Aligned Instructional Systems:

China Hong Kong

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History and background

Hong Kong is one of the most densely populated cities in the world with a population in 2013 of over seven million. Its population has been growing steadily, mainly due to an influx of approximately 45,000 mainland residents each year, who, however, do not have a right of residence. Almost all of the people who live in Hong Kong are of Chinese descent. The 5% who are not are primarily Indian, Pakistani, Nepalese, Vietnamese, Filipino and Thai, many of whom are employed as domestic helpers. There are also some Europeans, Australians and North Americans, Japanese and Koreans who mainly work in the city’s financial sector. Hong Kong has two official languages – Cantonese and English, but more and more emphasis is being put on Mandarin Chinese (Putonghua), the language of the mainland, although only 1.4% of the population speak it (Li & Pinna 2013).

Because the Hong Kong was a colony of the UK from 1841 to 1997, its pre-1997 education system mirrored that of the colonial power. While some reforms were undertaken while the British were still in power, for example the Llewelyn Report of 1982 paved the way for a more student-centered view of education – against which teachers resisted – much of Hong Kong’s current educational practice dates from 1997. Law characterizes the Hong Kong education system as “a harmonious compromise ...between Western progressive thought...and eastern traditional practices” (Law 2014, 219) with its unusual combination of personal autonomy and communal preferences.

Hong Kong’s sovereignty was returned to China in 1997 but it was not fully brought into line with mainland governmental practices, maintaining a “one country, two systems” policy. Hong Kong remains a separate jurisdiction and maintains autonomy in all areas except defence and diplomacy. As a Special Administrative Region (SAR) of China, Hong Kong, maintains an independent legislature, with a distinct currency and policies of its own, independent from the national government of Beijing. Hong Kong maintains its own system of education that reports to the Hong Kong government, without direct relations with the Ministry of Education in Beijing. Its education system is quite different from that of the rest of China, “with a unique history, structure and reform trajectory” (OECD 2010, 98).

Prior to 1997, Hong Kong’s education system followed the British pattern of six years of primary school followed by seven years of secondary school. The last two years were the preserve of students who wanted to go on to university education, and those students took A level courses and examinations. University courses were three years long. Those who successfully completed the first five years of secondary education were awarded Hong Kong Certificates of
Education (HKCE) (the equivalent of O levels) but fewer than 50% of these students went on to the next two years of upper secondary. Only 18% of students went on to university. There had never been many government schools in Hong Kong. From the 1950s to the late 1970s, government subsidized churches, charities and other institutions that together formed a public school system. Six year compulsory primary education was introduced in 1965, which simply reinforced an already nearly universal primary enrollment. Non-fee paying compulsory education for children’s first nine years of schooling was only introduced in 1979 (Li & Pinna 2013). Private schools proliferated in the 1970s in response to a shortage of local school places, some of which offered less than adequate educational provision. Once the principle of free schooling took hold, most of such schools disappeared. However, private schools remain part of the system through international schools, many of which have large local populations, as well as private schools the language of instruction in which is English. Again, many of the students are ethnic Chinese (OECD 2010). A system of vocational education was introduced with the establishment of the Vocational Training Council in 1982.

Post-colonial education reform

Comprehensive reform to the system began in the late 1990s, partially in response to new governmental structures, but also due to dissatisfaction that had been building up in the system since universal access to education was introduced in the 1970s and 1980s. Kai-Ming Cheng ascribes the dissatisfaction to a number of factors; schools were unprepared for the change in intake from a select few to almost everyone; schools were slow to accommodate sufficiently the needs of the less able; the locus of responsibility for failures within the system shifted from the students to schools and teachers; pedagogical practice did not adapt quickly enough and reinforced traditional curricular practices of didactic teaching and extensive examination preparation for the highly competitive A level examinations; and lastly, and to Cheng’s mind probably most importantly, employment pattern changes meant that young people with only nine years of education, who previously would have found blue-collar manufacturing work quite easily found that such jobs migrated to the mainland after 1997 because labor costs there were so much more affordable. On a more positive note, Hong Kong’s service sector expanded, but that meant the labor force needed a higher level of education than before (OECD 2010).

Education reforms were led by the Education Commission (EC), which is the oversight body for education policy and concentrated on system structure, curriculum and assessment. In 2001, school leaving examinations were abandoned at primary level. Although the change took some time to get used to, it meant that more localized school-based curricula and assessments could be put in place and the emphasis on examinations preparation could be abandoned. In 2001, another crucial reform document – Learning to Learn – was published (Curriculum Development Council 2001). The change of focus from teaching to learning and the new emphasis on the process of learning rather than memorizing facts were prominent features. In 2009 Hong Kong implemented the 6-3-3-4 model, in which three years of lower secondary followed the six years of primary and three years of upper secondary led to four years of university. This was more like the US model, which mainland China adopted, than the UK one. Four core subjects – Chinese, English, liberal studies and mathematics – plus a system of electives formed the backbone of the curriculum and only one set of public examinations, at the end of senior
secondary, was retained. These examinations culminate in the Hong Kong Diploma of Secondary Education (HKDSE), which also includes school-based, that is, teacher, assessment.

The school population is relatively small. In the academic year 2012-2013 there were 957 kindergartens and childcare centres (private) educating 164,800 children. 455 public sector primary schools educated 258,530 children and 397 public sector secondary schools educated 347,850 children (Hong Kong Government 2014). As of 2011, the proportion of people age 15 or over who completed all twelve years of primary and secondary schooling was 52% (Li & Pinna 2013). Hong Kong has 17 degree awarding institutions, some of which are publicly funded.

**Structure of educational system**

In 2012-2013 Hong Kong spent $79.1 billion on education, which represented about 19% of its total public expenditure. Much of that money was spent on public sector schools, which provide twelve years of free education, and vocational training for students who leave school after the third year of secondary education.

There are three main types of schools:

- government schools that the government itself operates
- aided schools, which are funded with government money but are run by voluntary bodies – school sponsoring bodies
- private schools, some of which receive government financial assistance.

The first two follow the Hong Kong curriculum and offer free primary and secondary education. There are also 15 schools that the English Schools Foundation runs that offer education to English speaking children. International schools cater to non-Chinese speaking students and foreign nationals and do not adhere to the Hong Kong curriculum (Information Services 2013).

Prior to 1997, the school system in Hong Kong followed the British model of six years of primary, three years of lower secondary, four years of upper secondary and three years of university. Upper secondary was divided in two, with each section culminating in external examinations, the O and A levels. Hong Kong retained much of this structure until 2009, when secondary education (both junior and senior) was shortened by a year (6+3+3) and university expanded to four years. One of the external examinations (the O level equivalent) was abolished and the school leaving examination was renamed the Hong Kong Diploma of Secondary Education (HKDSE), which was implemented for the first time in 2012.

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<th>Hong Kong school structure</th>
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<td>Secondary 6</td>
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<td>Secondary 5</td>
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<td>Upper secondary</td>
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Kindergarten:
Kindergartens and child care centres register with the Education Bureau and provide services for children from three to five years old. Voluntary and other private organizations run kindergartens, which in 2012 had enrollments of about 164,800 children in 957 centres. The government does subsidize kindergartens, providing rent-reimbursement, premises in public housing estates and fee remission for poorer parents. Training programs for teachers and principals are also available as are guidelines such as the 2007 Guide to the Pre-primary Curriculum (Hong Kong Government 2014).

Most kindergartens operate on a half-day basis and offer up to three years’ programs: nursery, lower kindergarten and upper kindergarten. They attempt to provide a stimulating learning environment that caters for children’s life experience and interests through activity centres, such as reading, mathematics, nature, art and crafts, music and home corners. These activity centres are all well equipped with teaching aids to facilitate self-learning.

All children in Hong Kong, irrespective of their nationalities, can apply for fee assistance under the Kindergarten and Child Care Centre Fee Remission Scheme as long as they are under six years old, study in kindergartens or child care centres and can fulfil other requirements specified in the scheme (EDB 2014d).

Primary Schools:
At the age of six children enter primary school and remain for six years (Primary 1 to 6). Morning, afternoon and whole day programs exist, but there is a concerted effort to institute whole day programs. Upon application, all eligible children are allocated Primary 1 places in either government or aided schools. Placement takes place in two phases: at the discretionary place phase parents apply for one government or aided school and admission is based on EDB criteria; at the central allocation phase the remaining students are placed by the EDB according to catchment area, parental choice and a random numbering system.
In September 2012, approximately 258,530 students were enrolled in 455 public sector primary schools. Students experience a wide range of learning activities, with emphasis placed on generic skills, values and attitude development. In line with the curriculum changes of 2002, schools try to turn their students into independent learners. Schools are able to adapt the territorial curriculum to meet best their own students’ needs (Hong Kong Government 2014).

Secondary schools:
Hong Kong secondary schools use the nomenclature of 20th century English schools, designating each year as a form. For ease of use, we will use the terms Secondary 1 to Secondary 6, with Secondary 1 to 3 (sometimes referred to as junior secondary) the equivalent to US junior high school. Secondary 4 to 6, US senior high school, is not compulsory. As with primary school, placement at a secondary school is a combination of a discretionary places phases and a central allocation phase. At the discretionary stage, schools can admit certain students according to the school’s criteria. At the central allocation stage, places are allocated according to the student’s allocation (achievement) band, parental choice and a random number.

In September 2012, 397 public sector secondary schools enrolled about 347,850 students. As of 2009 a new academic structure was put in place in senior high schools, which now offers three year programs instead of four, culminating in the Hong Kong Diploma of Secondary Education (HKDSE), which replaced the Hong Kong Certificate of Education Examination (HKCEE – an O level equivalent) and the Hong Kong Advanced Level Examination (HKALE – an A level equivalent). All students now have an opportunity to pursue six years of secondary education, and in the last three years, the subjects that students take vary (see below) according to the students’ interests and future plans. In Secondary 1 to 3 students study a broad-based, compulsory curriculum. Once again, life-long learning takes centre stage. The first cohort to graduate under this system did so in 2012 (Hong Kong Government 2014, ITS 2013).

Special needs education:
Depending on their needs, children either attend special schools that offer intensive support or are mainstreamed into regular schools. There are 60 government subsidised special schools that are run by non-governmental organizations. Some of these schools provide support for regular schools the population of which includes children with SEN. Schools must adopt a whole school approach to teaching SEN students and teachers are provided with appropriate training courses (Hong Kong Government 2014, EDB 2014c).

Vocational education:
The Vocational Training Council (VTC) is the main governance body for vocational education. It works with education and training providers such as the Technical and Higher Education Institute (THEi), the School for Higher and Professional Education (SHAPE), the Institute of Professional Education and Knowledge (PEAK), the Hong Kong Institute of Vocational Education (IVE), the Hong Kong Design Institute (HKDI), the Youth College (YC), the Hospitality Industry Training and Development Centre (HITDC), Chinese Cuisine Training Institute (CCTI),
Maritime Services Training Institute (MSTI), and Pro-Act Training and Development Centres. It also develops and operates a variety of schemes to train operatives, craftspeople, technicians and technologists, sometimes under an apprenticeship scheme. The YC offers programs for both Secondary 3 and Secondary 6 school leavers, running a credit-based program called the Diploma in Vocational Education for school leavers at or above Secondary 3 level. This program prepares students either for employment or for further education. In 2012-2013 the VTC oversaw programs that attracted about 44,000 full time and 26,000 part-time students. It also collaborates with universities to offer top-up degree programs as well as offering its own degree programs through the THEi.

The vocational offering is underpinned by a Qualifications Framework (QF) that was launched in 2008, which consists of a quality assured seven-level hierarchy separating out academic, vocational and continuing education qualifications (Hong Kong Government 2014).

Tertiary Education:  
In the post-secondary sector, 28 institutions offered self-financed sub-degree (equivalent to the US associate degree), degree and top-up programs to around 47,000 students. In 2012-2103 the VTC, the City University of Hong Kong (City U), the Hong Kong Polytechnic University (Poly U) and the Hong Kong Institute of Education (HKIEd) also offered publicly funded programs at the sub-degree level to around 10,200 students.

Hong Kong has 17 degree awarding higher education institutions, of which eight are publicly funded. Seven of those eight are universities and the eighth is a teacher training college. In 2012-2013 higher education institutions enrolled 82,700 full-time and 4,200 part-time students in publicly funded undergraduate and post graduate courses. The Open University enrolled an additional 18,000 students (Hong Kong Government 2014). The number of places available for undergraduate degrees is substantially fewer than the number of students who actually fulfill the entry requirements for general admission to university. For those who are unable to get a place on a degree program, an associate degree or a higher diploma, which may articulate with a degree course later on, is a popular option (ITS 2013).

Since the start of academic year 2012-13, many undergraduate programs have been extended to four years, in line with the government’s 3+3+4 policy.

Adult Education:  
Life-long learning is a key government policy, and many adults take courses. Most universities offer non-degree, adult learning courses and there are a range of other institutions offering professional, general education and interest courses. Language courses, especially English, Mandarin/ Putonghua and Japanese are common, and many adults study as a means of improving their prospects in the employment market. The government has established a scheme which enables adult learners to obtain fee reimbursement for approved courses (ITS 2013).

School year:
A typical school day runs from 8:30 a.m. to 3:30 p.m. and class sizes range from around 30 to 37. The length of the school year is at minimum 190 days, with shorter holidays throughout the year and a summer break that generally begins in mid-July. The Education Bureau makes clear to teachers that it is not unusual for them to be required to perform duties during school holidays (EDB 2009).

**Policy, aims and vision**

According to the Curriculum Development Council’s (CDC) 2001 *Learning to Learn – the Way Forward in Curriculum Development*, the overall aims of the school curriculum in Hong Kong reflect a move away from rigid practices to a more flexible approach. They stress life-long learning and social values and recognize that teaching needs to change alongside the curriculum:

The school curriculum should provide all students with essential life-long learning experiences for whole-person development in the domains of ethics, intellect, physical development, social skills and aesthetics, according to individual potential, so that all students can become active, responsible and contributing members of society, the nation and the world.

The school curriculum should help students to learn how to learn through cultivating positive values, attitudes, and a commitment to life-long learning, and through developing generic skills to acquire and construct knowledge. These qualities are essential for whole-person development to cope with challenges of the 21st century.

A quality curriculum for the 21st century should therefore set the directions for teaching and learning through a coherent and flexible framework which can be adapted to changes and the different needs of students and schools (CDC 2002, 2).

The recent senior secondary curriculum guide (CDC 2014) put the aims in context, stressing Hong Kong’s place within China as a nation:

To sustain the development of Hong Kong as an international city amidst the economic restructuring and rapid development in Mainland China, Hong Kong citizens need to develop their adaptability, creativity, independent thinking and life-long learning capabilities. Hong Kong has become part of China after 1997. It is necessary to enable every student, as a citizen of Hong Kong, to have more in-depth knowledge of modern China and the world (p. 1).

**Objectives:**
In order to fulfil these aims, the government has set out a number of policy objectives, which in general are to:
• provide nine years' free and universal primary and junior secondary education to all children attending public sector schools, including full-time vocational provision for students who leave secondary school after three years
• provide a balanced and diverse school education that meet the different needs of students and help them build up knowledge, values and skills for further studies and personal growth
• enhance students' biliterate [Cantonese and English] and trilingual [Cantonese, English and Mandarin/ Putonghua] abilities
• enhance teaching quality and effectiveness in learning
• improve the learning and teaching environment
• help newly arrived children from the mainland integrate into the local school system as soon as possible
• enhance the quality, flexibility and accountability of school administration.

For primary learners, the emphasis is on whole-day schooling, small class teaching (to be implemented by 2014-2015), promotion of the use of information technology (IT) through the 2008 Right Technology at the Right Time for the Right Task policy, implementing the 2001 curriculum reforms, enhancing the biliterate and trilingual abilities of students, improving the learning environment through structural changes and providing education services for newly arrived children from the mainland.

For secondary learners, the emphasis is on implementation of the New Senior Secondary academic structure (NAS) and curriculum enshrined in the 2005 New Academic Structure for Senior Secondary Education and Higher Education – Action Plan for Investing in the Future of Hong Kong and the 2009 structural changes that resulted in the three year senior secondary program and the HKDSE, fine-tuning the medium of instruction arrangements that allow more students the opportunity to learn English at junior secondary, and, as in the primary objectives, promoting the use of IT, enhancing biliterate and trilingual abilities, improving the teaching and learning environment and providing services to newly arrived students.

A consultation was launched in the summer of 2014 on the 4th Strategy on Information Technology. The proposal is to enhance the IT infrastructure including providing WiFi access in all public sector schools, enrich e-learning resources, build schools’ WiFi access in all public sector capacities, and develop communities of practice among teachers. The plan would also involve transforming pedagogical and assessment practices, partnering with parents and other stakeholders, and leverage community resources (EDB 2014c).

For post secondary education, the emphasis is on increasing opportunities, further developing Hong Kong as a regional hub for higher education, increasing the number of publicly funded HE places, ensuring all qualified students can go on to HE regardless of their personal financial situation, expanding adult provision, quality assuring both local and non-local provision (EDB 2014c).
21\textsuperscript{st} Century Skills

The introduction of 21\textsuperscript{st} century skills has been a priority of the reforms described above and the new curriculum focuses on the learning of these skills. Teachers are encouraged to change their pedagogy and focus on making the classroom more interactive. Assessment has also been changed to be more open-ended and inquiry based. There has been a huge investment in technology to facilitate developing 21\textsuperscript{st} century skills, which is designed to be interactive, creative and encourage students to synthesize and share (Singmaster 2012). The seven learning goals for students (see below) clearly emphasize skills; one of these goals is to “develop creative thinking and master independent learning skills, for example, critical thinking, information technology, numeracy and self management” (EDB 2012b). Information and communications technology (ICT) also forms the underpinning of the promotion of 21\textsuperscript{st} century skills. The Government launched technology strategies in 1998 and 2004, focusing on the enhancement of ICT infrastructure and empowering learning and teaching with ICT. In May 2014 a consultation document was published for the fourth Information Technology in Education strategy (ITE4). Its goal is to “unleash the learning power of all students to learn to learn and to excel through realizing the potential of IT in enhancing interactive learning and teaching experiences.” Its aim is to strengthen students’ self-directed learning, their creativity, collaboration, problem-solving and computational thinking skills, as well as ethical use of IT, in an enhanced IT environment, with schools’ professional leadership and capacity, as well as the support from community partnerships (EDB 2014a).

