentation by making observations and conducting experiments on living things and phenomena, while also cultivating their ability to analyze, interpret, and express the results. To enable students to understand the lives and varieties of living things and the continuity of life, as well as to foster scientific ways of looking at and ways of thinking about these things and phenomena
- to enable students to acquire skills for observation and experimentation by making observations and conducting experiments regarding geological events and phenomena, while also cultivating their ability to analyze, interpret, and express the results. To enable students to understand things like the composition and changes of the Earth, the climate and its changes, and the Earth and the universe, as well as to foster scientific ways of looking at and ways of thinking about these things and phenomena
• to enable students to foster respect for life and their attitude for contributing to the conservation of the natural environment, by conducting activities exploring living things and phenomena in nature surrounding them, thereby enabling the students to view nature in a comprehensive manner.

The content is divided into:

1. the lives and varieties of plants
2. the composition of and changes in the earth
3. the lives of animals and transitions of living things
4. weather and its changes
5. continuity of life
6. the earth and the universe
7. nature and humans

Content 1 and 2 are covered in year one of lower secondary, content 3 and 4 in the second year, and content 5, 6 and 7 in the third year.

Upper secondary biology exists as two courses, Biology 1 and Biology II, each worth three credits towards graduation. There is also biological content in Foundation Science and Integrated Science, each worth two credits.

The objectives of Biology I and Biology II are:

• to enable students to carry out observations and experiments concerned with living things and biological phenomena
• to enhance their interest in nature, to enhance abilities and attitudes to investigate in biology
• to enable them to understand basic concepts, principles and laws, and to develop scientific views of nature.

Biology I content is:

1. continuity of life
2. reactions between living things and the environment

Biology II content is:

1. biological phenomena and substances
2. biological classification and evolution
3. groups of living things
4. research project
Much detail is provided across both secondary sectors in terms of how the content is to be delivered. There is no set pathway through the content, but all content must be delivered, and the way in which this is to be done is clearly laid down. MEXT has considerable control over the curriculum, its delivery, and the text books to be used.

**Coherence and Clarity:**
The curriculum provides clear, specific goals and there is much detail provided as to the depth to which each topic is taught. The emphasis is very much on student engagement – a theme that runs through the whole of Japan’s education system. Lower secondary science shows the objectives for each section, for example:

1. the lives and varieties of plants
   - to instill the students with fundamentals concerning how they should examine living things through observations of and experiments with nearby plants
   - to enable students to understand the structure and function of plants, and to deepen their recognition of the lives and variety of plants.

The content is subdivided:

- a) observation of living things
- b) body structure and functions of plants
- c) groups of plants

There are further details to each of these, for instance from b) body structure and functions of plants:

- a) structure and functions of flowers:
  - to enable students to discover the basic characteristics of their structure, and to perceive them in relation to the functions of flowers, based on the records of observations which they conduct on the flower structure of various plants
- b) structure and functions of leaves, stems, and roots:
  - to enable students to discover the basic characteristics of their structures, and to perceive these in relation to the results of experiments concerning photosynthesis, respiration, and transpiration, based on the records of observations which they conduct on the structure of the leaves, stems, and roots of various plants.

This is supported by further guidance, for example: with regard to Content (1), the following items should be dealt with:

- a) with regard to the ‘living things’ in (1)-(a)-a., plants should primarily be studied, and the existence of microscopic living things in water should be touched on, as well
b) with regard to (1)-(b)-a., angiosperms should primarily be studied. For the ‘functions of flowers,’ the fact that after pollination ovules become seeds should primarily be dealt with.

c) with regard to (1)-(b)-b., the function of chloroplasts in photosynthesis should also be touched on. In addition, the functions of the leaves, stems, and roots should be related to one another in order to perceive the workings of the whole.

d) with regard to (1)-(c)-b., the fact that ferns, liverworts, and mosses produce spores should also be touched on.

A similar pattern is followed for upper secondary. The faithful implementation of this curriculum in every corner of Japan makes it much easier for everyone to hold the system accountable for results. The fact that all students are expected to master this very challenging curriculum, and at the same pace, adds to this transparency.

Scope:
The scope of both lower and upper secondary is at variance with many other countries. It could be said that the curriculum is narrow but very deep, and that students routinely master topics in science that are beyond secondary school students in other countries, especially when one considers that all students are expected to master this very challenging curriculum.

Lower secondary biology content is divided into four topics, spread across Grades 7 to 9. These are: the lives and varieties of plants, the lives of animals and transitions of living things, continuity of life, and nature and humans. Within this there is quite a narrow range for components of a three year course. For example, in the topic the lives of animals and transitions of living things, the content is described in much depth, for example:

Body structure and functions of animals:

a) functions that support life:
   to enable students to perceive the mechanisms of animals’ bodies for taking in and transporting the substances, in relation to the results of observations and experiments which they conduct observations and experiments on digestion, respiration and blood circulation. In addition, to enable students to understand that their bodies have mechanisms for excreting substances which they no longer need.