Another skills building initiative is the Business-School Partnership Program, which aims to foster cooperation and alliances between the business sector and school, giving students wider experiences to meet 21\textsuperscript{st} century challenges, understand different careers, establish the right work attitudes, gain an enterprising spirit, adapt to economic changes and complement whole-person development (EDB 2010). There is a focus on instrumental values, and learning the correct work attitude is seen as enhancing development of life values.

Innovation in education

The OECD “Measuring Innovation in Education” (OECD 2014a) 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 Hong Kong’s five most significant organizational innovations:

1. More peer evaluation of teachers in primary and secondary education
Hong Kong has increased its use of teacher peer review both in primary and secondary. For 8th grade mathematics and science classroom the increase between 2003 and 2011 was 26% points and 27% point respectively; in 4th grade the increase was 20% points

2. **More external evaluation of primary and secondary school classrooms**
   Between 2003 and 2011 there was a 26% point increase in the percentage of 4th grade students in schools that were externally evaluated, the second largest change in the analyzed systems. There were slightly smaller increases for 8th grade science and mathematics students

3. **More remedial mathematics education in secondary schools**
   Between 1999 and 2007 the proportion of 8th grade students in schools that offered remedial mathematics education rose by 20% points, higher than the OECD average change, which was 14% points

4. **More teacher observations of secondary school science classrooms**
   Secondary teachers observed each others’ classrooms frequently, rising between 2003 and 2011 by 8% points in 8th grade science (OECD average 2% points)

5. **More use of incentives for recruitment and retention of secondary teachers**
   Between 2003 and 2011 the percentage of 8th grade students in schools using incentives to recruit or retain mathematics teachers rose from 1% to 6.7%; in science the percentages increased from 1% to 4.9%.

In terms of pedagogic innovation the OECD reports suggests that Hong Kong’s main innovations are:

1. **More computer use in primary school reading lessons**
   Hong Kong teachers reported significant increases in primary school students' use of computers as reading resources, increasing from 2.8% to 41.6% between 2001 and 2006, the largest gain in all of the systems included in the OECD report

2. **More text interpretation in primary reading lessons**
   Between 2001 and 2011 teachers reported an increase of 38% points in students who were asked to make generalizations and draw inferences from a text one or more times a week, again the largest gain in all of the systems

3. **More relating of primary school lessons to everyday life**
   Teachers reported a 32% point increase in the percentage of 4th grade science students whose teachers asked them to relate what they learn in class to their daily life in at least half of their lessons between 2003 and 2011

4. **More active learning in secondary science lessons**
Between 2007 and 2011 there was a 24% increase in teacher reports of the percentage of 8th grade students who were asked to explain what they were studying in science lessons, which the OECD report associates with critical thinking and scientific communication. This was the second largest increase among the jurisdictions.

5. More use of answer explanation in primary mathematics

Between 2003 and 2011 teachers reported a 28% point increase in the proportion of mathematics students explaining their answers during lessons, again the second largest gain. However, the overall percentage is below the OECD average.

Governance

Governance of the instructional system

Morris and Adamson (2011) identify three distinct periods that shaped the modern governance system of schools in Hong Kong. From the inception of the People’s Republic of China to the mid-80s, the colonial government in Hong Kong was extremely wary of influences from the mainland, so it ceded to itself complete control of the school system and its curriculum, which it tried as much as possible to de-politicize in order to ensure that students would not be taught anything that would undermine colonial rule. Once the handover to China was confirmed in the mid-80s, though, the curriculum (and its governance) was modified to enshrine the “one country, two systems” principle and since 1997 a new set of governing agencies was introduced.

The Education Bureau (EDB) has the responsibility for formulating, developing and reviewing education policies at all levels of the system. An Education Commission (EC), established in 1984, advises the EDB and secretary of education both on policy and implementation. It established a Curriculum Development Institute (CDI), the main responsibility of which is to oversee developments in the school sector. For tertiary education advice is provided by the University Grants Committee and the Vocational Training Council. Alongside the EC is the Curriculum Development Council (CDC), which also provides advice about the school curriculum. While curriculum policy may emerge from the EC and CDC, Morris and Adamson (2011) characterize the system of curriculum decision-making as centralized and bureaucratic (p. 27).

In recent years the governance of Hong Kong has become far more participatory and interactive with multi-stage consultation processes especially for the new academic structure (NAS) since 2005. For the review upon the launch of the NAS (2012), there are short term (2013), medium term (2014-15) and longer term stages, adopting the same style of consultation (New Academic Structure Bulletin 2014).

While the CDI is responsible for curriculum development – in consultation with the CDC – the responsibility for public examinations and assessment lies with a different body, the Hong Kong
Examinations and Assessment Authority (HKEAA), meaning that curricula and assessment can become disjointed if not carefully attended to. The chart below gives some idea of how the administrative bodies are organized (Morris and Adamson 2011):

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<th>Chief Executive</th>
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<tr>
<td>Executive Council</td>
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<td>Curriculum Development Council (CDC)</td>
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<td>Advisory Committee on Teacher Education and Qualifications (ACTEQ)</td>
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<td>Education Commission (EC)</td>
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<tr>
<td>Standing Committee on Language Education and Research</td>
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<tr>
<td>Hong Kong examinations and Assessment Authority (HKEAA)</td>
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<tr>
<td>Education Bureau (EDB), including the Curriculum Development Institute (CDI)</td>
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<tr>
<td>University Grants Committee</td>
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<tr>
<td>Vocational Training Council (VTC)</td>
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<tr>
<td>Primary and Secondary Schools</td>
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<tr>
<td>Tertiary Institutions</td>
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<td>Workplace Education</td>
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The key decision makers are the CDC, CDI, HKEAA and the EC. Teachers have no significant role in policy formation, which is centralized. Syllabuses and textbooks are approved centrally. But some counter-tendencies do exist, for example, school-based initiatives (see below) that include both school-based management and school-based curricula. The CDI recruits staff from different sectors insofar as they possess the necessary expertise. Although they often come from schools, they are also recruited from tertiary institutions, the business sector, NGOs and assessment agencies. There are also local and overseas recruits.

The government also regulates school operations, including curriculum design and delivery, and use of funds. Quality assurance inspections take place, and school are subject to the auditing of their accounts. Government operated schools and subsidized schools, which are the majority of schools, are more strictly controlled than schools that operate under a Direct Subsidy Scheme. The last are able to decide on their curriculum, fees and entrance requirements, but they are also required to target their curricula at local students preparing for local examinations (Lai and Cheung 2013).

Under the school-based management system (SBM) that has been in place since 2000, schools are held accountable for the provision of quality education. Management is through the operation of School Sponsoring Bodies (SSBs) and Incorporated Management Committees (IMC). All primary and secondary schools are required to set up IMCs.
School Sponsoring Bodies responsibilities include:

- meeting the cost of furnishing and equipping the school premises
- setting the vision and mission for the school
- maintaining full control of the use of funds and assets owned by it
- deciding the mode of receiving government aid
- ensuring, through the sponsoring body managers, that the mission is carried out
- giving general directions to the incorporated management committee in the formulation of education policies of the school
- overseeing the performance of the incorporated management committee
- drafting the constitution of the incorporated management committee.

The incorporated management committee is responsible for:

- formulating education policies of the school in accordance with the vision and mission set by the sponsoring body
- planning and managing financial and human resources available to the school
- accounting to the Permanent Secretary and the sponsoring body for the performance of the school
- ensuring that the mission of the school is carried out
- ensuring that the education of the students of the school is promoted in a proper manner
- school planning and self-improvement of the school (EDB 2004).

**Public/private**

Only about 10% of schools in Hong Kong are directly run by the government. Hong Kong private schools can be local or international. The former generally enroll local children and Cantonese is the language of instruction. The latter cater to expatriates, although some local students are enrolled. Private organizations run private international schools, which do not receive a direct subsidy from the government, and do not have to follow the Hong Kong curriculum. Most international school use an English-based curriculum adhering to the British, American, Canadian or International Baccalaureate systems.

There are also private independent school, for which the government does offer land grants at a nominal fee, plus one-off capital grants for construction. Like other private schools they can charge fees, appoint teachers, choose the language of instruction; however, they must enroll 70% local children and be non-profit making (Yan 2010).

**Textbooks**

*Guiding Principles for Quality Textbooks* (EDB 2012a) recognize that textbooks can be used in myriad ways. Not only are they teaching materials, but students can use them for self-directed learning as well as for revision. Hoping that textbooks will support the learner-focused curriculum, the Education Bureau has set down rules publishers must follow if they want their
textbooks included in the allowed reading list. Categories for judgment include: content, learning and teaching, structure and organization, language and textbook layout. They cover all phases of learning, subjects and all key learning areas. Schools may then choose from the ‘Recommended Textbook List’, and there is also a limited number of e-Textbooks now being made available.

Content and teaching and learning regulations underpin Hong Kong’s emphasis on student-centered learning. Content rules demand that a textbook covers aims, content, teaching and learning strategies and assessment. They must align with the relevant curriculum or subject guide, be self-contained and not include superfluous material (so that room is left for learning to learn), be up to date and accurate, correct and precise, balance breadth and depth, support student progress, have balanced viewpoints that does not include bias, stereotyping or discrimination and include suggestions for further reading.

Learning and teaching principles require balanced coverage of cognitive skills enshrined in Bloom’s taxonomy, that is, information gathering, remembering, focusing, organizing, integrating, analyzing and generating. The guidelines stress higher order thinking skills including critical and creative thinking. Students must be allowed to search for information and be aware of the learning process. Textbooks must foster positive values and attitudes as well as catering to students of varying ability. Learning activities that can provide feedback are essential and must include real-life experiences.

In recent years the system has been far less reliant on a small number of standardized textbooks. The curriculum reform has introduced school-based flexibilities, and there is a wealth of learning and teaching materials prepared by different organizations, schools, and from overseas resources. The school-based curriculum can be adapted from the central curriculum framework to cater to learner diversity, different contexts of schools and home background of students. Textbooks, even if they do adhere to the guidance above, can determine the breadth and depth of topic area coverage. Since teachers and students rely heavily on these textbooks, publishers exert a certain amount of influence over the Hong Kong curriculum. For subjects that most students learn, there are a variety of textbooks available, but Morris and Adamson (2011) argue that since textbooks are commercial products, publishers are both wary of deviating too much from what teachers expect and are comfortable with, and also shy away from including anything that might displease the government.
Accountability

Hong Kong maintains systems of quality assurance in schools through performance indicators and appraisal mechanisms. Accountability is also built into teacher preparation programs, continuous professional development and leadership training (see below).

Schools conduct self-evaluation as the internal quality assurance mechanism and are also subject to inspections by the Education Bureau (EDB). Starting in the 2003-2004 academic year schools’ self-evaluations have been validated by an external school review. Schools submit their three year and annual school plans and annual reports to the EDB, both for developmental and accountability purposes, thus integrating quality assurance and planning. Progress toward the plans is reported on, featuring the key performance measures (KPM) in the four domains of performance indicators. The plans are also uploaded to the school’s homepage, thus making the accountability process public. Feedback to schools is then incorporated into the next planning round. Featured items in the reports include budget reports, teacher and principal professional development, teachers’ qualifications and experience, the number of active school days, lesson time for the eight Key Learning Areas (KLAs), students’ reading habits, student attendance, students’ destinations, and results of the Hong Kong attainment test and the HKCEE (as of 2012 the HKDSE) (EDB 2003).

The 2003 Quality Assurance Framework not only ensures that school prepare annual development plans and apply KPMs but they also must include stakeholder surveys, value-added information and norm-referenced outcome measures (Walker & Ko 2011). Starting in 2004 the EDB put into place a Territory-wide System Assessment (TSA) that measures student progress from Primary 3 to Secondary 3 in basic competency in Chinese, English and mathematics. TSA was put in place to ensure schools knew about students’ strengths and weaknesses and therefore improve the teaching and learning of those core subjects. The outcomes can also been used for accountability purposes through the schools’ self-evaluation reports (Cheng 2009). Complementing other accountability measures, the Education Bureau put in place professional development policies such as territory-wide information technology training, benchmark assessment instruments for language teachers and formal accreditation and professional training for aspiring principals. A Quality Education Fund and a Chief Executive’s Award for Teaching Excellence were also developed to ensure quality teaching through funded action research (Walker & Ko 2011).

Walker and Ko (2011) studied the effects of school accountability on principals and teachers and reported mixed results. Principals’ central role in school accountability was recognized by staff who reported that this gave the schools a clear sense of purpose and ensured that school priorities reflected government policy. But they also found that the centrally driven accountability system resulted in “narrowly defined goals with an overly rigorous focus, excessive central control and the imposition of external (often decontextualized) standards which combine to construct facades or illusions of effectiveness” (p. 386).
The media pays a great deal of attention to what goes on in schools, with education reports on an almost daily basis on policy and implementation matters. This adds another layer of public accountability (OECD 2010).

Teachers in government schools are civil servants, as in Singapore, but not Shanghai. However, this applies to only 10% of schools in Hong Kong. Teachers in aided schools are paid the same salaries as those in government schools but receive less generous benefits, such as housing and medical subsidies. Teachers and principals who work in direct subsidy schools sign contracts with the school sponsoring body (SSB) so they are directly accountable to the SSBs.

**Setting Standards**

Hong Kong's school curriculum is centrally developed. The CDC maintains committees for all of the Key Learning Areas (KLA) that are specified in the current Hong Kong curriculum and also oversees special needs, early childhood and gifted and talented provision. It issues curriculum guides to schools that specify aims, objectives, pedagogy and assessment. It also approves textbooks and related instructional materials that schools are allowed to use. Secondary schools have some leeway about which subjects they offer; if the subject is publicly examined at Senior Secondary then the HKEAA decides how it will be assessed.

Since 2007, Hong Kong has adopted one single *Curriculum and Assessment Guide* for examination subjects, which are all jointly prepared by the CDC and HKEAA. Public assessments have to follow the “standards” (that is the curriculum aims, learning objectives and targets) set out jointly by the CDC and HKEAA. Similarly the review of any HKDSE subject is reviewed jointly.

While the government has well established consultative processes, such as those for NAS reforms, it also uses various advice-giving committees. Morris and Adamson consider that the government can exert its influence over those committees, by, for example, setting up a number of committees to study the same topic, controlling agendas, hand-picking committee members and not always institutionalizing recommendations that committees make (Morris & Adamson 2011).

Where there is flexibility about curriculum decision making, Lai and Cheung (2013) found that the senior management team was the driving force, although the most successful schools bring teachers to the table by asking them to express their views on the school’s policies and practices and incorporating their opinions into final decisions.
Teacher training

A number of tertiary institution offer pre-service and in-service teacher training programs. The main provider is the Hong Kong Institute of Education (HKIEd), which offers a range of sub-degree, degree and post-graduate programs both for pre-service and in-service teachers. In 2012-2013 it enrolled about 4500 full-time and 3500 part-time students. Three other universities and the Open University also offer programs. Teachers may also become qualified through the Non-Graduate Teacher Qualifications Assessment, intended for candidates who enter teaching later in their careers. Some of the institutions offer short in-service courses, sometimes at the behest of the EDB (Hong Kong Government 2014).

Initial teacher training

Complementing the reforms to curriculum and assessment over the last decade, more emphasis has been placed on the professionalization of teachers. Whereas before the mid-1990s entry into the profession was largely unregulated, colleges of education merged into the Hong Kong Institute of Education (HKIEd) in order to provide standardized education for those entering the profession. Teacher candidates are now educated either at one of three comprehensive universities, or the Open University of Hong Kong, or the Institute of Education. The Education Bureau does not want to close qualified candidates out of the teaching field or discourage them from becoming teachers through specific training requirements (CIEB 2013).

The government sets professional standards for entry into teaching. Anyone who wants to teach must be a registered teacher with approved teaching qualifications (qualified teacher status (QTS)). “Permitted” teachers can have only academic qualifications but they are allowed only to teach specified subjects in specified schools. Language teachers – English and Mandarin/Putonghua have to meet a language proficiency requirement before they are allowed to teach. All new teachers must be trained graduates, which is a more stringent requirement than the previously accepted sub-degree pre-service training; starting in 2004-2005 all pre-service primary and secondary teachers who had graduated from teacher education programs had to have degrees (EDB 2008). The training program incorporates subject knowledge, classroom management, understanding the needs of students, communication skills, the ability to learn from and work with other people, sociability, physical and psychological well-being, assertiveness, flexibility and adaptability (CIEB 2013). Newly appointed kindergarten teachers have to have a Qualified Kindergarten Teacher qualification and all kindergarten principals must have a Certificate in Kindergarten Education.

New teachers are inducted through extensive school-based mentoring. Mentors and mentees are assigned based on subject responsibilities and activities center on lesson preparation and observation, assignment development and designing and implementing assessments (Wong 2013). In 2008 the Advisory Committee on Teacher Education and Qualifications (ACTEQ)
introduced a mentoring toolkit that guides teachers and principals on the best ways to make a teacher’s first year most productive and rewarding. Wong (2013) argues that ACTEQ’s contribution illustrates increased government intervention in teacher development and the increased importance of school accountability because of its more systematic and formal nature.

Every year, on the average about 30% schools receive professional capacity building services. These are school-based support services delivered either by EDB alone or jointly with universities to provide on-site advice on curriculum planning, learning and teaching strategies and lesson planning.

Continuous Professional Development

The government has developed a set of teacher competencies and a professional development framework to provide the empirical basis of and contribute to enriching a common continuing professional development framework for teachers. ACTEQ’s basic premises are that: teachers need to commit to lifelong learning in order to enhance their professionalism; CPD should promote student learning and development; teachers should choose a specific area in which to strive for excellence; CPD should be flexible; CPD should be focused on the school’s context; schools should develop CPD learning communities; and that collegial input and support are necessary factors in successful CPD.

In 2003 the government set targets of 150 hours of CPD over a three year period and suggested it be a combination of no less than 50 hours of structured learning and no less than 50 hours of less formal learning. Much of the activity is decided at the school level, to complement school-based management and curriculum development (see below). The professional development frameworks offer criteria against four major domains:

- teaching and learning: including subject knowledge, curriculum and pedagogy, teaching strategies, assessment
- student development: including diverse student needs, rapport, pastoral care, differential learning experience
- school development: including vision and mission, policies, home-school collaboration, responsiveness to society’s values
- professional relationship and services: including collaboration, professionalism, involvement in policies, education-related community service.

Threshold, competent and accomplished descriptors are detailed for each criterion (ACTEQ 2004).

An analysis of the new CPD demands was published in 2009 (ACTEQ 2009) that found that more than two thirds of teachers participated in over 50 hours of CPD in 2006-2007. Of that about 60% was, possibly predictably, concentrated in the first domain of teaching and learning. Some of the teachers surveyed believed that the 50 hour per year requirement was too high;
those whose schools had arranged CPD were less negative. Not surprisingly, time and other commitments were big factors in whether or not teachers believed that the CPD burden was too heavy. Ninety percent of teachers thought formal CPD opportunities to be helpful. Other useful activities included sharing teaching practice, exchanges with internal and external stakeholders, lesson observations, joint lesson preparation and sharing readings and ideas through learning and study circles.

**Curriculum overview**

Hong Kong’s Curriculum is structured around seven learning goals, four key tasks, eight Key Learning Areas and five essential learning experiences.¹

The seven learning goals are for students to:

1. recognize their roles and responsibilities as members in the family, the society, and the nation; and show concern for their well-being
2. understand their national identity and be committed to contributing to the nation and society
3. develop a habit of reading independently
4. engage in discussion actively and confidently in English and Chinese (including *Putonghua*)
5. develop creative thinking and master independent learning skills (for example critical thinking, information technology, numeracy and self management)
6. possess a breadth and foundation of knowledge in the eight Key Learning Areas
7. lead a healthy lifestyle and develop an interest in and appreciation of aesthetic and physical activities.

The four key tasks are:

1. moral and civic education
2. reading to learn
3. project learning
4. information technology for interactive learning.

The eight Key Learning Areas are:

1. Chinese language
2. English language
3. mathematics
4. personal, social and humanities
5. science

¹ The following is taken from the Basic Education Curriculum Guide (2002)
6. technology  
7. arts  
8. physical education.

These are underpinned by nine generic skills:

1. collaboration skills  
2. communication skills  
3. creativity  
4. critical thinking skills  
5. information technology skills  
6. numeracy skills  
7. problem solving skills  
8. self-management skills  
9. study skills.

The five essential learning experiences are:

1. moral and civic education  
2. intellectual development  
3. community service  
4. physical and aesthetic development  
5. career-related experiences (for junior secondary students).

All of these must be woven across the nine compulsory years of schooling to create a coherent and cohesive curriculum, which is an organizational challenge. The nine generic skills can be seen as 21\textsuperscript{st} century skills.

**Primary and junior secondary:**

Of the 190 school days each year, the government suggested that 172 of them or 792 and 918 hours be spent in lessons in primary and secondary school respectively. The primary curriculum consists of subjects including social studies, science, Chinese, English, mathematics, music, arts and physical education, with some built-in flexibility for schools to provide programs that best suit their students (ITS 2013). In the first three years of secondary (junior) students follow a compulsory program (ITS 2013).

During the compulsory years, for the three core areas of Chinese language, English language and mathematics, the basic education guide states that the lesson time over three years should take up between 54\% and 66\% in primary and between 46\% and 57\% in junior secondary. A suggested overall timetable from 2002 is below. Lesson hours are currently being review through the *New Academic Structure Review* (EDB 2014b):

**Suggested Lesson Time**

<table>
<thead>
<tr>
<th>Key Learning Area</th>
<th>Lesson Time (over three years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Chinese Language

<table>
<thead>
<tr>
<th></th>
<th>P1 – P3</th>
<th>P4 – P6</th>
<th>S1 – S3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>594-713 hours</td>
<td>594-713 hours</td>
<td>468-578 hours</td>
</tr>
<tr>
<td></td>
<td>(25-30%)</td>
<td>(25-30%)</td>
<td>(17-21%)</td>
</tr>
</tbody>
</table>

### English Language

<table>
<thead>
<tr>
<th></th>
<th>P1 – P3</th>
<th>P4 – P6</th>
<th>S1 – S3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>404-499 hours</td>
<td>404-499 hours</td>
<td>468-578 hours</td>
</tr>
<tr>
<td></td>
<td>(17-21%)</td>
<td>(17-21%)</td>
<td>(17-21%)</td>
</tr>
</tbody>
</table>

### Mathematics

<table>
<thead>
<tr>
<th></th>
<th>P1 – P3</th>
<th>P4 – P6</th>
<th>S1 – S3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>285-356 hours</td>
<td>285-356 hours</td>
<td>331-413 hours</td>
</tr>
<tr>
<td></td>
<td>(12-15%)</td>
<td>(12-15%)</td>
<td>(12-15%)</td>
</tr>
</tbody>
</table>

### Science

<table>
<thead>
<tr>
<th>General Studies for Primary Schools</th>
<th>P1 – P3</th>
<th>P4 – P6</th>
<th>S1 – S3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>285-356 hours</td>
<td>285-356 hours</td>
<td>276-413 hours</td>
</tr>
<tr>
<td></td>
<td>(12-15%)</td>
<td>(12-15%)</td>
<td>(10-15%)</td>
</tr>
</tbody>
</table>

### Personal, Social and Humanities

<table>
<thead>
<tr>
<th>P1 – P3</th>
<th>P4 – P6</th>
<th>S1 – S3</th>
</tr>
</thead>
<tbody>
<tr>
<td>276-413 hours</td>
<td>276-413 hours</td>
<td>2534 hours</td>
</tr>
<tr>
<td>(10-15%)</td>
<td>(10-15%)</td>
<td>(92%)</td>
</tr>
</tbody>
</table>

### Technology

<table>
<thead>
<tr>
<th>P1 – P3</th>
<th>P4 – P6</th>
<th>S1 – S3</th>
</tr>
</thead>
<tbody>
<tr>
<td>220-413 hours</td>
<td>220-276 hours</td>
<td>2534 hours</td>
</tr>
<tr>
<td>(8-15%)</td>
<td>(8-10%)</td>
<td>(92%)</td>
</tr>
</tbody>
</table>

### Art

<table>
<thead>
<tr>
<th>P1 – P3</th>
<th>P4 – P6</th>
<th>S1 – S3</th>
</tr>
</thead>
<tbody>
<tr>
<td>238-356 hours</td>
<td>238-356 hours</td>
<td>238-356 hours</td>
</tr>
<tr>
<td>(10-15%)</td>
<td>(10-15%)</td>
<td>(8-15%)</td>
</tr>
</tbody>
</table>

### Physical Education

<table>
<thead>
<tr>
<th>P1 – P3</th>
<th>P4 – P6</th>
<th>S1 – S3</th>
</tr>
</thead>
<tbody>
<tr>
<td>119-190 hours</td>
<td>119-190 hours</td>
<td>138-220 hours</td>
</tr>
<tr>
<td>(5-8%)</td>
<td>(5-8%)</td>
<td>(5-8%)</td>
</tr>
</tbody>
</table>

### Sub-total of the lower range of lesson hours over three years

<table>
<thead>
<tr>
<th>P1 – P3</th>
<th>P4 – P6</th>
<th>S1 – S3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925 hours</td>
<td>1925 hours</td>
<td>2534 hours</td>
</tr>
<tr>
<td>(81%)</td>
<td>(81%)</td>
<td>(92%)</td>
</tr>
</tbody>
</table>

### Flexibility

<table>
<thead>
<tr>
<th>Flexibility</th>
<th>P1 – P3</th>
<th>P4 – P6</th>
<th>S1 – S3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility</td>
<td>19% (about 451 hours over three years)</td>
<td>19% (about 451 hours over three years)</td>
<td>8% (about 220 hours over three years)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flexibility</th>
<th>P1 – P3</th>
<th>P4 – P6</th>
<th>S1 – S3</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Moral and Civic Education/Guidance to complement values education across KLAs</td>
<td>19% (about 451 hours over three years)</td>
<td>19% (about 451 hours over three years)</td>
<td>8% (about 220 hours over three years)</td>
</tr>
<tr>
<td>– Additional common reading time</td>
<td>19% (about 451 hours over three years)</td>
<td>19% (about 451 hours over three years)</td>
<td>8% (about 220 hours over three years)</td>
</tr>
<tr>
<td>– School assembly/Class teacher period to complement values education across KLAs</td>
<td>19% (about 451 hours over three years)</td>
<td>19% (about 451 hours over three years)</td>
<td>8% (about 220 hours over three years)</td>
</tr>
<tr>
<td>– Remedial or enhancement studies in KLA(s) or across KLA(s)</td>
<td>19% (about 451 hours over three years)</td>
<td>19% (about 451 hours over three years)</td>
<td>8% (about 220 hours over three years)</td>
</tr>
<tr>
<td>– Other broadening learning experiences such as community service, co-curricular activities to complement life-wide learning</td>
<td>19% (about 451 hours over three years)</td>
<td>19% (about 451 hours over three years)</td>
<td>8% (about 220 hours over three years)</td>
</tr>
</tbody>
</table>

### Total number of lesson hours over three years

<table>
<thead>
<tr>
<th>P1 – P3</th>
<th>P4 – P6</th>
<th>S1 – S3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2376 hours</td>
<td>2376 hours</td>
<td>2754 hours</td>
</tr>
<tr>
<td>792 hours x 3</td>
<td>792 hours x 3</td>
<td>918 hours x 3</td>
</tr>
<tr>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Adapted from CDC (2002), Booklet 2, 6-8.

**Senior Secondary:**

The senior secondary curriculum was reformed extensively in 2007, moving away from the British system. It now emphasizes: students' capacity for self-directed and life-long learning by incorporating independent learning and generic skills into all subjects; reinforcing communication, critical thinking and creativity; ensuring progression to students' chosen pathway; articulating to tertiary institutions and employment; avoiding offering too many subjects with duplication possibilities; and enshrining cross-curricular elements to ensure curriculum coherence (CDC 2014).
This included the implementation of school-based assessment in all 24 subjects of the new curriculum (see below) (HKEAA, 2011). Core subjects of Chinese, English, mathematics and liberal studies now define senior secondary experiences. Suggested lesson time has been as found below. The short term phase of the *New Academic Structures Review* has made a number of recommendations about flexibility in lesson time, for example, recommending 2,400 +/- hours as the range of total lesson time.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Suggested Time Allocation</th>
<th>Compulsory</th>
<th>Elective</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chinese</strong></td>
<td>12.5 – 15% (338 – 405 hours)</td>
<td>67 – 75% of total (225 – 304 hours)</td>
<td>25 – 33% of total (85 – 135 hours) Two to four elective modules chosen from ten proposed modules (a self-designed module can be one of them)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nine Strands: Reading, Writing, Listening, Speaking, Literature</td>
<td>Approximate 25% (approximately 100 hours)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moral and Affection, Chinese culture, Thinking, Independent Language Learning</td>
<td>32 – 36 hours per module</td>
</tr>
<tr>
<td><strong>English</strong></td>
<td>12.5 – 15% (338 – 405 hours)</td>
<td>Up to 75% (approximately 305 hours) Three strands Interpersonal Knowledge Experience Nine suggested modules comprising 19 units</td>
<td>About 25% (approximately 100 hours) Three elective modules chosen from two groups Language Arts, Non-Language Arts, and at least one module from each group</td>
</tr>
<tr>
<td><strong>Mathematics</strong></td>
<td>10 – 12.5% (270-338 hours) for the compulsory part 15% (405 hours) for the compulsory part with one foundation module from the extended part</td>
<td>Three strands Numbers and algebra, Measures, shape and space Data handling Categorized into foundation topics and non-foundation topics</td>
<td>One of two modules Calculus and Statistics Algebra and Calculus</td>
</tr>
<tr>
<td><strong>Liberal Studies</strong></td>
<td>Minimum 10% (270 hours)</td>
<td>Six modules (30 hours each) Personal and interpersonal relationships Hong Kong today Modern China Globalization</td>
<td>Independent Enquiry Study (90 hours) Suggested themes include Media Education Religion Sports Art</td>
</tr>
</tbody>
</table>
Public health  
Energy and the environment  
Information and communication technology (ICT)

<table>
<thead>
<tr>
<th>Total Core Subject Time Allocation</th>
<th>45 – 52.5% of curriculum time</th>
</tr>
</thead>
</table>

| Elective subjects (students take two or three – and up to eight) | Chinese Literature  
Literature in English  
Chinese History  
Economics  
Ethics and Religious studies  
Geography  
History  
Tourism and Hospitality studies  
Biology  
Chemistry  
Physics  
Science  
Business, Accounting and Financial studies  
Design and Applied Technology  
Health Management and Social Care  
Technology and Living  
Information and Communication Technology (ICT)  
Music  
Visual Arts  
Physical Education  
Modern Foreign Languages |
|-----------------------------------|-------------------------------|

| Applied Learning subject categories | Applied Science  
Business, Management and Law  
Creative studies  
Engineering and Production  
Media and Communication services |
|-----------------------------------|-------------------------------|

(adapted from CDC 2014)

**Language of instruction**

The medium of instruction for most of the local schools in Hong Kong is Cantonese. While most of the local secondary schools changed their medium of instruction to Cantonese in 1997, many schools have gone back to the English medium of Instruction (EMI). In 2013, 112 out of 400 secondary schools were EMI (ITS 2013).

However, the government maintains a policy of “mother tongue instruction” in which the medium of instruction is Cantonese, with written Chinese and English. In secondary schools, “biliterate and trilingual” proficiency is emphasized, and Mandarin/Putonghua language education has been increasing (Li & Pinna 2013).
Assessment processes

Assessment for learning

A central plank in the 2001 learning to learn program is assessment for learning (AfL). The CDC (2001) recommended the following ways of carrying out AfL in schools:

- diversifying assessment modes, reducing tests and examinations
- providing opportunities for teachers to carry out assessment collaboratively with students, encouraging students to do peer and/or self-assessment
- sharing learning goals with students so that they are completely familiar with expected standards
- shifting the emphasis of assessment from memorization to understanding, higher order thinking skills and creativity.

A 2006 case-study of three schools (Yu, Kennedy, Fok, & Chan 2006) showed that schools still maintained testing and examinations regimes, but that they had shifted assessment strategies from memorization, for example through dictation, and gradually introduced AfL strategies such as project learning, self and peer evaluation. There were differences in how deeply the AfL strategies had taken hold, however.

Leung (2008) found that Project Learning’s interdisciplinary approach augmented subject specific learning, helped develop generic skills, reinforced student-parent and student teacher relationships and supported the “all round development” of students. He warned, however, that teachers had concerns about the implementation of Project Learning, which demands on-going collaboration among teachers and the refocusing of their pedagogical approaches. Not surprisingly, he recommended enhanced professional development, more collaboration among schools and universities and the development of resources for teachers.

Carless (2011) upon reviewing the literature on AfL in Hong Kong schools, sees the main obstacles to entrenchment of AfL in Hong Kong schools as: deeply held views that assessment should be summative and competitive; a focus on performance rather than mastery; and teachers’ “limited understandings of and sympathies for” AfL (p. 89). However, Carless and Lam (2014) found that some successful formative assessment could be carried out, if it did not conflict with the emphasis on summative assessment, that is, “formative assessment strategies embedded within a cycle of test preparation, testing and test follow-up” (168).

School-based assessment

School-based assessment is being introduced in Hong Kong to serve two purposes – assessment and reviewing – placing much greater emphasis than in the past on formative
assessment. Prior to implementation extensive reviews, research, trialling and public consultations were carried out (Barley 2013). Teacher assessment carries 20% of overall marks for each subject in senior secondary programs. Implementation of school based assessment is being phased in, starting in 2012 for liberal studies, Chinese, English, Chinese history, design and applied technology, history, ICT and visual arts. The practical (laboratory) components in the sciences (biology, chemistry and physics) were implemented starting in 2012 and 2013 with full implementation in 2014. Other subjects due for full implementation in 2014 are Chinese literature, English literature, geography, economics, ethics and religious studies, health management and social care, technology and living, tourism and hospitality studies and physical education. Music has been deferred to 2015 and mathematics and business, accounting and financial studies will be fully implemented in 2016. During the transition phase the curriculum for each subject remains unchanged, but schools are expected to carry out school based assessment activities suggested in curriculum guides (HKEAA 2007).

According to Barley (2013) the Hong Kong education authorities view formative assessment as a crucial element of teaching and learning, feedback from which allows both teachers and students to identify students’ strengths and weaknesses, encouraging continual improvement and confidence building. Research into SBA’s effects has shown improvements in students’ public oral examinations as well as absentee rates. But it has not been an unalloyed success. The Hong Kong Professional Teachers’ Union reported in 2013 that SBA had greatly increased both teachers’ and students’ workload, with teachers carrying out additional lessons and spending additional time marking students’ work. Surveyed teachers were suspicious that final marks for senior secondary might be adjusted when SBA results were aggregated with external assessment, especially if students did very well on the internal components or if the HKEAA suspected widespread teacher leniency. Another problem, which is certainly not confined to Hong Kong, is that students are tempted to short-cut their workload by cutting and pasting information from the internet, sometimes resulting in plagiarism. When plagiarism is suspected teachers must spend time cross checking references.