This is enhanced in the guidance:

With regard to (3)-(b)-a., the functions of each organ should primarily be dealt with. For ‘digestion,’ the functions of typical digestive enzymes should be dealt with. In addition, the fact that food that has been ingested turns into substances which are absorbed through the wall of the small intestine by means of digestion should also be touched on. Regarding ‘respiration,’ cellular respiration should also be touched
In relation to ‘blood circulation,’ the functions of the constituents of blood and those of the kidneys and liver should also be touched on.

Upper secondary biology follows the same pattern. Biology I contains only two topics: continuity of life, and reactions between living things and the environment. Continuity of life covers these topics:

- cells
  - structure and functions of cells
  - cellular multiplication and structure of living bodies
- reproduction and development
  - formation of reproductive cells and fertilization
  - development and its mechanism
- heredity
  - laws of heredity
- investigation activities concerned with the continuity of life.

Again, there is a repeated pattern of limited breadth, but considerable depth. To meet the goals as described in the curriculum, the demand for mastery is high. In most Japanese high schools, roughly 70% of total available time was devoted to just five subjects: Japanese, social studies, mathematics, science, and foreign language (mostly English). There is still less choice for students in the Japanese curriculum than is typically the case in any Western country, even with the changes that have taken place.

This curriculum, combined with the fact that Japanese students spend much more time at school, means that they have much more time to go into greater depth in these core subjects, like science, than in most other countries. They are also very focused on the core subjects in the curriculum because they are not distracted by subsidiary courses.

**Levels of demand:**
The curriculum is very demanding, because of the nature of its narrow breadth and considerable depth. There is little evidence of differentiation, as all students are expected to master the curriculum. Students are not held back and routinely progress from one grade to the next.

Much of the content is quite factual, but the objectives for field 2 clearly point to the development of investigational and problem solving skills. The content progresses step by step in a very logical fashion from year to year, concentrating in each year on the topics that must be mastered in order to understand the material presented in the following year.

A similar pattern applies at upper secondary, where schools are required to teach all of the defined content, but not necessarily in the order given. Additional content can be added, but this must conform to the stated objectives. Again, much of the content is quite factual and there is little evidence of differentiation as all students are expected to master the curriculum.
Progression:
The curriculum is very well defined and highly coherent, in that the content progresses step by step in a very logical fashion from year to year, concentrating in each year on the topics that must be mastered in order to understand the material presented in the following year.

Objectives and content are provided for each grade from elementary school to upper secondary, so it is very straightforward for a teacher to build a teaching scheme knowing what has been taught and what needs to be taught in the future. In the curriculum guidance teachers are required to take account of what has been taught in previous grades and to build on that.

The curriculum is designed in such a way that every student will follow the same progression and there is no differentiation for the individual as each has to master all aspects of the curriculum.

Assessment:
There is no national testing of science in lower or upper secondary in Japan. The first time Japanese students meet national tests is the entrance exams for high school and university.

Teachers assess their students through teacher-developed tests and many other forms of student-based work. There is considerable autonomy in how and when teachers assess, but the underlying driver seems to be that teachers are required to maximize engagement between students and what they are learning. Homeroom teachers often spend many years with the same group of students and are involved with their lives outside the classroom, making the assessment process easier, more precise and more accessible to parents.

The National Center Test for University Admissions is a standardized test used by public and some private universities in Japan. It is held annually during a weekend in mid-January over a period of two days. Some universities decide on successful candidates using only the National Center Test, but most prestigious universities require the candidate to take another, institution-specific exam, which is often more difficult than the National Center Test. The Center tests are subject-specific, including biology. The biology test lasts sixty minutes and takes the form of a multiple choice test.

MEXT plans to replace the Center Test and offer new achievement tests two or three times a year, allowing students to pick their best results in applying for university admission.

Key Competencies:
There are changes being made to the Japanese curriculum to promote key competencies. One of these changes is the introduction of the Period of Integrated Study

The objectives for lower secondary field 2 (Biology) include:
• to enhance students’ interest in living things and the natural phenomena surrounding them, and through identifying problems within these phenomena and inquiring activities into them eagerly
• to enable students to learn processes of discovering regularity and solving problems.

The curriculum guidance states that:

Care should be taken to ensure that sufficient time is allocated for observations and experiments, and for problem-solving discovery-type activities.

At upper secondary, the guidance for Biology I states that:

While giving due consideration to links with science at lower secondary school level, teachers should aim at the formation in students’ minds of the basic concepts of biology, and at the same time, by enabling them to acquire the methodology for carrying out investigations in biology, cultivate scientific thinking, judgmental and expressive ability.

There is a similar statement in Biology II linking back to Biology I.

The policies that have been introduced are likely to make a difference, but there is still the underlying issue that in Japanese society the focus in creativity is on the group, not the individual. This results in a process of continuous improvement by the team, rather than individual creativity and invention.