Barley conducted a survey of stakeholders including principals and teachers in which only about 50-65% of respondents agreed with the statements, “SBA enables students/me to have a better understanding of their own strengths and weaknesses” and “SBA enables students to demonstrate their ability in areas which cannot be assessed in public examinations” and “I support school-based assessment because it enables me to give feedback to students frequently” (Barley 2013, p 34). On the positive side, teachers felt confident in their ability to design effective tasks and were able to implement SBA relatively smoothly.

Examinations and certification

Examinations have long been a focus of attention in China in any attempt to reform education. Teachers in secondary schools tend to concentrate on examination syllabuses and examination preparation. In some cases non-examined subjects are removed from the timetable. Students spend long hours in school preparing for examinations and often continue to do so on weekends in special examination preparation classes. Nationally, the policy thrust is to move away from
this examinations orientation, but with limited success. As discussed above, Hong Kong has tried to ameliorate these tendencies by introducing AfL and school-based assessment.

Hong Kong has also tried to move away from excessive examination orientation by cutting down on the number of examinations students take, most notably abolishing the examinations at the end of primary and lower secondary. Allocation to secondary school is no longer based on examinations in Primary 6 although there is an optional pre-secondary 1 attainment test; it should be noted, however, that schools can develop their own criteria for entrance, and gaining admission into a top ranked secondary school is highly competitive. Students in Secondary 4-6 prepare for the one still existing set of tests that culminate in the HKDSE, the examinations for which are held at the end of Secondary 6.

The new HKDSE examinations replaced the Hong Kong Certificate of Education Examination (HKCEE) and the Hong Kong Advanced Level Examination in 2012. Students in the last year of senior secondary school take examinations in the four core subjects of Chinese, English, mathematics and liberal studies plus, typically, two or three other subjects (see subjects on offer above). This last category consists of three types of subjects: 20 elective subjects (Category A), 30 applied learning subjects (Category B) (a provisional list was published in 2009) and six other language subjects (Category C). Candidates may, if they choose, take up to eight examinations in addition to the compulsory ones; these candidates must take at least one examination in each of the three categories. The Category A examinations are standards-based (that is, they have set and explicit performance standards) and reported out at levels 1 to 5, with 5 being the highest and a 5* and 5** grade available for the highest achievers. For each level there is a description of typical (mid-range) performance. Decisions about cut-scores are made using a combination of human judgement and statistical evidence. The 5** and 5* cut scores are determined by cut score for level 5, with the former going to the top 10% of level 5 candidates and the latter to the next 30%. The Category B subjects are graded attained and attained with distinction, and category C subjects are conducted under the auspices of Cambridge International Examinations and are graded A (highest) to E. Results are reported out on an HKDSE certificate with SBA results aggregated with examination results rather than separately reported (HKEAA 2011).

Language papers use a variety of question types. The reading paper consists of multiple choice questions (MCQ) and short answer questions; the writing paper is essay based; the listening paper is a combination of MCQ, short answer and essay. Liberal studies papers’ questions are all open-ended, some of which are short answer. There are two mathematics papers one of which is entirely MCQs the other of which is entirely open-ended.

International school students do not have to take local public examinations and many pursue the International Baccalaureate (IB) or home-country specific curricula and assessments. Some direct subsidy schools offer the IB and/or UK GCSEs and A levels, especially if their student cohort is aiming to study at universities abroad. Students also sometimes take the US SAT or IELTS in order to gain entry to an overseas university (ITS 2013).
**Territory-wide System Assessment**

The Territory-wide System Assessment (TSA) is a series of tests of basic competency administered to each school at Primary 3 and 6 and Secondary 3. They provide schools with objective data on students’ performances in Chinese language, English language and mathematics. The TSA reports and school reports provide information about students’ strengths and weaknesses against specific basic competencies and KLAs. The outcomes of the tests are meant to aid schools and teachers in their teaching and learning plans. The territory-wide data are used by the government to review policies and to provide focused support to schools (HKEAA 2014b).

Moderation Committees produce assessment blueprints, ensuring that KLAs and basic competencies are all covered. The Committees consists of tertiary academics, EDB curriculum officers, HKEAA subject managers and serving teachers. After draft tests are produced the Committees quality-assure the process by reviewing and endorsing the items (HKEAA 2014a).

Primary students in Years 3 and 6 take visual and oral assessments in Chinese and English as well as written assessments in Chinese and English reading, listening and writing and mathematics. Test length is around 40 to 45 minutes for the younger children and about an hour for the older ones. Although all students participate in these tests, each student only takes a sample from the full paper, and schools can apply for exemptions for those with SEN. The stakes are low for individual students, with reports are generated at the school level. The tests’ purpose is to assess basic competency in critical curriculum areas. The mathematical concepts covered are i) number, ii) measures, iii) shape & space, iv) data handling and v) algebra (Primary 6 only). Access to the data is restricted to the schools and the government only.

Language tests consist primarily of multiple choice, filling in the blanks and sequencing, with some extended writing. The mathematics tests are a combination of multiple choice and open-ended items, the latter generally involving one word or number (HKEAA 2014b).

For secondary the method is again sampling in each school for Secondary 3. Students take reading, writing and listening examinations in Chinese and English and a mathematics examination. Test length is longer than for primary, with 30 minutes for the reading test, 40 minutes for the writing test, 25 minutes for the listening test and 65 minutes for the mathematics test. The reading test consists of multiple choice items, the writing test consists of one essay question of 150 words, the listening test consists of multiple choice and fill-in (one word) items, the mathematics test is a combination of multiple choice and open-ended problems. The last covers number and algebra, measures, shape and space and data handling (HKEAA 2014a).

The EDB is keen to stress that these tests are for internal use only and make it clear that comparisons on the performance among schools and students should not be made and that access to data is restricted, with schools following a strict protocol to avoid information misuse (HKEAA 2014a). However, Carless (2011) argues that while the tests are ostensibly there to help teachers diagnose students’ strengths and weaknesses and provide support accordingly, that is, low stakes, schools and teachers actually perceive of them as high stakes because
school outcomes are reported introducing an accountability element. Teachers duly focus therefore on the statistics and methods for raising test scores rather than using feedback formatively.

**International testing**

<table>
<thead>
<tr>
<th>PISA 2012</th>
<th>Score²</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>
<tbody>
<tr>
<td>Mathematical Literacy</td>
<td>561</td>
<td>3rd of 65</td>
<td>302 points</td>
<td>9%</td>
<td>34%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OECD = 302</td>
<td>OECD = 23%</td>
<td>OECD = 13%</td>
</tr>
<tr>
<td>Reading</td>
<td>545</td>
<td>2nd of 65</td>
<td>281</td>
<td>7%</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OECD = 310</td>
<td>OECD = 18%</td>
<td>OECD = 8%</td>
</tr>
<tr>
<td>Scientific Literacy</td>
<td>555</td>
<td>2nd of 65</td>
<td>276</td>
<td>6%</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OECD = 304</td>
<td>OECD = 18%</td>
<td>OECD = 8%</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>540</td>
<td>5th of 44</td>
<td></td>
<td>10%</td>
<td>19%</td>
</tr>
</tbody>
</table>

China does not participate as a separate country in PISA. Instead the jurisdictions of Hong Kong, Macau and Shanghai participate separately. The points differences between Hong Kong’s 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 lower than the OECD average. Between 2003 and 2012, mathematics performance in PISA increased by 11 points, between 2000 and 2012 reading increased by 20 points and between 2006 and 2012 science increased by 13 points³. Around 9% of participants in the 2009 PISA tests were top scorers across all three subjects (international average is about 4%). In the 2012 problem solving test 80% of top performers were also top performers in mathematics; the other subjects were just under 50% (OECD 2014b; OECD 2013a; OECD 2013b).

**PIRLS and TIMSS 2011**

² Although PIRLS, 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 PIRLS does not equal coming in 4th in PISA.

³ As a rule of thumb, the OECD equates 40 points with one year of schooling.
<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><strong>PIRLS 4\textsuperscript{th} grade</strong></td>
<td>571</td>
<td>1st of 45</td>
<td>18%</td>
<td>99%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>International Median = 8%</td>
<td>International Median = 95%</td>
</tr>
<tr>
<td><strong>TIMSS math 4\textsuperscript{th} grade</strong></td>
<td>602</td>
<td>3rd of 57</td>
<td>37%</td>
<td>97%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>International Median = 4%</td>
<td>International Median = 90%</td>
</tr>
<tr>
<td><strong>TIMSS math 8\textsuperscript{th} grade</strong></td>
<td>586</td>
<td>4th of 56</td>
<td>34%</td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>International Median = 3%</td>
<td>International Median = 75%</td>
</tr>
<tr>
<td><strong>TIMSS science 4\textsuperscript{th} grade</strong></td>
<td>535</td>
<td>12th of 57</td>
<td>9%</td>
<td>96%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>International Median = 5%</td>
<td>International Median = 92%</td>
</tr>
<tr>
<td><strong>TIMSS science 8\textsuperscript{th} grade</strong></td>
<td>535</td>
<td>12th of 56</td>
<td>9%</td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>International Median = 4%</td>
<td>International Median = 79%</td>
</tr>
</tbody>
</table>

Hong Kong’s average score in PIRLS increased between 2001 and 2011 by 43 points. Participants did better on informational than on literary reading. Between 1995 and 2011 Hong Kong’s average score in TIMSS 4\textsuperscript{th} grade mathematics has increased by 45 points, in 8\textsuperscript{th} grade mathematics by 17 points, in 4\textsuperscript{th} grade science by 27 points and in 8\textsuperscript{th} grade science by 25 points (Martin et al 2013; Mullis et al 2013 [PIRLS]; Mullis et al 2013 [TIMSS]).

**Detailed analysis of curriculum**

*Primary: Chinese language*

*Some notes on learning Chinese:*

The basic graphic unit in Chinese is a character. Each character represents a syllable and a morpheme, the smallest unit of meaning. There are about 4,600 to 4,900 commonly used Chinese characters in Hong Kong. Students in Hong Kong encountered about 1,300 new Chinese characters in Primary 1, around 36% of all the new Chinese characters they are to learn in elementary grades (Chung & Leung 2008). Many words in Chinese are formed by combining different morphemes, (for example, “foot-ball,” “basket-ball,” “hand-ball,” etc.), and we may derive the meaning of the whole word from its constituent morphemes. Given the
characteristics of large number of homophones and word compounding in Chinese, awareness of morphemes is particularly important in learning to read Chinese.

About 80% to 90% of Chinese characters are ideophonic compounds, each comprising a semantic and a phonetic component (stroke-pattern known as “radical”). In general, the semantic radical in a Chinese character signifies the semantic category of the character. Around 33% of the semantic-phonetic compound characters encountered by Primary 1 students in Hong Kong are transparent (for example, the character “mother” with the semantic radical “female”), 22% were semi-transparent (for example, the character “decay” with the semantic radical “plant”), and 30% were opaque (for example, the character “increase” with the semantic radical “soil”) (Yeung, Ho, Chik, Lo, Luan, Chan & Chung 2011).

The sound of a Chinese character can be derived directly from its phonetic radical or indirectly by making an analogy with other characters having the same phonetic radical. Overall, semantic radicals are functionally more reliable than phonetic ones.

Because the Chinese writing system represents sound and meaning differently from alphabetic languages, the kind of skills that are important to learning to read and write Chinese words are expected to be different from those found in alphabetic languages. Where students learning to read alphabetic languages have to pay attention to the regularities of letter combination, students learning to read Chinese need to be sensitive to the regularities of character structure and the ortho-semantic and ortho-phonological regularities of the radicals (Yeung, Ho, Chik, Lo, Luan, Chan & Chung, 2011).

Chinese character is simultaneously a visual whole, a syllabic unit, and a morpheme, which contrasts with the units of writing in alphabetic scripts, letters that indicate sound only and have no dovetailed relation with meaning. The script-sound-meaning convergence of the Chinese character can facilitate the process of understanding and retrieval of the meaning of multi-character words since the component morphemes of multi-character Chinese words provide meaningful cues. Knowledge of morphemes allows students to have an educated guess when they encounter unfamiliar words in isolation or in a passage (McBride-Chang, Shu, Zhou, Wat, & Wagner 2003).

In the Chinese language, the written form (Modern Standard written Chinese) is almost consistent, whereas there are more than 240 dialects spoken in China. It has been found that the linkage of oral language and literacy skills become weaker when the discrepancy between oral language and written language increases. Cantonese, the Chinese dialect spoken by the majority of Chinese in Hong Kong, differs in significant ways from Modern Standard written Chinese in both vocabulary and syntax (Yeung, Ho, Chik, Lo, Luan, Chan & Chung, 2011).

There are six reading-related skills considered to form the basis of reading comprehension in Chinese: phonological awareness, rapid naming, orthographic skills, morphological awareness, listening comprehension and syntactic skills.
**Orientation:**
The Chinese language is the main tool of communication for all Chinese. Therefore reading, writing, speaking and listening are important skills for every student.

The primary phase seeks to see all students learn correct, fluent and appropriate language skills that meet the needs of life, study and work. It aims to inculcate good habits of reading and writing that will see the student well equipped into adulthood. Students should be able to use a variety of strategies to support all their reading, writing, speaking and listening needs.

**Coherence and Clarity:**
In the absence of a breakdown that examines the curriculum for each grade, the points below refer to the entire phase of primary education.

**Scope:**
The primary curriculum (Primary 1 – 6) sets out a series of skills that need to be covered across the years in this phase of education. All of these skills are addressed throughout the student’s time at school with a gradient of demand and expectations as they progress.

The key objectives for the phase are as follows:

- students should learn the formation of Chinese characters
- students need to master the different styles of writing needed for further study
- students need to be able to understand the different tones\(^4\) of speaking and listening and differentiate their meanings
- students need to understand the meanings of common words, phrases and sentences and the use of different types of speech such as questions, interrogatives, conjunctions and negatives
- students need to understand and use punctuation properly
- students should be able to use aids to understanding such as dictionaries.

**Speaking:**
Students should be able to understand a range of different types of speaking style, including narrative, argument, discussion, report and poetry.

Speaking competencies include:

- being able to determine good content and style, be able to express what they mean and be able to adjust their style of speech and use appropriate styles of speech according to their audience
- being able to organize their speaking, understand how to speak according to themes and structure, and understand how to start and finish their speaking
- being able to speak clearly, use proper tones in Cantonese and correctly phrase commands and questions. The use of tones should be natural and flexible, pace and

\(^4\) Each written character may have up to four different tones in speech, will change the characters meaning.
volume should be appropriate to the audience. Students should be able to use colloquial words and phrases as well as more formal speech as appropriate

- being able to associate speech with life experience, to think before they speak and be able to speak for different contexts
- being able to utilize body language and gesture in appropriate ways
- being able to use visual aids appropriately for example, pictures, diagrams and illustrations.

Students need to learn good speaking habits including the ability to make a speech, take part in a discussion and to report on others’ opinions both politely and cordially.

**Listening:**
Students need to be able to understand different speech styles including oral instructions, stories and literature, poetry, broadcast media, reports, debate and argument. They need to understand the different genres of speech including speech used in daily life, in science and technology, history and literature.

Students need to be able to identify the key information contained in a speech as well as the feeling and emotions and any symbolism used.

At a higher level, students should be able to distinguish different opinions represented in speech and to identify and understand the arguments used.

**Analysis and Synthesis:**
Using skills of analysis and synthesis students should be able to distinguish between facts and opinions and the meaning behind different arguments, and analyze and understand connections and compare arguments and evaluate debate and distinguish between rights and wrongs.

**Exploration and innovation:**
Students should be able to understand the underlying meanings in speech and make associations with new meanings. Students should understand the use of audio-visual media to enhance meaning (for example, illustrations, audio, television or internet links). Students should use their own experiences and relate it to speech content, be able to appreciate and understand the use of body language such as facial nods, gestures and eye contact.

**Writing:**
Students should learn to write in a range of different modes, such as narrative, poetry, storytelling and functional writing such as writing cards, notes, letters and reports.

Writing competencies include:

- being able to write common words with pen and brush
- being able to write with the correct posture
- being able to decide on the correct purpose content and style of writing, the use of narration, description etc.
• being able to organize their writing by choosing material and arranging the structural elements; they need to understand how to start and close their writing
• students should be able to use a range of writing styles including formal, colloquial and writing from life experience; they should understand how to write using different tones, to be able to use rhetorical devices and to punctuate properly
• students should understand how to revise and improve their writing.

When reaching higher levels of learning, students should be able to write in different styles and include feelings and emotions, use examples, comparisons, classifications and argue cogently. Students should be able to write in a range of functional styles as appropriate and produce literary writing.

Students should be able to utilize their life experience in their writing, organize and plan their writing and use comparison and classifications. They should learn how to integrate illustrations and other resources to enhance their writing.

Students should build the habit of writing carefully and accurately, to appreciate the writing of others, to share thoughts on writers and to have the confidence to try different styles of writing and have mastery of a range of writing equipment.

Reading:
Students need to be able to read a variety of materials including narrative, description, storytelling and poetry. They also need to be able to read a variety of genres, including textbooks, newspapers, internet and web content, poems, stories, folk tales and functional reading – notices, posters, reports, advertising, diaries.

Reading competencies include:

• understand the common Chinese characters, shape, tone and meaning
• understand common sentences, paragraphs use of direct speech
• understanding ‘old style’ classical Chinese characters (i.e. Wenyanwen rather than Modern Standard written Chinese)
• students should be able to analyze and synthesize the meaning of paragraphs, understand their organization and the purpose of the text
• they should be able to evaluate the characters of the text.

Exploration and Creativity:
Students should be able to judge the implicit opinions and attitudes of the text, learn an appreciation of good language and understand the use of illustration and audio-visual materials.