Secondary: Chemistry

Orientation:
The lower secondary Grade 7, 8 and 9’ science curriculum begins with a general statement of overall objectives, which refers to interest in natural phenomena, skills in observation and experimentation, supporting attitudes for scientific investigations, and deepening understanding of natural phenomena. The curriculum also comprises two fields with respective sets of objectives. The first set of objectives, for field 1, relates to physical events and chemical substances. The second set of objectives, for field 2, relates to living things and geological events. These two sets of objectives refer to interest in these phenomena, skills for observation and experimentation, and awareness of developments (in the first set of objectives) or respect for the environment (in the second set of objectives). Like the overall objectives, these objectives are quite general but relate to each of the two fields.

The overall aims of the upper secondary Grade 10, 11 and 12 curriculum are stated in personal development terms which are further explicated in objectives. These include gaining ‘personal knowledge and culture’, positive attitudes and skills for life and work. In comparison with the lower secondary curriculum, the objectives for upper secondary place more emphasis on
everyday life and work situations for Basic Chemistry and future specialization in science and technology for (advanced) Chemistry.

Coherence and Clarity:
The lower secondary curriculum sets out contents for each set of objectives. These contents provide clear and specific objectives for learning relating to each field and then statements on handling the contents in each grade. For field 1, the contents clearly state that ‘familiar physical phenomena’ and ‘matter in our daily lives’ are for Grade 7, ‘electrical current and its uses’ and ‘chemical changes and atoms/molecules’ are for Grade 8, ‘motion and energy’, ‘chemical changes and ions’ and ‘science, technology and humans’ are for Grade 9. For field 2, the contents clearly state that ‘the lives and varieties of plants’ and ‘the composition of and changes in the earth’ are for Grade 7, ‘the lives of animals and the transitions of things’ and ‘weather and its changes’ are for Grade 8, ‘continuity of life’, ‘the Earth and the Universe’ and ‘nature and humans’ are for Grade 9.

Following the contents for each of the fields, statements on handling the content stipulate several items which ‘should be dealt with’. With respect to handling the contents, the curriculum states that schools should allocate hours to each field while giving ‘consideration’ to ‘the connection between each field and between each item’. This direction clearly seeks to foster coherence across the curriculum. However, the organization of the text as all ‘contents’ followed by ‘handling the contents’ results in a disjointed structure but the curriculum does comprise clear and specific goals for each grade with some specific required activities. While the level of specificity in the curriculum appears to be sufficient to support teachers in interpreting the curriculum, there is very little prescription. For example, beyond the direction to provide ‘basic examples’, the substances through which chemical changes will be observed are not specified. It may be that, in practice, textbooks provide this level of prescription.

The upper secondary chemistry curriculum for Grades 10, 11 and 12 has two major sections. The first is Basic Chemistry and the second is (advanced) Chemistry, which were mentioned above in relation to their distinct objectives. The content of these sections is organized in topics, which comprise sub-topics with statements that provide examples, give advice and specify an outcome. As in lower secondary, teachers are therefore given a great deal of scope to interpret the curriculum.

Scope:
Lower secondary: In field 1, with particular reference to chemistry, “chemical changes and atoms/molecules” comprises the ‘composition of substances’, ‘chemical changes’ and ‘chemical changes and the mass of substances.’ “Chemical changes and ions” comprises “solutions and ions” and “acids/alkalis and ions.” Following the contents for each of the fields, “statements on handling” the content stipulate several items which “should be dealt with”, such as for ‘chemical changes and atoms/molecules’ in Field 1 at Grade 8:

With regard to atoms …the fact that many types of atoms exist should be touched on by using the periodic table. In addition, basic examples should be dealt with
concerning their ‘symbols.’ With regard to chemical formulas and chemical reaction formulas …simple examples should be dealt with. With regard to ‘oxidation and reduction’ …simple examples should be dealt with.

…or for ‘chemical changes and ions’ in field 1 at Grade 9:

With regard to the ‘composition of atoms’ …the fact that atoms are made up of electrons and a nucleus should be dealt with, and in doing so the fact that the nucleus is made up of protons and neutrons should also be touched on. In addition, with regard to ‘ions,’ the fact that these are expressed in ionic formulas should be touched on as well. With regard to ‘batteries’ …the reaction that occurs at the electrodes should primarily be dealt with. In addition, typical batteries which are used in everyday life and society should also be touched on.

…pH should be touched on as well....the fact that there are salts which dissolve in water and salts which do not dissolve in water should be touched on.

With respect to handling the content, the curriculum also states that schools should allocate roughly the same number of hours to each field throughout the year. Furthermore, the need to provide sufficient time for experiments with opportunities to question, plan and observe is emphasized. There is also an emphasis on the value of ‘coordination and cooperation’ between schools and museums or similar learning centers. Lastly, there is a requirement to make links with ‘moral education’ by giving ‘instructions’ in accordance with the moral education section of the curriculum and with ‘the characteristics of science.’ Although the contents repeatedly refer to discovery, understanding and experiments, references to attitude are limited to the content on science, technology and humans and references to interest are limited to the objectives.

Upper secondary: basic chemistry comprises three topics (each with two sub-topics): chemistry and human life (Chemistry in human life and Chemistry and its role in daily life); structure of materials (Structure of atoms and Electron configuration and the periodic table); and change in materials (Mass and Reaction formula). An example of the statements for each sub-topic is given below in an extract from the sub-topics in the chemistry and human life topic.

<table>
<thead>
<tr>
<th>Topic:</th>
<th>Chemistry and human life</th>
<th>Extracts from statements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sub-topic 1:</strong></td>
<td>Chemistry in human life</td>
<td><em>For example,</em> students bring cans and bottles into school and conduct experiments to test their heat and chemical resistance. Try to use a typical metal or plastic and always discuss recycling. Students will be motivated towards learning chemistry.</td>
</tr>
<tr>
<td><strong>Sub-topic 2:</strong></td>
<td>Chemistry and its role in daily life</td>
<td><em>For example,</em> by using food additives and detergents they learn about the nature and the chemical behavior of these materials. Always try to discuss the uses and risks associated with the materials. Students will understand how much of these chemicals to use.</td>
</tr>
</tbody>
</table>
At upper secondary level, chemistry (i.e. the progression from basic chemistry) comprises five topics (each with between two and four sub-topics): conditions of materials and equilibrium (Change in conditions, the nature of gas and the structure of solid matter); change in materials and equilibrium (Chemical reaction, Heat and light, Electrolysis, and Redox); inorganic matter and its use (Typical elements and Transition elements); organic compounds and their uses (Hydrocarbons, Functional groups of chemical compounds, and Aromatic compounds); and, polymer chemistry and its use (Synthetic polymer chemistry and Natural macro-molecules). The content reflects the emphasis on specialization and careers in chemistry.

Demand and progression:
At Grades 7 to 9, the chemistry content of the curriculum and the related objectives are logically-ordered to permit a smooth progression from one grade to the next. The content relating to familiar physical phenomena and matter in daily life in Grade 7 provides a link between students’ prior experience and the content to follow in Grade 8. With particular reference to chemistry, the content on electrical currents and on atoms and molecules in Grade 8 provides the rudiments for the content on conductivity and ions in Grade 9. The content within chemical changes and atoms/molecules and within chemical changes and ions is also logically sequenced in terms of the required prior knowledge. Furthermore, directions ‘to touch on’ some additional content, such as pH, suggests that a basis is being laid for chemistry in Grade 10 and beyond. While the statements on handling the content stipulate several items which ‘should be dealt with’ so that a minimum for all students is intended, there is substantially more content available for each field, giving teachers the opportunity to introduce higher levels of demand.

Assessment:
The curriculum documents did not appear to refer to formative or summative assessment but some external examination papers were available.

The science examination for entry to upper secondary education has a multiple-choice format and is 50 minutes in duration. There are two questions for each of the three sciences. Both of the chemistry questions ask students to select the most appropriate of four statements. One of the chemistry questions is about electrical circuits; it incorporates one item. The other question provides details of two experiments on acid and alkaline solutions, and their results, and incorporates three items.

The chemistry examination for entry to university has a multiple-choice format and the duration is not stated on the examination paper. There are seven questions, which are about: allotropes; classification of elements; atomic mass; redox; gas and energy; thermochemical equations; and, electrolysis.

Key competencies:
In the lower secondary curriculum, although there are no explicit references to key competencies or to similar or subsidiary constructs, there is a particular emphasis on students ‘conducting experiments’ in the contents relating to chemistry.
In the upper secondary curriculum, at the end of each topic there is a sub-topic called research activities involving experiments (data collection, form hypotheses, plan the experiment and then conduct the experiment, data analysis and identify the relevance of the outcomes to daily life, then write a report and present it to their class). The expected outcomes are that students will be more independent and learn to work individually (but no references to working together were apparent).

**Secondary: Physics**

**Orientation:**
This review covers physics in the compulsory lower secondary and the basic and advanced physics courses in upper secondary.

**Purpose:**
The overall aims of the curriculum are stated in personal development terms which are further explained in objectives. These include gaining personal knowledge and culture, the development of attitudes and of skills for life and a career. Developments over the past decade have had the intention to stress science (and mathematics) but in a less didactic way. The objectives of the lower secondary science curriculum exemplify this and are a more specialized version of the general objectives. They include interest in and positive attitude to the subject, ability to perform investigations and scientific ways of looking and thinking. The objectives in upper secondary are similar but show more focus on everyday life and work situations, for the basic course and future specialization in science and technology in the advanced course.

**Coherence and Clarity:**
The lower secondary science curriculum is presented as a list of seven topics, in each of two fields, physical science and biological and earth sciences. Two topics in each field are to be covered in each of the first two years (Grades 7/8) and three in Grade 9. The descriptions are quite brief, but are written in terms of what students should do, in achieving the learning outcomes. These are followed by some detailed advice notes, further clarifying the treatments. In some cases these are not however that clear:

7c) conservation of the natural environment and the use of science and technology: to enable students to scientifically consider modalities for conservation of the natural environment and the use of science and technology, while also recognizing that the creation of a sustainable society is essential.

The advisory note for this simply states that students should apply what they have learnt from both fields 1 and 2, this topic being intended to draw together earlier learning.