Reading strategies:
Students should be able to associate their own experiences with the materials they are reading. They should be able to read silently, or aloud. They need to learn how to read intensively, the skills of skimming and scanning and looking for key words and phrases. Students should develop an interest in enjoying reading, should be encouraged to make reading a habitual activity, to make use of libraries and museums, to exchange ideas after reading.
Reading should be combined with the other skills of writing, speaking and listening in an integrated manner.

*Levels of Demand:*
From the point of view of a primary English curriculum, this curriculum looks quite demanding.

*Progression:*
Primary 1 – 6 encompass a smooth accumulation of the skills and abilities described above.

*Assessment:*
Territory-wide assessment in Primary 3 and 6 is described above. In addition, there are guidance notes for how to assess Chinese language skills.

The Ministry website recommends that assessment should be though multiple processes, which might include writing, observation, discussion and be conducted by teachers, peers or parents.

Assessment should be comprehensive and not just be done by means of a written test. Assessment should include the process of study as well as the final output, should take account of learning differences, have multiple participation, should include feedback for students and be appropriate in quantity and demand.

Assessment should be objective, judge performance and include evaluation. Feedback should be effective and assist students to improve their performance in the future. Teachers should take note of assessments and adjust their future teaching strategies and parents need to understand the process and use it to support both students and their teachers in the future.

This as an endorsement of assessment for learning as well as assessment of learning.

*Key competencies:*
The curriculum aims to see primary students train in all four skills – reading, writing, speaking and listening. The focus of studying is the competence in these four skills and the relationship between them. Chinese culture and moral values should also be embedded within the content of the material studied. Students should learn to self study the four skills of Chinese and develop a keen interest in the language and develop good habits in how they use it.

*Primary: Mathematics*

Mathematics is identified as a Key Learning Area (KLA) within the Hong Kong school curriculum. Information about KLAs states that mathematics is necessary for every individual if they are to contribute towards the prosperity of Hong Kong. There are statements about mathematics pervading all aspects of everyday life. It is also seen as an essential part of the school curriculum in Hong Kong, both as a means of communication, a tool for studying other subjects, a mode of thinking and a discipline through which students can develop their ability to think logically.
The various documents available, especially background documents, suggest a certain tension in the aims of teaching mathematics in Hong Kong as changes are made in the way the subject is taught.

**Coherence and Clarity:**
Learning targets are given for the end of Primary 3 and Primary 6. The implication is that detailed activities are available in text books.

**Scope:**
Only outline headings are provided in the curriculum framework. There is an implication in some of the documentation that the detail is provided through the textbooks. The framework of the mathematics curriculum consists of learning dimensions, generic skills and values and attitudes. The five learning dimensions at primary are:

- number
- algebra
- measures
- shape and space
- data handling.

The curriculum is divided into Key Stage 1 (Primary 1 to Primary 3) and Key Stage 2 (Primary 4 to Primary 6). The algebra dimension is not included at Key Stage 1. At each Key Stage, a table of learning targets is provided, followed by a more detailed table specifying learning units.

The learning targets at Key Stage 1 suggest broad coverage across the four learning dimensions, although the more detailed learning units make it clear that there is more content related to number than other aspects. The number work at this key stage involves working with numbers up to five digits. Students also add and subtract up to four digits, multiply up to single digit by two or three digit numbers and divide two or three digit numbers by single digit divisors. Students are expected to carry out mixed operations, including brackets and to have basic understanding of fractions including comparison. Shape and space content at this key stage includes 3D shapes such as prisms, pyramids, spheres and cones. Students also work with straight lines and curves and various 2D shapes. These include polygons, circles and various quadrilaterals and triangles. They also work with angles and parallel and perpendicular lines. The measuring work includes use of standard units for distance, time, mass and capacity. Students also work with money and tell the time to the minute as well as using twenty-four hour clocks. Data handling work at this key stage is about pictograms and block graphs.

At Key Stage 2, the number content is again considerable. The emphasis is on multiplication and division of larger numbers together with an understanding of multiples and factors including common multiples and common factors. Work on fractions includes equivalent fractions and the four operations with fractions. Students also work with decimals and progress to carrying out the four operations with decimals. They are introduced to percentages and convert between fractions, decimals and percentages. Students extend their knowledge of different types of
quadrilateral and also work on fitting and dissecting shapes and on symmetry. They work with 3D shapes, including prisms and pyramids, and use the language of vertices, edges, faces and sections. Students work with circles. Measuring work includes finding perimeter and circumference and area including area of parallelograms, trapeziums and polygons. They work with standard units of volume and capacity and with speed in metres per seconds or kilometres per hour. In data handling, students meet bar charts and broken line graphs. They calculate averages. Algebra is introduced at this key stage and that includes algebraic symbols and simple equations involving one or two steps to find a solution.

**Levels of Demand:**
The learning units for Key Stages 1 and 2 appear challenging, in both number, shape and space and measures, though less so for data handling. The introduction of formal algebra at Key Stage 2 is also of note.

One of the stated guiding principles of the Hong Kong curriculum is that all students can learn but they learn at different speeds. Elsewhere, it is stated that the issue of student diversities has been considered in the development of the mathematics curriculum at primary and secondary levels. It is then stated that at secondary level there is a distinction between core and extension work, but that no such distinction is made at primary level because most of the concepts are basic and fundamental.

**Progression:**
Progression between key stages is clear. It is less clear how students progress between grades, although tabulated information suggests that topics are revisited at a higher level.

**Assessment:**
Sample tests are provided for Primary 3 and Primary 6. They include coverage across the curriculum and generally match the targets for the end of each key stage. They appear quite challenging for the age groups specified and although those reaching the end of key stage targets should be able to answer correctly, there appear to be a relatively small number of questions for students not able to succeed at this level.

**Key competencies:**
Nine generic skills are stated and the expectation is that they should be embedded within the learning and teaching of mathematical concepts rather than be added on. The generic skills are:

- collaboration skills
- communication skills
- creativity
- critical thinking skills
- information technology skills
- numeracy skills
- problem solving skills
- self-management skills
• study skills.

For each of these, detail is given about what they might mean in mathematics. In some cases, the examples appear to apply across age groups, but there is progression between Key Stages 1, 2 and 3 for communication skills, critical thinking skills, information technology skills, numeracy skills, problem-solving skills and study skills.
**Primary: Science**

**Orientation:**
The aims, goals and rationale for science education reflect the emphasis throughout Curriculum Development Council documents on learning how to learn and learning for life. Aims for science education are aligned with the new aims for education for the 21st century that focus on enabling “students to enjoy learning”, enhance “their effectiveness in communication” and develop “their creativity and sense of commitment” (p5).

The key messages for science education are made explicit. Science education should promote “scientific literacy” and develop a combination of “scientific knowledge and understanding, process skills, attitudes and values for their personal development and for contributing towards a scientific and technological world” (p iii).

Priority is given in the *Guiding Principles for Action* on promoting learning dispositions associated with scientific inquiry, including fostering interest, scientific thinking, active learning and making informed judgements based on evidence.

This is reinforced by an emphasis in the overview of science as a Key Learning Area on the interrelationships among knowledge, skills, values and attitudes and the promotion of scientific literacy to enable students to “participate in public discourse” and “deal sensibly with problems.” The *Directions for Development* refer also to the need for students to “develop an understanding of the interconnections between science, technology and society.”

**Coherence and clarity:**
There is coherence between the aims of the science education, learning targets for each stage of education, the strands (the major learning elements in the science curriculum) and the teaching and learning approaches advocated. Strategies for Development set out in the introduction to the science curriculum provide recommendations and examples for “Nurturing interest in science”, “Emphasizing scientific thinking”, “Developing students to become active learners in science” and “Helping students to make informed judgements based on scientific evidence.” Recommendations seek to promote a more hands on approach to science education and more limited reliance on textbooks. Exemplar material provided also reflects an emphasis on inquiry and the opportunities for the promotion of generic skills within science education. Suggestions are provided for selecting learning and teaching resources coherent with the overarching aims and orientation of the science curriculum.

Learning objectives for primary science are set out in broad terms for Key Stage 1 (Primary 1-3) and Key Stage 2 (Primary 4-6) under the following headings: Scientific investigation, Life and Living, The Material World, Energy and Change, The Earth and Beyond and Science Technology and Society. These indicate clearly the themes to be addressed across each key stage. Specific goals within each strand or for each year group are not identified. Teachers
would need to do this in developing schemes of work and in assessing progress (as indicated in the exemplar materials).

**Scope:**
In the primary phase science is an integral part of the general studies curriculum alongside personal, social and humanities education and technology education. The major strands address key areas of knowledge and understanding common in primary science related to living things, materials and physical processes. Earth in space is included but not Earth sciences more generally. Reflecting the emphasis in the aims of the curriculum, Scientific Investigation and Science Technology and Society are presented as separate strands. Attitudes and values are integrated into the strands for example through references to curiosity and interest, working with peers, showing concern for the environment or the wise use and conservation of energy in everyday life. Throughout connections are made to everyday life, application and safety issues.

**Levels of demand:**
Objectives are expressed in broad terms so it is difficult to judge the level of demand. In the strands related to subject content, there is limited reference to key scientific concepts or terminology to be introduced. Students are generally expected to be able describe, identify, recognize patterns, phenomena and features of their environment. There is little specific emphasis on explanation or understanding. The strand for scientific investigation refers to interest, planning investigations and solving problems and recording and discussion observations and suggesting interpretations. There are no specific references in the objectives to raising questions, predicting or generating and evaluating ideas and explanations based on evidence. These processes are, however, represented to some extent in the exemplar materials for teachers, for example, related to feedback or the assessment of practical work and in the guidance of what to assess that refers to questioning, hypothesizing and predicting (p89).

**Progression:**
Some progression is evident from Key Stage 1 to Key Stage 2 in terms of the range and depth of subject matter to be addressed and a greater emphasis on patterns, relationships and applications. There is limited progression in the objectives related to scientific investigation. However in the appendices to the science education document, descriptors are provided of expected achievements for each key stage in relation to generic skills. Some of these are linked to inquiry skills and give a flavor of expectations in terms of progression.

**Assessment:**
Detailed guidance and support is provided in relation to assessment in science that underlines the importance of formative assessment in promoting active and lifelong learners. A range of assessment approaches is advocated including questioning, observation, assignments and projects as well as practical tasks and tests. These are illustrated in the exemplar materials for teachers.

Summative assessment is carried out at the end of the year and key stage.
**Key competencies:**
High priority is given to the development of generic skills throughout the documentation in particular communication skills, creativity, critical thinking and problem solving. The rich opportunities for the development of these skills in science education are highlighted and exemplified in the introduction to the document, the curriculum framework and appendices to the document.

**Secondary: Chinese language**

**Orientation:**
The language of instruction in Hong Kong is Cantonese. The four skills of reading, writing, speaking and listening are emphasized, together with a focus on the integration of mother tongue language study with other subjects.

**Assessment:**
The Hong Kong Diploma of Secondary Education (HKDSE) examination aims to measure the attainment of Secondary 6 students who have completed a three-year senior secondary curriculum.

There are 24 subjects under Category A, of which Chinese Language, English Language, Mathematics and Liberal Studies are core subjects.

School-based Assessment (SBA) refers to assessments administered in schools with students being assessed by their own subject teachers. All school candidates have to complete the SBA of the subjects concerned and the marks awarded are counted towards their results in the HKDSE Examination. To ensure the reliability and consistency of SBA results, the HKEAA moderates the marks submitted by different schools, either through statistical moderation or expert judgment. For most subjects, the moderation is conducted by statistical adjustments supplemented with sample review of students' work.

The upper secondary examination has an unusually strong emphasis on listening skills. In the examination studied two technical passages are read out, followed by 15 multiple choice questions. Students then watch a video, followed by 13 multiple choice questions. Reading is tested through a comprehension exercise, firstly a modern prose narrative, followed by a second piece, a more reflective passage about social integration, which includes elements of the classical *wen yang wen*. There are 24 multiple choice questions to be answered within 30 minutes. A third passage is from the *wen yang wen* tradition, with multiple choice questions relating to a technical understanding of the piece. A fourth passage, in modern Cantonese, has multiple choice questions relating to a detailed understanding. A written test (75 minutes) is around functional language use. In this example a conversation is used as the source. Students

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5 Unlike other curricular documents on the Hong Kong Education Bureau website, the documents pertaining to secondary Chinese language learning are in Chinese only.
must summarize the key points, and then create a poster to reflect the outcome of the conversation. A second piece of creative writing is to respond to the stimulus “a starting point.”

**Secondary: Mathematics**

**Orientation:**
The mathematics curriculum sets out its main goals as enabling students to cope confidently with the mathematics needed in a technology-oriented and information-rich society. Students should acquire the abilities to think critically and quantitatively, to appreciate and communicate mathematics, and to manipulate mathematical objects. The senior secondary curriculum restates the same goals as for younger years and adds an emphasis on inquiry and investigation and on integrating the mathematics they have learned.

The curriculum leads with an expression of the strengths of its previous versions and aims to improve without threatening this position. The stated strengths lie in computational skills and solving routine problems, while conceptual understanding and exploratory problems are areas to improve. Having a positive attitude to mathematics is also emphasized. The curriculum is described as an expression of shared values of parents and teachers (at lower grades) and mathematicians, professionals in mathematics education. Higher grades also benchmark against overseas mathematics curricula at the same level. The language of key stages and the strand titles recalls the historical link to the English curriculum.

The secondary curriculum presents mathematics as a subject that “all students should strive to learn” but includes some differentiation. Junior secondary students spend 13% of their lesson time on mathematics, and senior high students between 10 and 15% depending on electives. In both secondary stages the compulsory part is separated into foundation and non-foundation topics, and teachers have freedom to decide the suitability of teaching non-foundation topics for their students. The foundation topics are chosen to include essential basic knowledge and to cover topics from different, connected areas of mathematics. At senior secondary there is a choice between two additional “Extended Part” modules for students who will specialize in mathematically rich subjects at university.

**Coherence and Clarity:**
The secondary curriculum is presented in two sections: junior secondary, Key Stage 3 (KS3), is included with the primary grades and senior (grades S4-6) in a separate document. Each has detailed set of expectations that relate to content, a second set related to generic skills and a list related to values and attitudes. Teachers and schools are expected to weave these together into integrated programs and there is some exemplification, at Key Stage 3 only, of how this could be achieved.

The content is set out in grades S1-S3 for the key stage as a whole and not by grade. This is unusual in the sample. The material is organized into three strands that coalesce the five strands of the primary curriculum: number and algebra; measures, shape and space; data handling. Overall the data handling strand appears to have only about a 10-15% weighting, although none is explicitly given. The relationship between Learning Targets and Learning
Units is not clearly mapped. For example the number and algebra target *To interpret simple algebraic relations from numerical, symbolic and graphical perspectives* could be associated with any or all of six units (*Formulating Problems with Algebraic Language, Linear Equations in One Unknown, Linear Equations in Two Unknowns, Identities, Formulas, Linear Inequalities in One Unknown*). It would be extremely difficult to plan teaching from this document alone. However, there are references to the previous (1999) curriculum and it appears that the main changes are not in the Key Stage 3 content but in revisions to grades S4-6 and the introduction of the generic skills. In particular learning units have the same titles as in the 1999 national curriculum, where there is more detail of content objectives, foundation topics and time allocation. There is thus considerable continuity over time in junior secondary with recent changes directed at S4 to 6.

The content for grades S4-6 is set out by course and not by grade, and schools are able to vary the teaching hours for mathematics over the three grades as long as the compulsory foundation topics are covered. This again is an unusual arrangement in the sample. The compulsory part uses the same three junior strands, but the extended material in the two modules is organized into topics. Learning targets, units and objectives are given with accompanying remarks.

There is a discrepancy between the apparent foci of the targets and objectives, with the objectives phrased in terms of understanding and using abstract mathematical concepts and the targets incorporating the stated generic skills. For example, a compulsory target is to: *manipulate more complex algebraic expressions and relations and apply the knowledge and skills to formulate and solve real-life problems and justify the validity of the results obtained.* However, there are no further references or examples of real-life problems involving algebra. This is unlike the Canadian and US curricula, which integrate processes of representation, interpretation and modelling into the content specification. There is further evidence of this discrepancy in the use of any real-life context in examination questions, which is very varied: around 20% at S3, and at S3 is 10% and 50% for the two compulsory papers in the Diploma, nearly 75% for extended calculus and statistics, but minimal for calculus and algebra (for example, “a snowball in the shape of a sphere …”). Overall the emphasis and treatment of problem solving is not consistent from target to operational curriculum.

Both curriculum documents include advisory sections on curriculum planning, learning and teaching, resources, information technology and assessment. This advice is of two kinds. Firstly, it concerns schools’ and teachers’ freedom to order the learning units over the three grades within mathematically coherent constraints. (Each unit is to be taught as a block, omitting non-foundation topics as appropriate, but the order of units can be chosen). Secondly, the majority of the advice is aimed at widening the pedagogy from drill and practice to include direct instruction, inquiry learning and co-construction of knowledge. This meets the aims of the revised curriculum, although as stated above, these aims are not evident in the listing of objectives.

**Scope:**
Grades S1 to S3
The three strands, number and algebra; measures, shape and space; data handling have 8, 8 and 4 Learning Targets and 16, 14 and 4 Learning Units, respectively. Overall the data handling strand appears to have only about a 10-15% weighting. The 1999 national curriculum gives a minimum time allocation for learning units as 62 (in number); 100 (algebra); 65 (measures including trigonometry); 127 (geometry); 60 (data handling) compatible with this judgement.

For number and algebra, students are required to: calculate with directed numbers; estimate; approximate and find errors; manipulate surds; use percentages including repeated change problems; use rates and ratios; use algebraic expressions to describe patterns; simplify and factorise polynomials, use integer indices; solve linear equations in one and two unknowns; recognize identities, manipulate formulae; solve simple linear inequalities using a number line. These are all standard topics for this phase.