In upper secondary, basic physics is a compulsory one-year course, and at advanced an optional two-year course. In each a number of topics is outlined and then detailed in a similar way, with a final topic intended as an opportunity to review all the learning in the course. Each course refers to building on prior learning.
**Scope:**
The scope of the lower secondary curriculum is broad, covering astronomy, meteorology and geology, in addition to biology, chemistry and physics. In physics a good range of sub topics are covered within the topic for each grade. For example the Grade 7 topic Familiar Physical Phenomena covers reflection and refraction of light, lenses, properties of sound, effects of force, pressure. The guidance includes details of refraction at an interface, image formation by lenses, speed of sound, Hooke’s Law, hydrostatic pressure. The Grade 8 topic Electric Currents and its Uses content includes electric circuits, voltage/current and resistance, electrical energy, electromagnetism. The Grade 9 topic is Motion and Energy, followed by the topic 7, Science, Technology and Humans mentioned above, which is intended to synthesize previous learning, in the contexts of energy conversions, energy resources, technological developments and conservation.

General advice is provided on syllabus (schemes of work) design for teachers; this includes: equal times for each of the two fields, the encouragement of problem-solving and research, the use of outside resources such as science centers and the use of ICT.

The whole provides a detailed and accessible statement of the subject for the three years.

The one year Basic Physics course has four topics:

1. movement and energy which includes different types of energy, uses of energy, gravity
2. waves which includes sound, the electromagnetic spectrum, seismic waves, radiation
3. electricity and its uses including magnetism
4. technological applications of the previous topics in everyday life examples include: high speed trains, medical applications, robotics, earthquake resistant buildings.

The two-year Advanced Physics course has five topics: Energy and Waves in the first year, Electricity and Magnetism, and Atomic Physics in the second, together with a topic combining these with a future orientation. This last topic is designed to meet the aim of integrating the students’ understanding of physics, its concepts and perspectives on the world.

Each of the four topics also has the requirement of a research report to be written. Examples of the content are:

1. energy: Newton’s Laws, planetary motion, conservation of energy and of momentum; gas laws. Suggested activities include: video analysis of the hitting of a ball in sports, analysis of collisions of vehicles
2. waves: in light, sound, water - oscillations, circular motion
3. electricity and magnetism: circuits and components, electrolysis, electronics, electromagnetic induction
4. atomic physics: photons, spectroscopy, wave mechanics, types of radiation, atomic structure, particle physics for example quarks. Suggested research activities: investigate the photoelectric effect, visit to research institute
5. future physics: suggested areas of study: nanotechnology, cosmology and space exploration, biomechanics, neurology, environmental protection.

This represents a forward-looking and ambitious program of study.

**Demand and Progression:**
Each of the curriculum programs has potentially a high demand curriculum, though the contents are similar to England’s physics National Curriculum and GCE A level specifications. The demand can be tailored to the abilities of the students as the learning objectives are expressed concisely and include student learning activities, as well as simply physics content. In lower secondary, progression is handled by the guidance on which of the topics are to be taught to each grade; the demand clearly increases across the three years, culminating in the final topic for each field Science, Technology and Humans. Similarly in upper secondary there is progression from basic to advanced and within each, by the use of the final synthesizing/application topic. The frequent requirement of research reports also aids the differentiation of demand.

**Assessment:**
In lower secondary there is frequent teacher assessment through their own or off-the-shelf tests. This leads to student grade outcomes of courses, which are monitored by Local Authorities. There has been no whole cohort national assessment in Japan, but a new mandatory National Test in Science for year 9 has been introduced from 2013. The students’ exam results at the end of lower secondary will determine which entry exams to the upper secondary institutions they will take. The sample reviewed was a 50 minute test of science in which there were only two questions on physics. These were both set in the context of a situation involving movement down a slope. Considerable information was provided and two multiple choice questions were asked – both quite demanding. It is understood that this National Assessment is currently under review – the sample seen was certainly not an adequate assessment of the curriculum as described.

In the upper secondary stage there is much assessment in preparation for university entrance examinations. Teacher grades provide the student with guidance as to which level of university they should attempt the entrance examination. There is much use of private tutors and short courses to prepare for these examinations. They have not been reviewed but are understood to be multiple-choice tests of academic content. There is a current initiative from the government to expand the use of the International Baccalaureate, to provide a qualification acceptable for university entrance, perhaps combined with a points system for achievement in upper secondary. This requires a significant change in perspective from selection by entrance examination to that by qualification.

**Key Competencies:**
As noted above, the brief statements of the course objectives are set in broad terms of personal development. The individual learning objectives often have active behavioral aspects for example:

Acquire skills such as how to operate laboratory equipment and how to record data; frequent reference to conducting experiments; building circuits and measuring their electric current and voltage; recognize the fact that science and technology enrich human life and make it more convenient and pleasurable.

Very few examples of assessment materials were available and although these included an experimental context, the range of learning objective assessed by multiple choice questions is somewhat limited. Teacher assessment is essential to record this.

**Secondary: Social science**

**Orientation:**
In Lower Secondary (Grades 7-9) local Boards of Education make decisions about how to organize the study of history, geography and civics. A number of models are possible as indicated below.