Two aspects are noticeable. First the learning unit organization suggests a mastery assumption in which topics are not revisited as such, only incorporated into later work. Secondly there is very little emphasis on different representations of linear relations, only algebraic expressions and infrequently graphs are used, not diagrams, tables or context or worded problems. In this aspect the curriculum lacks depth.

For measures, shape and space, students are required to estimate and find areas and volumes of shapes/solids involving polygons and circles including similar ones; analyze geometric transformations, congruence and similarity; use angle properties in parallel lines, triangles and quadrilaterals; present deductive proofs of related geometric problems; use Pythagoras’s theorem, sketch from 3D, plot figures in four quadrants and their images under transformation, find slopes and midpoints, use sine, tangent and cosine in right angled triangles and in bearings problems. The relatively long time (27 hours) spent on deductive proof problems is of interest here.

For data handling students are required to be aware of methods for collecting data, use simple diagrams to represent data; use theoretical and empirical probability understand measures of central tendency. Although shorter, this last unit includes demanding non-foundation objectives such as understanding the effect on the average of altering the data.

Grades S4-S6
In the compulsory part, the three strands, number and algebra; measures, shape and space; data handling have 6 Learning Targets each and 9, 4 and 4 Learning Units, respectively. There is a “Further Learning” section of two units designed to integrate and apply knowledge and skills learned in the other strands.

The topics in the compulsory part include (underlined topics are non-foundation and may be omitted):

- quadratic equations; functions including exponential, logarithmic and polynomial functions, their graphs, roots and intersections; direct and inverse variation; sequences and series; inequalities and linear programming
• shape and space: properties of circles, cyclic quadrilaterals and tangents; loci; coordinate equations of lines and circles; trigonometric graphs and equations. There is no explicit geometric proof in the foundation topics
• data handling: permutations and combinations; formal probability; measures of spread; uses of statistics
• further applications: exploring real-life and sophisticated problems.

The suggested time allocation for learning units is 122 for algebra (and this covers expressions, functions and graphs, no number); 35 (co-ordinate geometry and trigonometry); 30 (geometry); 43 (probability and statistics; 10 (further applications). Another 20 hours is allocated for inquiry and investigation to be spread throughout the course.

Algebra is the main emphasis of the compulsory curriculum and its assessment. The content is similar to that in other jurisdictions, so that most students will have met the same range of exponential, logarithmic and polynomial functions. Some of these are non-foundation topics, giving the possibility of a less demanding curriculum. There are very few questions on these non-foundation topics in the sample assessment materials for the Diploma Compulsory paper.

**Extended Part:**
Module 1 (calculus and statistics) is intended for students who will be involved in disciplines or careers that demand a deeper understanding of mathematics, and develops intuitive concepts of calculus and statistics. The content is in three strands with 10 hours allocated for inquiry and investigation to be spread throughout the course.

- foundation knowledge (10 hours): binomial expansion, exponential and logarithmic functions
- calculus (56 hours): concept of a derivative from first principles, differentiating functions (polynomial, rational, exponential and logarithmic but not trigonometric ones), rules, second derivative and applications; integration as antidifferentiation, as area and an explicit treatment of the Fundamental Theorem of Calculus (without proof), trapezium rule.
- statistics (59 hours): conditional probability, Bayes theorem; expectations and variance, binomial, geometric, poisson and normal distributions and their applications; sampling and confidence intervals for the sample mean and proportion.

This module revisits exponential and logarithmic functions from the compulsory course in more depth, and now they are central to the examination paper. The statistics content is demanding. The combination of statistics and calculus would give a good preparation for further study in economics, health care, civil engineering or biological sciences.

Module 2 (algebra and calculus) is designed for students who will be involved in mathematics-related fields and careers, and develops intuition and fluency in algebra and calculus for their
future studies and careers. The content is in three strands with 10 hours allocated for inquiry and investigation to be spread throughout the course:

- foundation knowledge (22 hours): surds, mathematical induction, binomial expansion, exponential and logarithmic functions, radians and double angle formulae, e as a number and a limit.
- calculus (67 hours): introduction to limits of a function (without proof), concept of a derivative, differentiating functions (polynomial, rational, exponential, logarithmic and trigonometric ones), rules, second derivative, and applications to equations of tangent and normal and curve sketching; integration as antidifferentiation, as the limit of a sum, and an explicit treatment of the Fundamental Theorem of Calculus, integration by parts, applications to area and volume of revolutions, trapezium rule.
- algebra (36 hours): systems of linear equations, 2x2 and 3x3 matrices, determinants and inverses. Matrix operations, vector operations and proofs. Vectors in \( \mathbb{R}^2 \) and \( \mathbb{R}^3 \) including vector and scalar product and applications to distance between skew lines, 2-D and 3-D problems.

This course meets all the requirements for a thorough preparation in the algebraic and calculus techniques needed for further study in mathematics, physical science or engineering.

Both the extended courses are extremely abstract in their approach and in their assessment. Despite the 10 hours allocated to inquiry, the overall impression is that the problems tackled are abstract and closed. In scientific/statistical contexts, the modelling has been done by others and what is required is a standard application of the mathematics, such as solving a given differential equation or finding the probability of an oversized package in a manufacturing process where errors are normally distributed. There is no content that is included to motivate or engage a wider range of students by demonstrating its relevance or by encouraging students’ own modelling skills.

**Levels of Demand:**
The level of demand overall in this curriculum is high. The two extended courses give a thorough grounding in abstract mathematics needed for university courses. The inclusion of calculus in both electives is unusual and provides a broader and stronger statistics-based course than some other countries. In the compulsory curriculum, the demand is similar to many other curricula studied, for example completing a study of linear functions by grade 10. This does suggest a step-change in demand for the students completing compulsory and extended courses.

Section 3 of the document suggests a range of ways of organizing the compulsory and elective courses over three years, some sequential but others including a taster of one or both electives in grade 10 alongside the compulsory part. There is a fair amount of flexibility in how the units can be taught, subject to a flowchart showing mathematical progression. This appears to meet a concern that students should be encouraged to study mathematics and not rule themselves out by an early choice.
This curriculum is also unusual in designating non-foundation topics that are in the compulsory course but may be omitted at teachers’ discretion. This reduces the demand considerably and these omissions would be problematic for students completing the extended modules. The Diploma examinations at the end of grade 12 predominantly address foundation topics. The two areas of significant progression from the territory wide examinations in S3 are the emphasis on algebra of quadratic expressions and inequalities, and the complexity of the open-response test questions, which typically involve several stages to reach answer. Thus although restricting the curriculum mainly to foundation topics reduces its scope, the difficulty of questions retains a high demand, especially as this is intended for all students.

**Progression:**
The curriculum is given in key stages, and progression between the two key stages is coherent, with the major change in demand being between compulsory and extended parts. There is still a change in overall focus, with the majority of the geometry being completed in S1-3, leaving only circle theorems for S4-6 (and radian measure for extended courses). The time previously given to geometry is used instead for reasoning symbolically and algebraic problem solving.

Progression between grades is left as a matter for the schools and teachers to determine. There is guidance in the form of flowcharts to show dependent topics. There is also some near-overlap (for example, in the study of exponential and logarithmic functions) that suggests revisiting topics between compulsory and extended courses. Otherwise, teachers are free to develop progression based on students’ cognitive development and their prior knowledge, abilities and inclinations.

One significant issue in progression in this curriculum is whether schools actually offer or encourage students to follow the extended part. Choi, Lam & Wong (2013) suggest that state schools vary and may offer one, both or neither extended module, depending on teacher expertise, the student cohort’s academic profile, parental pressure and school leadership. One reason for lack of take up is that extended part modules do not receive the same credits as other electives and thus are a supernumerary study load for students. The significance of this availability issue is that the more demanding modules may not be widely available. The compulsory curriculum may instead be a better benchmark.

**Assessment:**
Grade by grade assessment is carried out in schools. There is a territory wide assessment examination taken in S3 where students sit one of four papers that between them cover the learning objectives in the curriculum. The examination questions are either multiple choice, short answer-only or short, justified responses. They focus mainly on conceptual understanding of mathematical concepts, accurate techniques, and careful reading of mathematical instructions. Only about 20% of the questions involve real-life contexts and students are not required to choose between mathematical models.

The Diploma examinations in S6 have demanding papers: two for the compulsory module and one for each elective module. All papers are demanding. Even in the module taken by all students the questions may include distracting information. For example, this question is
relatively simple in that it uses Pythagoras’s theorem learned in Key Stage 3, but students have to decide to apply the theorem and then organize the given information appropriately:

20. In the figure, $AB = 1 \text{ cm}$, $BC = CD = DE = 2 \text{ cm}$ and $EF = 3 \text{ cm}$. Find the distance between $A$ and $F$ correct to the nearest 0.1 cm.

A. 7.2 cm  
B. 7.4 cm  
C. 8.0 cm  
D. 8.1 cm

The most demanding examination questions are written in solely algebraic terms, requiring application of formal rules to prove abstract statements. For example, this identity is written using a parameter $a$, and is to be proved without reference to the graphic interpretation which might for some be more intuitively obvious.

13. (a) Let $a > 0$ and $f(x)$ be a continuous function.

Prove that $\int_0^a f(x) \, dx = \int_0^a f(a - x) \, dx$.

Hence, prove that $\int_0^a f(x) \, dx = \frac{1}{2} \int_0^a [f(x) + f(a - x)] \, dx$.

A new feature of the curriculum from 2014 is the introduction of school-based assessments that contribute 15% to the mark for the compulsory part. Two tasks are specified, one for S5 and one for S6, which should be one task on mathematical investigation or problem-solving; and one task on data handling. These are designed to address the learning objectives in the curriculum, particularly those in the skills and attitude domains that cannot be readily assessed in external written examinations for various reasons.

Key competencies:
Nine generic skills have been identified: collaboration skills, communication skills, creativity, critical thinking skills, information technology skills, numeracy skills, problem-solving skills, self-management skills and study skills.

Each of these skills is set out separately for Key Stage 3 via three or four learning targets and examples of how it can be implemented in the content curriculum. It is notable that this cross-
referencing is detailed and specific to the key stage, and that there is progression in all targets between key stages.

From grades S4-6 each course has a further learning section that specifies only “various learning activities” through which students should discover and construct knowledge, and improve their “ability to inquire, communicate, reason and conceptualise mathematical concepts.” There is no further explanation in the accompanying documents. The new use of school-based assessment is a response to the invisibility of generic skills in the traditional examination questions.

**Secondary Science**

There is a clear and coherent educational rationale behind the curriculum. The educational philosophy appears to lean toward social efficiency – i.e. the effective social and economic functioning of the state in future, for example in the following statement:

...a broad knowledge base to enable our students to function effectively in a global and technological society such as Hong Kong’s.

However, there is balance to the educational rationale, with attention to whole-person development and preparation for lifelong learning. “Scientific literacy” is a key goal and there is much in the early sections of the curriculum documents and within the specified content and later material to support the valuable aim of educating critical and creative thinkers. The consideration of individual flourishing as a goal appears supported by fostering a “sense of wonder and curiosity about, the natural and technological world.”

The broad aims of the curriculum are stated as enabling students to:

- develop interest in, and maintain a sense of wonder and curiosity about, the natural and technological world
- acquire a broad and general understanding of key science ideas and explanatory frameworks of science, and appreciate how the ideas were developed and why they are valued
- appreciate and develop an understanding of the nature of scientific knowledge
- develop skills for making scientific inquiries
- develop the ability to think scientifically, critically and creatively, and to solve problems individually or collaboratively in science-related contexts
- use the language of science and communicate ideas and views on science-related issues
- make informed decisions and judgments about science-related issues
- be aware of the social, ethical, economic, environmental and technological implications of science and develop an attitude of responsible citizenship
- develop conceptual tools for thinking and making sense of the world.
The critical thinking and issues-based approach to science is often framed in terms of the economic outcome of education, for example in the use of the word “consumer” here:

There are many opportunities to reflect on issues and controversies in matters involving science and technology, and so become better informed and more sophisticated consumers of science-related information.

Another example is in the attention given to careers following a science education:

Possible post-secondary educational and careers pathways including Business Administration, Law, Dental Surgery, Risk Management Science, Actuarial Science, Information Engineering, Sports Sciences, etc.

The curriculum is well balanced, however, with respect to knowledge, skills, values and attitudes. Balance is explicitly stated:

- balance between breadth and depth
- balance between theoretical and applied learning
- balance between essential learning and a flexible and diversified curriculum.

“Learning how to learn” is a curriculum purpose. Scientific literacy is seen as providing “thinking tools.” Ultimately the conclusion on analysis is that this curriculum leans toward instrumental purposes (secure economic futures for Hong Kong).

*Integrated Science:*
The integrated science curriculum "serves to develop in students the scientific literacy essential for participating in a dynamically changing society and to support other aspects of learning across the school curriculum" (Integrated Science, p.2).

The integrated science curriculum aims to develop in students a broad and sound knowledge base to meet the challenges of living in a technologically advanced society. The curriculum adopts an interdisciplinary thematic approach.

The integrated science curriculum aims to empower students to be inquisitive, reflective and critical thinkers, by equipping them with a variety of ways of looking at the world and by emphasizing the importance of evidence in forming conclusions. It is believed that in a technologically advanced society, like Hong Kong’s, many people will find a knowledge and understanding of science concepts useful to their work and a competency in scientific inquiry of great value in creative problem solving in life (Integrated Science, p.3).

The unifying concepts of the integrated science curriculum are expressed in the following diagram:
Assessment:
The document, *Key Learning Area (KLA) Curriculum Guide (Primary 1 to Secondary 3), Science Education Schools*, provides guidance on assessment for junior secondary. It states that assessment is the practice of collecting evidence of progress in students’ learning. It is an integral part of the learning and teaching cycle. Assessment provides information for both teachers and students on the processes of and the improvement in learning and teaching. It is essential that assessment should be aligned to the processes of learning and teaching. School-based assessment, both of formative and summative nature, should be given due consideration.

Information about formative assessment is provided and states that formative assessment should be carried out on a continuous basis using different methods such as oral questioning, observation of students’ performance, assignments, project work, practical tests and written tests. It should be integrated with learning and teaching throughout the course with the purpose of promoting their quality and effectiveness. It should provide feedback to teachers who can then make decisions about what should be done next to enhance students’ learning and adopt an appropriate teaching method. In formative assessment, teachers will also provide feedback to students to promote assessment for learning, so that students understand how to plan and to take control of their learning.
Information about summative assessment is given, and it is stated that it should be school-led, based on the acquisition of knowledge and an understanding of the basic science concepts, the ability to use scientific skills and the development of attitudes important to the learning of science. It is suggested that assessment should be carried out on a regular basis and through different modes, such as oral questioning and observation of students by teachers during class, assignments, practical and written tests.

At senior secondary the emphasis is on the need for both formative and summative assessment, and that there will be internal assessment and public assessment of biology. A detailed explanation is provided of both forms and it is emphasized how important formative assessment should be. The syllabus for Secondary 4-6 states that there are good educational reasons why formative assessment should be given more attention and accorded a higher status than summative assessment, on which schools tended to place a greater emphasis in the past. There is research evidence on the beneficial effects of formative assessment when used for refining instructional decision-making in teaching and generating feedback to improve learning. For this reason, the CDC report *Learning to Learn – The Way Forward in Curriculum Development* (CDC, 2001) recommended that there should be a change in assessment practices, with schools placing due emphasis on formative assessment to make assessment for learning an integral part of classroom teaching.

The HKDSE Examination was administered for the first time in 2012. Chinese Language, English Language, Mathematics and Liberal Studies are core subjects, and the rest, including biology, integrated science and combined science are elective subjects. The assessment design is shown below:

<table>
<thead>
<tr>
<th>Component</th>
<th>Outline</th>
<th>Weighting</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public examination</td>
<td>Paper 1 Compulsory Part</td>
<td>60%</td>
<td>2.5 hours</td>
</tr>
<tr>
<td></td>
<td>Paper 2 Elective Part (a choice of two out of four elective topics)</td>
<td>20%</td>
<td>1 hour</td>
</tr>
<tr>
<td>School-based assessment (SBA)</td>
<td>Practical related tasks and non-practical related tasks</td>
<td>20%</td>
<td></td>
</tr>
</tbody>
</table>

An analysis of a sample Paper 1 shows that there are two sections, A and B, testing the core components. Section A carries 36 marks and Section B carries 84 marks. Section A consists of 36 multiple-choice questions and Section B contains conventional questions, being a mix of short response and essay type.

An analysis of paper 2 shows that it tests the electives, where students choose the two relevant electives. The questions contain much scaffolding and are a mix of one, two, three and four mark questions requiring a degree of free response.

The School-based Assessment (SBA) refers to assessments administered in schools and marked by the students’ own teachers. The primary rationale for SBA in biology is to enhance the validity of the assessment by including the assessment of students’ practical skills and generic skills.
**Key Competencies:**

Key competencies are given as:

- scientific thinking
- scientific investigation
- practical skills
- problem-solving
- information handling
- informed decision-making
- independent learning
- communication skills
- collaboration
- positive values and attitudes.

There is ample opportunity to develop these competencies through the curriculum, in the knowledge content, skills and processes through which students learn – all competencies are deeply embedded in the curriculum documents, and revisited frequently. There is progression in the competencies within and between phases.

The major learning elements of science are arranged into six strands:

1. scientific investigation – to develop science process skills and understanding of the nature of science
2. life and living – to develop understanding of scientific concepts and principles related to the living world
3. the material world – to develop understanding of scientific concepts and principles related to the material world
4. energy and change – to develop understanding of scientific concepts and principles related to energy and change
5. the earth and beyond – to develop understanding of scientific concepts and principles related to the earth, space and the universe
6. science, technology and society (STS) – to develop understanding of the interconnections between science, technology and society.