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>History</td>
<td>Year 7</td>
<td>Years 7-8</td>
</tr>
<tr>
<td>Geography</td>
<td>Year 8</td>
<td>Years 7-8</td>
</tr>
<tr>
<td>Civics</td>
<td>Year 9</td>
<td>Year 9</td>
</tr>
</tbody>
</table>

The models adopted vary with context (for example depending on staffing limits in small rural schools). The official position is that Model 2 above should be adopted but Model 1 is common in rural areas. The premise of social studies is, as both models above indicate, that history and geography matter as foundations for civics rather than as ends in themselves. The time allocated to the subjects tells a rather different story, perhaps.

<table>
<thead>
<tr>
<th></th>
<th>Time allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>History</td>
<td>120 x 50 minute lessons</td>
</tr>
<tr>
<td>Geography</td>
<td>130 x 50 minute lessons</td>
</tr>
<tr>
<td>Civics</td>
<td>100 x 50 minute lessons</td>
</tr>
</tbody>
</table>

The overall aim of social studies is to engender in students understanding of, and attachment to, their society / country through an appreciation of its history and culture. A number of statements are provided in the curriculum focusing on the aims of history. Students are expected to:
• develop an interest in historical events and to develop an understanding of the current development of Japanese history (the key focus) and of world history (secondary focus)  
• develop attachment to Japanese history and culture [Added in 2008]
• understand international relationships and interactions in relation to Japanese history and to develop an attitude of international co-operation
• develop an interest in the history of their own area – develop their abilities to make decisions and express themselves [added to the curriculum to encourage movement away from rote learning].

There is a key focus on periodization (and on learning given period features) in the curriculum, and students should develop an interest in the history of their locality and in the context of Japanese and world history.

Upper Secondary
The overall aim of both the history and the geography courses include the cultivation of positive attitudes including:
• viewing international society positively
• cultivating the attitudes necessary for a Japanese person living in an international society
• teachers are required to help students understand world history in the modern and current age and to understand Japan in this context geographically and socially.

Objectives are differentiated by A and B options (see 2B (1) below); in B options students are expected to understand the big picture of world history and the culture of the contemporary world. A key focus in B options is the explanation of why things happen (causal reasoning).

A key attitudinal / affective focus (continued from lower secondary) is the development of attachment to Japan and to students’ locality/town/prefecture in accordance with Articles 14 and 15 of the Basic Act.  
Coherence and Clarity:  
Lower Secondary

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14 See comments in the analysis of the primary history curriculum. There is perhaps an implication here that what students are to understand is already a given – there is a clear story of the current development of Japanese history for students to learn and understand (and self-define in relation to).

15 Again, the implication is that these are givens; periods simply are and one learns their characteristics rather than debates them – periodization is not a concept to be explored but a set of short-hand categories to be learned.

16 Overall, it would appear that in upper secondary there is continuity with lower secondary in the sense that affective / attitudinal aims are key. In addition, in Option B courses, a focus on historical reasoning (understood largely in terms of causal explanation) is important also.
Grades 8-9 are not broken down by grade although detail is provided on what is expected in Grade 7. The only information available is on content (not objectives).

Pedagogic advice (‘handling the content’) is similar in tone / approach to primary (see above); learning should be age appropriate, should focus on interrelationships between the component subjects of social studies, should focus on students’ localities first, should make use of museums and a variety of learning experiences, and so on. It is stated also that teachers should not focus too much on knowledge but that they should aim to enable students to reflect, express themselves and solve problems. Students should be encouraged to consider links between social studies and moral education. Teachers should encourage students to select materials and develop information literacy, information management and research skills. Students should learn to use newspapers, statistics and so on. Teachers should encourage students to write reports and make presentations.

Upper Secondary
Advice on ‘handling content’ indicates that facts should be based on objective and fair materials; that the focus should be on relationships between countries; that content should be considered from multiple perspectives and that multiple themes should be addressed; that there should be a focus on understanding Japan from the perspective of other countries. Advice on ‘how to create a plan’ is similar to lower secondary. There are overall objectives for both geography and history. There should be a balance between geography and history. See below for further comments from this section relevant to key competencies.

Scope
Lower Secondary
The expectation is that students should master chronological concepts (period labels and characteristics) and cover a wide range of history from ancient to early modern Japanese history. Students are to begin by learning period terms. These periods are to be studied in a Japanese optic only. After the early modern period (and particularly after the Meiji Restoration) students are to learn both Japanese and world history and that latter ceases only to matter as a context for developments in Japan. Grade 7 history repeats basic Japanese history learned earlier but it (a) goes further back in time (ancient Japan); (b) covers the content in greater depth; (c) covers material in the context of world history rather than simply Japanese history; and d) includes a broader range of aspects of history (cultural and economic not simply political).

The above is consistent with the overall orientation of social studies – the primary purpose of the subject (as noted in the analysis of the primary document) is to develop identification with, and positive dispositions towards, Japan.

Upper Secondary
There are two history streams in upper secondary - History A and History B. These are summarized below:
There are also two course options in each stream – Japanese History and World History. The contrasts in the table above apply to both courses – in B the expectation is that more content is covered and it is also required that students engage more fully in historical reasoning (for example, causal explanation).

The major content of World History B is summarized in the table below. All periods are to be given equal curriculum time.

<table>
<thead>
<tr>
<th>Item</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Approach (applicable to all content areas)</td>
<td>• Relationships between people and environments should be a key focus when exploring Japanese and World History; world history should be understood in its impact on daily life. Students should come to understand the formation of distinct regions of the world – West Asia, the Mediterranean, South and South East Asia, East Asia and Inland Asia\textsuperscript{17} • In all topics there should be a focus on understanding time (periods and timescale) and on causal explanation (understanding ‘why’) • Students are expected to develop their ability to problem</td>
</tr>
</tbody>
</table>

\textsuperscript{17} Reference is made to the wider context of world history in the remainder of the table. The regional focus of the curriculum (Asia-centric) is suggested by the regions that are listed here, however.
solve / make choices based on a wide range of materials through their historical studies.

| The evolution of the world | The focus is on the world seen from temporal and spatial perspectives – from the middle ages onwards the focus is wider than the Asian region.  
|                          |   - The expansion of Islam (Turkey, Africa, South Asia)  
|                          |   - European development  
|                          |   - Migration and the movement of peoples. |

| The Formation and Transformation of the World (Early Modern history) | Asia and Japan  
|                                                                  | Expansion of Europe and the Atlantic World  
|                                                                  | Industrialization and nation states  
|                                                                  | The world market and Japan. |

| The Modern Age | Imperialism  
|                | Science and technology  
|                | The integration of national peoples and countries through imperialism and international migration. |

| Globalization and Japan | An independent research module focused on global world issues. |

It is hard to comment on scope with the limited information about the detail in which any of the above are to be studied and limited information on assessment. It would appear that there are significantly higher demands in Option B courses than in Option A courses (in terms of the depth required and also in terms of the requirement to reason and argue about cause). However, assessment appears to be about recall so it is difficult to know how far this increased demand is actually present or what it means in practice. Overall, this appears to be a wide ranging course in terms of the range of periods and regions to be covered.

**Progression:**
Progression is modeled in the curriculum on a ripple model. Students start with things local to them and move outwards over time in their focus.
As noted above, Grades 7-9 are not broken down by grade – progression through grade related objectives does not arise, therefore it is hard to talk about progression in conceptual / procedural / disciplinary terms.

**Assessment:**

Lower Secondary

Lower secondary is assessed by an examination at the end of Grade 9 the purpose of which is to gain entry to upper secondary schools of varying status / degrees of academic focus. These examinations are set at prefecture level (national assessment is focused on improving the curriculum rather than on accountability).

A Tokyo prefecture end of Grade 9 exam was scrutinized. In Tokyo there is one examination for social studies overall. The exam is in six parts and most questions are multiple choice questions although some questions require candidates to write descriptive prose and / or to problem solve and / or express ideas. Some questions integrate all elements of subject studies (for example, a question about the local prefecture). Although most questions call for the recall and identification of correct answers to factual questions, some questions aim to integrate some consideration of problem solving skills. An example of a history question was scrutinized. Students were given a brief explanation of an aspect of Japanese history over a long time scale (ancient to modern). Students were then asked (through multiple choice items) to recall and apply knowledge by sequencing sentences in the correct chronological order. Students were then asked to match statements to eras (demonstrating knowledge of the characteristics of eras). They were then asked another sequencing multiple choice question. Finally students
were asked to answer a combined history/geography question and write answers open hand. Questions like these aimed to assess students’ abilities to problem solve and express themselves.

Upper Secondary
As noted elsewhere in this report, there are two modes of university entrance assessment are used:

- national tests consisting of multiple choice questions focused on the recall of information
- universities set their own assessments in which students are asked to write longer free text answers through which their abilities to (a) consider and reason and (b) problem solve and make decisions are assessed.

Key competencies:

Lower Secondary
The key concept relevant to competencies was translated as Zest for Life. This concept is explored (see above) in curricular guidance on how to teach / plan teaching. The intention is to cultivate dispositions in students (such as an interest in their own society). In the materials on history there is a clear focus on developing active modes of thinking on the part of students. For example, in Objective 1.4 the focus is on developing students’ abilities and attitudes to enable them to make use of a range of materials and to analyze facts and materials from a number of perspectives. Students are to develop competencies that enable them to express their views, to consider and to make decisions. It is not clear whether or not the focus here is individual or collective (and whether, for example, there is an emphasis on collaborative problem solving and / or teamwork).

Upper Secondary
In addition, the advice on ‘how to create a plan’ to deliver the syllabus states that teachers should prioritize activities that require students to process information, that students should learn through practical experience, that students should be encouraged to read and create maps and timelines, that students should gain experience in collecting and organizing statistics and that students should be encouraged to make research based presentations based on the collection and interpretation of materials. Students should use computers and the internet positively.