The learning targets of science education at completion of the junior secondary level are that students should:

- acquire basic scientific knowledge and concepts for living in and contributing to a scientific and technological world
- have developed an ability to define problems, design experiments to find solutions, carry out practical work and interpret the results
- apply their understanding of science to technological applications, social issues, and their daily experiences
• recognize the usefulness and limitations of science and the evolutionary nature of scientific knowledge
• relate their understanding of science to their personal health and cultivate an awareness of safety issues in everyday life and take proper action to control risks
• consider the effects of human activities on the environment and act sensibly in conserving the environment.

Two documents provide information concerning the content and delivery of science at junior secondary level. They are Syllabuses for secondary schools science (secondary 1-3) 1998 and Key Learning Area (KLA) Curriculum Guide (Primary 1 to Secondary 3), Science Education; both published by the Curriculum Development Council, Hong Kong.

Together these provide clear specific goals covering both science content and scientific skills. The syllabus emphasizes a balanced approach towards the acquisition of scientific knowledge, attitudes and skills through carefully organized learning activities. The detail within the two documents provides learning activities and pedagogical materials to enable those goals to be met.

Secondary: Earth Science

Coherence and Clarity:
Earth science is embedded within other subjects (integrated science and combined science). There is much coherence in the earth science curriculum, through science with an environmental slant. Both the integrated science curriculum and combined sciences (biology, chemistry and physics) support a strong and coherent study of earth science. Curriculum documents are very detailed and thorough, with attention to the full range of key curriculum control factors (such as assessment arrangements and teaching approaches as well as stated content coverage).

There is clarity in where and how earth science fits in to the wider science curriculum. Key ideas in science, unifying concepts and the ‘nature of science’ are guiding principles and have been used to inform a coherent curriculum design. See figure above.

There is ample specification and exemplification of different content areas and how knowledge, skills and pedagogy relate. The support and advice for teachers in curriculum documents is strong and it is notable (and unusual) that much emphasis is placed on the teacher to design the detail of the curriculum for their students’ needs, for example, in the order in which content is studied, the type of practical work carried out and the nature of school assessed tasks. To support this (again, unusually) there is a substantial section of the key curriculum document devoted to “curriculum planning.”

Scope:
Integrated science is not compulsory – but earth science is also within combined science (biology, chemistry and physics). In both, scope is broad and deep with strong and balance attention to knowledge, skills and values and attitudes. In the integrated science curriculum,
there are six strands: “Scientific Investigation”, “Life and Living”, “The Material World”, “Energy and Change”, “The Earth and Beyond” and “Science, Technology, Society and Environment (STSE).” A strong feature is the practical element. Fourteen hours of the total curriculum time are allocated for relatively large-scale or cross-theme/discipline investigations. Simple investigations requiring shorter periods of time are also expected and there are suggestions given to support the teacher.

The example of a unit on “water” shows the scope for breadth and depth of knowledge, and indicates curriculum coherence (with good linkages to elements of the curriculum). See two figures below.
The emphasis in the very detailed Senior Secondary Curriculum and Assessment Guide on curriculum planning extends into different models of teaching and learning. Three models are discussed – teaching as direct instruction, teaching as inquiry, teaching as co-construction – and teachers are encouraged to explore each in appropriate contexts. This support for varied pedagogy supports scope (breadth and depth) and curriculum demand level.

A proviso must be made though, that the teacher should be a capable earth science educator (as opposed to a science educator) – as a broad, deep and challenging curriculum, requires linkages to be made (for example between natural and human systems) which requires strong subject understanding. Geography teachers with strong physical geography knowledge might be better placed than science teachers to realize the potential of this earth science curriculum.

**Levels of Demand:**
Much in the curriculum supports high levels of challenge and appropriate demand for students. There is extensive content coverage, integration of knowledge, skills and attitudes and the use of various lenses to provide frameworks for asking challenging questions and demanding complex thought processes. So for example, the concept of a system structures thinking about water on the earth. Emphasis on problem-solving is high, and supports challenge. Curriculum flexibility and the expectation of teachers to plan and take ownership of the detail of curriculum planning, coupled with good supporting advice in the curriculum guide document, encourages teachers to make a suitably challenging curriculum for their students. Assessment arrangements also support demand, with scope for practical assessment, inquiry, extended writing and problem-solving as well as knowledge recall. There is a high level of attention to the teacher using the curriculum to support individual needs. This is consistent with the orientation of the curriculum and the overall message of the curriculum, to challenge learners and produce independent, skilled and intellectually capable individuals.

**Progression:**
There is much concern for prior knowledge and tables show how knowledge based from previous phases is built upon in the secondary and higher secondary phase. The precise design of the curriculum (ordering and sequencing for example) is left to the teacher. This is not a weakness – teachers’ ownership of their department’s curriculum can foster an engaging, challenging and dynamic curriculum. But the point should be noted that progression will only be as strong as the teacher’s capability allows.

Assessment:
There is much consideration of the role of assessment and formative uses are clearly recognized:

First and foremost, it gives feedback to students, teachers, schools and parents on the effectiveness of teaching and on students’ strengths and weaknesses in learning.

There is good alignment between external examinations and curriculum. A strength is the scope for and encouragement of innovative school-based assessment, using a range of modes, such as practical work and oral assessment as well as written work. There is much emphasis on tracking progress and the use of feedback. Assessment arrangements have broad scope (not only a narrow purpose of measuring outcomes). Assessment is embedded in the curriculum and the learning approach.

Secondary: Biology

Orientation:
The broad aims of the biology curriculum at senior secondary level are to enable students to:

- develop and maintain an interest in biology, a sense of wonder and curiosity about the living world, and a respect for all living things and the environment
- construct and apply knowledge of biology, understand the nature of science in biology-related contexts, and appreciate the relationships between biological science and other disciplines
- develop the ability to make scientific inquiries; think scientifically, critically and creatively; and solve biology-related problems individually and collaboratively
- understand the language of science and communicate ideas and views on biology-related issues
- be aware of the social, ethical, economic, environmental and technological implications of biology, and be able to make informed decisions and judgments on biology-related issues
- develop an attitude of responsible citizenship and a commitment to promote personal and community health.

Biological aspects of the science curriculum are found in Strand 2 Life and Living.
The learning objectives at Key Stage 3 (Secondary 1-3) for Strand 2 are:

- to appreciate the diversity of life and to understand the basic principles of classification systems
- to recognize that cell is the basic unit of life
- to develop a basic understanding of some of the life processes
- to appreciate and understand how a new life is born and be aware of the physiological and emotional changes during puberty
- to recognize the importance of maintaining body health.

and for Key Stage 4 (Senior Secondary) are:

- to develop a basic understanding of the essential life processes
- to understand the basic principles of genetics and its applications
- to evaluate the impact of global environmental issues on the quality of life
- to be committed to a healthy lifestyle.

Biology is taught as an integral part of science in Junior Secondary, and as biology at Senior Secondary, or as part of science, either as integrated science, which has an interdisciplinary approach, or combined science with a combined approach. Syllabi are prepared for use in secondary schools by the Curriculum Development Council, Hong Kong.

**Coherence and Clarity:**
The content is described in the *Syllabuses for secondary schools science (secondary 1-3) 1998*, and is divided into fifteen units, spread across the three years. Those that relate to biological content are:

1. looking at living things
2. cells and human reproduction
3. living things and air
4. sensing the environment
5. a healthy body.

Each unit has an outline of content, for example:

11. sensing the environment
   11.1 sensing the environment
   11.2 how we see
   11.3 limitations of our eyes
   11.4 defects of the eye
   11.5 how we hear
   11.6 limitations of our ears
   11.7 effects of noise pollution
11.8 senses of smell, taste and touch
11.9 the brain and our senses
11.10 responses to stimuli
11.11 effects of drugs and solvents on our senses.

For each unit, detailed teaching guidance is provided, including an overview, unit objectives, content for more able students, for example for Unit 11.2 How we see, key points are provided:

- functions of main parts of the eye
- focusing (more able students only).

Together with core content:

- main parts of the eye, including the cornea, iris, student, lens, retina and optic nerve and their functions.

Extension content:

- light sensitive cells on our retina – the rods and the cones
- focusing by eye lens.

And suggested activities:

- using an eye model, identify the main parts of the eye
- dissection of an ox eye and identification of the main parts
- observe printed characters through the ox eye lens. What happens to the size of the print when you squeeze the lens?

Similar support is provided for scientific skills, and the syllabus emphasizes the importance that students progressing through the junior secondary level should acquire and continually develop the skills that will enable them to solve problems in a logical way and to make sense of the environment. Some of the skills listed are cognitive in nature – for example, learning how to control variables in an experiment and proposing hypothesis. Some are very practical – for example, handling equipment and apparatus properly. Throughout the course students should be exposed to various learning opportunities to develop their proficiencies in these skills. A brief explanatory note is provided for each of the skills, for example:

*Observing closely and carefully:* This is the skill of using our senses (including the use of instruments to extend the range of our senses) to gather qualitative as well as quantitative information about a particular object, event or phenomenon. Careful observation of details and of the order of events are important aspects of observation. The different facets of observation include:

- making use of several senses
- noticing relevant details of the object and its surroundings
- identifying similarities and differences
• discerning the order in which events take place
• using instruments to aid the senses for studying details.

The document *Science Education Key Learning Area Curriculum and Assessment Guide (Secondary 4-6) Biology* provides very full and clear information concerning the content and delivery of science at senior secondary level. There are similar documents for integrated science and combined science.

The learning targets of the biology curriculum are categorised into three domains: knowledge and understanding, skills and processes, and values and attitudes. The content is divided into two parts; compulsory and electives. Students select two of the four electives.

The topics of the compulsory section are:

- cells and molecules of life
- genetics and evolution
- organisms and environment
- health and diseases.

and the electives are:

- human physiology: regulation and control
- applied ecology
- micro-organisms and humans
- bio-technology.

Each topic is provided with very clear guidance, giving detail of both what students should learn and what students should be able to do. For example, in Topic 1 cells and molecules of life students should learn:

- water and inorganic ions (for example nitrogen, magnesium, calcium and iron)
- biomolecules: carbohydrates, lipids, proteins and nucleic acids
- building blocks
- functions.

and should be able to:

- relate the significance of water, inorganic ions and biomolecules to life.

A similar level of detail is provided for scientific skills.

**Scope:**
The biological content at junior secondary level is found in five units:

1. looking at living things
2. cells and human reproduction
3. living things and air
4. sensing the environment
5. a healthy body.

These form a progression from previous year groups, linked through the concept of a Key Learning Area (KLA). Science forms one of these KLAs. The function of the KLA is to provide the fundamental and connected concepts within major fields of knowledge which should be acquired by all students. A KLA provides a context for the development and application of generic skills and subject-specific skills, positive values and attitudes through appropriate use of learning and teaching activities and strategies. It also serves as a context for the construction of new knowledge and the development of understanding.

The breadth and depth is clearly defined in terms of the scientific skills and science content. For example, the topic 2.3 diversity of plant and animal life provides detail of core and extension content:

• observing the diversity of forms among living things
• observing and comparing variation within the same kind of living things, for example variation of length of hand spans or size of leaves from the same tree
• constructing and interpreting bar charts; variation from norm (extension).

and scientific skills, although expressed throughout the curriculum, are also found in Unit 1 Introducing Science: carry out a simple scientific investigation:

• carrying out an experiment
• observing and recording the results
• thinking about the results
• drawing conclusion.

and the extension includes: design and carry out a simple scientific investigation, which may consist of some or all of the following steps:

• identifying the problem to be investigated
• identifying factors involved
• proposing hypothesis
• designing the investigation.

Suggested learning and teaching activities are provided. The scope seems very similar to Key Stage 3 science in the UK.

The science curriculum for senior secondary follows the same pattern, but at a very much greater depth, and the scope is very similar to current UK GCSEs in sciences.

Levels of demand:
The level of demand is appropriate for this course in biology. There is a consistent development of standards from P1 – S6. At junior secondary level the provision of both core and extension
content allows teachers to best judge what is appropriate for each group of students and to build a teaching program that builds sequentially on prior knowledge.

For example, Unit 7.4, how do green plants obtain energy, provides the following core content:

- green plants make food through photosynthesis
- starch and oxygen are products of photosynthesis
- test for starch in green leaves
- conditions for photosynthesis.

and extension content:

- destarching in photosynthesis
- experiments Investigating the various conditions required for photosynthesis
- test for starch in green leaves
- show that oxygen is produced during photosynthesis
- investigate the necessary conditions for photosynthesis: carbon dioxide, light and chlorophyll
- green plants take in energy from sun and are producers of food, animals are consumers
- idea of food chain.

Progression:
The curriculum framework provides information as to how progression can be ensured from P1 to S6. The arrangement of major learning elements in science into six strands in the science curriculum allows a teacher to follow themes throughout the curriculum and ensure that progression takes place. This is demonstrated by the way that learning objectives within topics are traceable from P1, for example:

P1-3 Life and Living

- to recognize the features of living things through observing and interacting with Nature
- to develop healthy living habits
- to appreciate the characteristics of living things
- to develop a general understanding of life processes
- to work with peers in the care of living things.

P4-6 Life and Living

- to appreciate the existence of a variety of living things
- to identify personal needs and the needs of other familiar living things
- to identify observable features of individuals and be aware of the functions of different parts of the human body as the basis for self-care
- to identify animal and plant features that change over time
- to recognize the interdependence of living things and their environment.
S1- 3 Life and Living

• to appreciate the diversity of life and to understand the basic principles of classification systems
• to recognize that cell is the basic unit of life
• to develop a basic understanding of some of the life processes
• to appreciate and understand how a new life is born and be aware of the physiological and emotional changes during puberty
• to recognize the importance of maintaining body health.
S4-6 Life and Living

- to develop a basic understanding of the essential life processes
- to understand the basic principles of genetics and its applications
- to evaluate the impact of global environmental issues on the quality of life
- to be committed to a healthy lifestyle.

The document, *Key Learning Area (KLA) Curriculum Guide (Primary 1 to Secondary 3), Science Education Schools*, makes it clear that schools should have in place arrangements to ensure bridging of the science curriculum at junior and senior secondary levels by completing the core parts of the science (S1-3) curriculum before starting the science curricula at S4-5 level.

Assessment:
Please see notes in Secondary Science section above.

*Key Competencies:*
At senior secondary, some of the skills are defined, and have to be integrated within the curriculum. These include:

- make careful observations, ask relevant questions, identify problems and formulate hypotheses for investigations;
- recognize the importance of evidence in supporting, modifying or refuting proposed scientific theories;
- develop the ability to think scientifically and creatively;
- acquire an analytical mind to critically evaluate biology-related issues

*Secondary: Chemistry*

This report refers to Chemistry in integrated science (integrated science students taking a balance of the natural sciences, equivalent to one subject), combined science (chemistry for combined science students specializing in biology or physics, equivalent to two subjects) and chemistry (combined science students specializing in chemistry, equivalent to two subjects) at Secondary 4, 5 and 6 (S4, S5 and S6).

*Orientation:*
'The New Academic Structure for Senior Secondary Education and Higher Education – Action Plan for Investing in the Future of Hong Kong (2005) advocated the development of a broad and balanced curriculum emphasizing whole-person development and preparation for lifelong learning. Besides four core subjects – Chinese language, English language, mathematics and liberal studies – students are encouraged to select two or three elective subjects from different Key Learning Areas (KLAs) "according to their interests and abilities." This replaces the traditional practice of streaming students into science, arts and technical/commercial subjects" (Integrated Science, p.1). While integrated science has an interdisciplinary approach, combined science has a "combined approach", where the three sciences are distinct.
Combined Science: Chemistry (non-specialist):

The emergence of a highly competitive and integrated economy, rapid scientific and technological innovations, and a growing knowledge base will continue to have a profound impact on our lives. In order to meet the challenges posed by these changes, Combined science, like other science electives, provides a platform for developing scientific literacy and for building up essential scientific knowledge and skills for lifelong learning in science and technology...

Combined Science complements the study of one other specialized single science subject. This arrangement serves to provide a balanced learning experience for students across the sciences and broadens their future choices for further study and work. It also helps to cater for the diverse interests and needs of students (Combined Science, p.3).

Combined Science: Chemistry (specialist)
The rationale for the course is that: “…Chemistry, like other science electives, will provide a platform for developing scientific literacy and for building up essential scientific knowledge and skills for lifelong learning in science and technology… The curriculum attempts to make the study of chemistry exciting and relevant. It is suggested that the learning of chemistry be situated in real-life contexts…” (Chemistry, page 3).

The overarching aim of the course is: “…to provide chemistry-related learning experiences for students to develop scientific literacy, so that they can participate actively in our rapidly changing knowledge-based society, prepare for further studies or careers in fields related to chemistry, and become lifelong learners in science and technology” (Chemistry, page 3).

Coherence and Clarity:
Chemistry in Integrated Science
Each “module” is organized into two major parts: Overview and Table of Content. The Overviews comprise an Introduction, Focusing Questions and Module Organization (presented diagrammatically). These overviews provide a clear orientation for each module, relating explicitly to the key ideas, unifying concepts and nature of science targeted by the course. The tables of content are organized into three parts: Students should learn (mandatory), Suggested learning and teaching activities (non-exhaustive and non-mandatory) and Module highlights. These tables of content provide specific goals with a clear relationship, via the module overviews, to the course rationale and aims. In particular, a Chemistry for World Needs module has a particular resonance with the rationale of the integrated science curriculum that it will be useful for work and of value for life. The level of specificity in the What students should learn sections seems appropriate and the Suggested learning and teaching activities signal the range of examples with which students should become familiar.