Vocational education

Orientation:
The Japanese system has traditionally held a preference for general education under a single track system. Beyond a national curriculum requirement for practical skills, vocational education lay largely outside of the state system, with quality vocational training seen as the responsibility of employers. The onset of economic problems in the late 1990s changed this picture, and young people today do not expect the same long term and secure employment expectations as
previous generations. Gaining and securing work is much harder than it was, and unemployment for young people has increased. This has meant that vocational and work-oriented training has been transformed in recent years.

Today, about 25% of 15-18-year-olds attend senior high schools with a focus on vocational education. These schools provide educational opportunities for students who know that they want to work in a particular occupational area. In these schools, 50-70% of class time is spent on vocational and technical subjects, with the remaining class time devoted to mathematics, Japanese and foreign languages. Students who graduate may apply to universities, although the majority of them go on to two-year vocational institutions if they pursue higher education.

One area that has been particularly successful in adapting to the changing economy is the system of Kosen colleges, Japan’s 57 national colleges of technology. Although this system of institutions was founded in 1961, they have enjoyed increased popularity in recent years since their graduates have been swamped with job offers in an otherwise difficult economy. Kosen colleges were established in response to industry needs, and remain closely connected to industries now, although the industries have shifted from manufacturing to computer science and applied chemistry. Students can enter these colleges at the age of 15, and after five years of study, leave with the equivalent of a bachelor’s degree. While the number of students entering Kosen colleges is just 1% of all Japanese students leaving lower secondary school each year, the program is growing, and now 1.7 students compete for each spot.

**Coherence and Clarity:**
The recent trends observed in vocational education in Japan in the agricultural, industrial and commercial courses in upper secondary schools, are as follows.

In upper secondary school, agricultural courses such as agriculture, horticulture and animal husbandry are organized to prepare the students to assume direct responsibility for modern agricultural management. The importance of experiments and practical projects has been accentuated for the expansion of productivity and also for the selective development of agriculture.

Very careful examination has been made as to the contents of courses in machinery, electricity, industrial chemistry, architecture and civil engineering. To meet the modern social needs to develop industrial engineering, the school curriculum today covers such new subjects as industrial metrology, electronics, automatic control, chemical engineering, and general study of nuclear engineering.

In commercial courses, special emphasis is laid on the study of business management, especially scientific management of office work and effective use of office machines. In business accounting, for example, classes are equipped with electrical machines. Bookkeeping calculating and copying machines are now being installed as instructional equipment in appropriate classrooms.
Vocational courses are also provided in part-time and correspondence upper secondary schools. Since these courses are provided mainly for working students, measures have been in effect since 1961 authorizing approval of education obtained in on-the-job training facilities approved by the Minister of Education as equal to specified number of credits offered by the upper secondary school. There are 34 such facilities and about 5000 students receiving the benefit of the cooperative program. Moreover, the certificate of graduation is granted to those successfully completing for a required period the machinery course or electrical course in the correspondence industrial upper secondary schools.

**Scope:**
Miscellaneous schools provide students with vocational and practical training such as dressmaking, cooking, book-keeping, typing, automobile driving and repairing, computer techniques. Most courses in miscellaneous schools require for admission the completion of lower secondary schooling. These courses normally last one year or more, but there are also shorter courses. Colleges of technology were initiated as educational institutions in 1962 to provide lower secondary school graduates with a five-year consistent education. However, the majority of vocational schools are privately controlled, particularly through sponsorship from industry. If they meet standards laid down in the *Vocational Training Law* and obtain approval from the local government, they then qualify for assistance. Small firms independently or in cooperation with other companies, can obtain subsidies from the central prefectural government of around two-thirds of their costs.

Each course must have at least 40 students and involve systematic instruction, lasting not less than one year, of 800 class hours or more per year. These schools tend to specialize in a particular vocational area (for example agriculture) but in general, not job specific training. Some core curriculum, Japanese, mathematics, social science, is required. Students have the right to seek to progress to university from these colleges but they are still regarded as low status options.

**Level of Demand:**
The secondary school technology program of study is fairly demanding, nearer to what might be classed as engineering in other systems, for example:

- to understand energy conversion methods and the mechanisms for power transmission
- to understand the basic mechanisms of equipments, and to be able to perform their maintenance checks and to prevent accidents
- to deliberate the proper evaluation and use of technology of energy conversion.

The level of demand at higher levels of vocational training is set, by and large, by the sponsoring firm.

**Progression:**
At upper secondary, or post secondary, students (about 30% do) may opt for one of a few specialized training colleges or the large number of miscellaneous schools, which offer courses in a variety of practical vocational and technical education programs in response to market forces. Progression may be to university, in a minority of cases, but is largely to employment.

Assessment:
Changes to the curriculum in 2011 emphasized, for vocational education, changes to what is taught to develop knowledge, skills and abilities that are required in the workplace and introducing moral and ethical factors. Institutions are judged on their record of progression, to university or to employment, rather than by their results.

Key competencies:
Practical learning in the curriculum is identified, at primary level, as art/handicraft, and at secondary level as art/home economics/technology. In later training, skills and ethics have been reinforced, as above.
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