Combined Science: Chemistry (specialist and non-specialist)
There are five major parts in each topic. The first three parts are: Overview (of the major concepts, principles and terminology), Students Should Learn (which appears to refer to declarative knowledge) and Should Be Able to (which appears to refer to skills – predominantly describe and demonstrate). The degree of specificity in the Students Should Learn and Students Should Be Able to sections seems appropriate and there is a clear relationship to the course rationale and aims via the Overview. The remaining two parts of each topic are: Suggested Learning and Teaching Activities (explicitly broadening the range of skills developed in the topics), Values and Attitudes (particularly through discussion), and Science, Technology, Society and Environment (STSE) connections (to develop an understanding of current issues).

For students specializing in chemistry, elective topics relating to Industrial Chemistry, Materials Chemistry and Analytical Chemistry may, as per the rationale for the curriculum, broaden students’ future choices for further study and work – though clearly each elective is more relevant to some career paths than to others.

Scope:
Chemistry in Integrated Science
One of the design principles of the curriculum is a balance between breadth and depth. Since the curriculum is designed as one subject, there is a thematic approach focusing on the key ideas, concepts and the nature of science. Although the curriculum does not cover all of the topics in traditional upper secondary science curricula, selected topics are taught in more depth. Indeed, it is intended that students should focus on a small number of topics so that they can gain a better depth of understanding and apply what they have learned.

In relation to chemistry, the key ideas are: chemical change, the chemical basis of life, electricity and magnetism and radioactivity. Related compulsory modules are: Chemical Patterns, Electrical Enlightenment, and Radiation and Us. The elective module that relates to these three compulsory modules is Chemistry for World Needs. This is one of three elective modules (the other two elective modules relate to physics or biology). The strength of the approach is the coherence of the thematic organization of modules. The trade-off, as acknowledged in the curriculum document itself, is with the breadth of content across the course. Nonetheless, the course appears to offer a reasonably broad and coherent introduction to the key ideas, concepts and nature of science.

The Chemical Patterns module comprises six topics: Elements in order; The periodic table; Looking into an atom; Atomic number and the modern periodic table; Electrolysis and the ionic theory; and Chemical bonding and structure. The Electrical Enlightenment core module includes seven topics relating to the discoveries, significance and applications of Volta, Oersted, Ampere, Faraday, Ohm, Faraday, Joule and others, and concludes with an exploration of domestic electricity. The topic relating to the work of Joule is detailed below:

<table>
<thead>
<tr>
<th>What students should learn</th>
<th>Suggested learning and teaching activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.6 Joule and the consumption of electricity</td>
<td>• Measure electrical energy with a joulemeter</td>
</tr>
</tbody>
</table>
• Joule’s discovery of energy conservation in electrical circuits and establishment of Joule’s Law in 1840
• Electrical energy = I²Rt
• The quest for high temperature

• Study the heating effect of a current in a nichrome wire
• Propose a model using the particle superconductors theory to explain the heating effect of a current-carrying wire
• Read about the contribution of Paul Chu to the development of high-temperature superconductor
• Search for information on the advances in Maglev trains

The Radiation and us core module comprises five topics: The electromagnetic spectrum; EM radiation as a carrier of energy; Ionising radiations; The decay, half-life and uses of radioisotopes; and Nuclear energy. The Chemistry for World Needs elective module comprises four topics: From laboratory to industry; Chemicals for personal; household and public hygiene; Chemicals for agriculture; and Man-made polymers fit for different purpose.

Combined Science: Chemistry (non-specialist)
The Combined Science Curriculum serves as one of the elective subjects to widen the spectrum of subjects available for student choice. A balanced coverage of topics is selected to broaden the scientific understanding of students. This curriculum provides students with essential knowledge and concepts, while the choice of different combinations allows flexibility to cater for the needs and interests of students” (Combined Science, p.7). The topics in the chemistry part are detailed below.

### Part 2: Chemistry

| I) Planet Earth | a) the atmosphere  
b) the ocean  
c) rocks and minerals |
| II) Microscopic World | a) atomic structure  
b) the Periodic Table  
c) metallic bonding  
d) structures and properties of metals  
e) ionic and covalent bond  
f) structures and properties of giant  
g) ionic substances  
h) structures and properties of simple molecular substances  
i) structures and properties of giant covalent substances  
j) comparison of structures and properties of important types of |
<table>
<thead>
<tr>
<th>III) Metals</th>
<th>substances.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) occurrence and extraction of metals</td>
<td>a) occurrence and extraction of metals</td>
</tr>
<tr>
<td>b) reactivity of metals</td>
<td>b) reactivity of metals</td>
</tr>
<tr>
<td>c) reacting masses</td>
<td>c) reacting masses</td>
</tr>
<tr>
<td>d) corrosion of metals and their protection.</td>
<td>d) corrosion of metals and their protection.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IV) Acids and Bases</th>
<th>a) introduction to acids and alkalis</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) introduction to acids and alkalis</td>
<td>a) introduction to acids and alkalis</td>
</tr>
<tr>
<td>b) indicators and pH</td>
<td>b) indicators and pH</td>
</tr>
<tr>
<td>c) strength of acids and alkalis</td>
<td>c) strength of acids and alkalis</td>
</tr>
<tr>
<td>d) salts and neutralization</td>
<td>d) salts and neutralization</td>
</tr>
<tr>
<td>e) concentration of solutions</td>
<td>e) concentration of solutions</td>
</tr>
<tr>
<td>f) volumetric analysis involving acids and alkalis</td>
<td>f) volumetric analysis involving acids and alkalis</td>
</tr>
<tr>
<td>g) rate of chemical reaction.</td>
<td>g) rate of chemical reaction.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>V) Fossil Fuels and Carbon Compounds</th>
<th>a) hydrocarbons from fossil fuels</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) hydrocarbons from fossil fuels</td>
<td>a) hydrocarbons from fossil fuels</td>
</tr>
<tr>
<td>b) homologous series, structural</td>
<td>b) homologous series, structural</td>
</tr>
<tr>
<td>c) formulae and naming of carbon compounds</td>
<td>c) formulae and naming of carbon compounds</td>
</tr>
<tr>
<td>d) alkanes and alkenes</td>
<td>d) alkanes and alkenes</td>
</tr>
<tr>
<td>e) alcohols, alkanoic acids and esters</td>
<td>e) alcohols, alkanoic acids and esters</td>
</tr>
<tr>
<td>f) addition polymers and condensation polymers.</td>
<td>f) addition polymers and condensation polymers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VI) Redox Reactions, Chemical Cells and Electrolysis</th>
<th>a) chemical cells in daily life</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) chemical cells in daily life</td>
<td>a) chemical cells in daily life</td>
</tr>
<tr>
<td>b) reactions in simple chemical cells</td>
<td>b) reactions in simple chemical cells</td>
</tr>
<tr>
<td>c) redox reactions</td>
<td>c) redox reactions</td>
</tr>
<tr>
<td>d) redox reactions in chemical cells</td>
<td>d) redox reactions in chemical cells</td>
</tr>
<tr>
<td>e) electrolysis</td>
<td>e) electrolysis</td>
</tr>
<tr>
<td>f) importance of redox reactions in modern ways of living</td>
<td>f) importance of redox reactions in modern ways of living</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VII) Chemical Reactions and Energy</th>
<th>a) energy changes in chemical reactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) energy changes in chemical reactions</td>
<td>a) energy changes in chemical reactions</td>
</tr>
<tr>
<td>b) standard enthalpy change of neutralisation, solution, formation and combustion</td>
<td>b) standard enthalpy change of neutralisation, solution, formation and combustion</td>
</tr>
<tr>
<td>c) Hess’s Law.</td>
<td>c) Hess’s Law.</td>
</tr>
</tbody>
</table>

As an example of the content, the content of the *Chemical reactions and energy* topic relating to Hess’s Law is detailed below:

<table>
<thead>
<tr>
<th>Students should learn</th>
<th>Students should be able to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hess’s law</td>
<td>Hess’s law</td>
</tr>
<tr>
<td>• use of Hess’s law to determine enthalpy changes which cannot be easily determined by experiment</td>
<td>• apply Hess’s law to construct simple enthalpy</td>
</tr>
<tr>
<td></td>
<td>• change cycles and enthalpy level diagrams</td>
</tr>
</tbody>
</table>
Directly
- enthalpy level diagrams
- calculations involving enthalpy changes of reactions

• perform calculations involving such cycles and relevant energy terms, with particular reference to determining enthalpy change that cannot be found directly by experiment

Combined Science: Chemistry (specialist)

Students who choose to specialize in chemistry take the same seven chemistry topics as students specializing in physics and biology (although Microscopic World is divided into two topics for chemistry specialists). In addition, chemistry specialists take a further seven chemistry topics, comprising four more compulsory topics (Rate of Reaction, Chemical Equilibrium, Chemistry of Carbon Compounds and Patterns in the Chemical World), two elective topics (from a choice of three: Industrial Chemistry, Materials Chemistry and Analytical Chemistry) and an investigative study topic (in chemistry). Thus students specializing in chemistry take the equivalent of one subject through topics in chemistry and the equivalent of one subject through topics in biology and physics (though it should be noted that the number of hours allocated to topics varies, so the equivalence is approximate).

The Materials Chemistry topic comprises five sub-topics: Naturally occurring polymers; Synthetic polymers and plastics; Metals and alloys; Synthetic materials in modern life; and Green Chemistry. In accordance with the rationale for the topic, there is a particular focus on Synthetic polymers and plastics, which is reproduced below.

<table>
<thead>
<tr>
<th>Students should learn</th>
<th>Students should be able to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthetic polymers and plastics</td>
<td>Explain the properties of cellulose and chitin in terms of their structures. Compare structural features of cellulose and chitin. Explain the effect of structures on the properties of silicates as exemplified by chain silicates, sheet silicates and network silicates.</td>
</tr>
<tr>
<td>a) naturally occurring polymers structures and properties of cellulose, chitin and silicates</td>
<td></td>
</tr>
<tr>
<td>b) synthetic polymers and plastics addition polymerization formation and uses of addition polymers such as polytetrafluoroethane (PTFE), polymethyl methacrylate (PMMA) and cyanoacrylate (superglue) condensation polymerization formation and uses of condensation polymers such as polyesters and polyamides polymeric biomaterials such as polylactide (PLA) effect of structure on properties such as density, hardness, rigidity, elasticity and</td>
<td>Explain the terms “thermoplastics” and “thermosetting plastics” describe the characteristics of addition polymers using examples like PTFE, PMMA and cyanoacrylate. Describe the characteristics of condensation polymers: poly (ethylene terephthalate) (PET), nylon, Kevlar and urea-methanal. Deduce the type of polymerization reaction for a given monomer or a pair of monomers. Deduce the repeating unit of a polymer obtained from a given monomer or a pair of monomers. Write equations for the formation of addition and condensation polymers. State the similarities and differences between addition</td>
</tr>
</tbody>
</table>
biodegradability as exemplified by

I. High density polyethylene and low density polyethylene
II. Nylon and Kevlar
III. Vulcanization of polymers
IV. Biodegradable plastic fabrication processes – injection molding, blow molding, extrusion molding, vacuum forming and compression molding

polymerization and condensation polymerization explain the properties of polymers in terms of their structures recognize the applications of polymeric biomaterials describe the process of making biodegradable plastics using PLA as an example relate the choice of fabrication processes to the properties of plastics and the uses of their products discuss the importance and problems of recycling plastics.

Demand and progression:
Chemistry in Integrated Science
Teachers are asked to consider the progression and interaction of ideas across the modules, and a sequence for the modules is suggested. Although 10% of curriculum time should be allocated to integrated science, there is no guidance on which modules should be taught during S4, S5 or S6; teachers may therefore adjust demand to reflect progression.

There is a clear intention for the curriculum to take account of prior learning. Schools are encouraged to plan for the interface with the junior secondary science curriculum and refer to the learning targets and objectives in the relevant curriculum and syllabus documents.

Combined Science: Chemistry (specialist and non-specialist)
Again, there is no guidance on which topics should be taught during S4, S5 or S6 but teachers may adjust demand to reflect progression. Indeed, schools are encouraged to use flexible timetabling, with the three sciences offered in parallel with equal hours or sequentially (for example, biology in the first semester, chemistry in the second and physics in third). Topics are not strictly ordered in the curriculum and teachers can decide how to interweave the topics in order to highlight the interrelationship of the sciences.

In terms of progression to senior secondary sciences, “Students can explore their interests through the study of foundation topics in Biology, Chemistry and Physics. This will ensure smooth progression to S5 and S6 when they choose the science subject they wish to specialize in….this curriculum enables students to pursue academic and vocational/professional education and training with articulation to a wide range of post-secondary and university studies or to the workplace” (p.8).

Assessment:
The curriculum documents state both what students should learn in each module/topic and what the overall learning objectives of each course should be. There is an explicit intention for the assessment objectives to be closely aligned with the sections on what students should learn in each module/topic. The learning objectives are intended for both summative and formative assessments. In the curriculum documents, formative assessment is carefully distinguished
from summative assessment and emphasized as important for learning. There is a lack of information on assessment instruments to evaluate them for threats to validity. The learning objectives (listed in full below for completeness), however, appear aligned with the aims, rationales and contents of the courses.

Chemistry in Integrated Science

Page 119-120: The learning objectives to be assessed in integrated science are to evaluate students’ ability to:

- a) recall and show understanding of facts, concepts and principles of science, and the relationships between different topic areas in the curriculum framework
- b) apply scientific knowledge, concepts and principles to explain phenomena and observations, and to solve problems
- c) formulate working hypotheses, and plan and perform tests for them
- d) demonstrate practical skills related to the study of science
- e) present data in various forms, such as tables, graphs, charts, drawings, diagrams, and transpose them from one form into another
- f) analyze and interpret both numerical and non-numerical data in forms such as continuous prose, diagrams, photographs, charts and graphs – and make inferences and logical deductions, and draw conclusions from them
- g) formulate arguments, justify claims, evaluate evidence and detect errors
- h) select, synthesize and communicate ideas and information clearly, precisely and logically
- i) demonstrate understanding of the applications of science to daily life and the contributions of science to the modern world
- j) show awareness of the ethical, moral, social, economic and technological implications of science, and critically evaluate science-related issues
- k) make suggestions, choices and judgments based on scientific knowledge and principles.

Combined Science: Chemistry (non-specialist AND specialist)
The assessments in chemistry aim to evaluate students’ abilities to:

- a) recall and show understanding of chemical facts, patterns, principles, terminology and conventions
- b) demonstrate understanding of the use of apparatus and materials in performing experiments
- c) handle materials, manipulate apparatus, carry out experiments safely and make accurate observations
- d) demonstrate understanding of the methods used in chemical investigations
- e) analyze and interpret data from various sources, and draw relevant conclusions
- f) manipulate and translate chemical data and perform calculations
- h) apply chemical knowledge to explain observations and solve problems which
may involve unfamiliar situations
i) select and organize scientific information from appropriate sources and communicate this information in an appropriate and logical manner
j) understand and evaluate the social, economic, environmental and technological implications of the applications of chemistry
k) make decisions based on the examination of evidence and arguments.

Key competencies:

Chemistry in Integrated Science

The curriculum sets out learning outcomes for the course, not only in terms of knowledge and understanding but also in terms of skills and processes relating to scientific thinking, scientific investigation, practical skills, problem-solving, information handling, informed decision-making, independent learning, communication skills and collaboration and in terms of positive values and attitudes. This represents an ambitious but desirable list of outcomes and a section on curriculum planning includes a subsection on Nurturing Students’ Generic Skills. This subsection lists examples of opportunities for promoting these generic skills with reference to specific modules. Furthermore, a section on Teaching and Learning sets out various pedagogic approaches for achieving the various learning outcomes.

Combined Science: Chemistry (non-specialist and specialist)

Each topic incorporates Suggested Learning and Teaching Activities, Values and Attitudes, and Science, Technology, Society and Environment (STSE) connections. The suggested learning and teaching activities include activities such as discussion, debate, practical work, investigations and information searching. Indeed, the Values and Attitudes and STSE connections are expected to be developed through these varied activities. Although less explicitly than in the integrated science curriculum, these activities may therefore serve to develop various key competencies.

Secondary: Physics

Orientation:

Physics can be studied as a single subject or in combined science or integrated science. This review covers the curriculum in each of these four specifications. Scientific literacy is a key goal and is seen as providing thinking tools. The curriculum documents provide much detail to support this and the aim of educating critical and creative thinkers, for example by fostering a sense of wonder and curiosity about, the natural and technological world. There is a particular emphasis on science and technology’s impact on society, for example:

The are many opportunities to reflect on issues and controversies in matter involving science and technology, and so become better informed and more sophisticated consumers of science-related information.

The curriculum aims to be balanced with respect to knowledge, skills, values and attitudes. Balance is explicitly stated:
• balance between breadth and depth
• balance between theoretical and applied learning
• balance between essential learning and a flexible and diversified curriculum.

Coherence and Clarity:
The curriculum documents are full of advice and guidance on the curriculum as a whole, its structure and teaching and learning. There is an emphasis on the interconnections between the different topics within a particular course, and illustrations of the different dimensions of a study in science. Clarity is provided by descriptions of the curriculum at a range of levels, facilitating both an overview of the development in learning, complemented by the detailed specifications.

Scope:
The scope is set out in the documents as a conceptual framework, at each stage. For example in S1-3:

The content of this syllabus is organized into 15 units, yet the topics should not be viewed as compartmentalized blocks of knowledge. In order that students can have a coherent understanding of the world around them, the diversity and multiplicity of scientific facts and concepts should be learned as inter-related “bigger ideas” in a conceptual scheme.

There is also a broad scope in the expected teaching approaches and learning activities, with a useful spectrum from teacher centered to student-centered methods, which are described in detail. The 15 units are presented as five for each year with physics content of Energy in S1, Electricity and Space Travel in S2, and Light and the Spectrum in S3. Schools are expected to devote at least four periods a week to science, and the detailed content is divided into core and extension, to provide for ability range, with suggested timings for each.

Each unit has an overall aim and set of objectives followed by a table of contents and suggested teaching activities. For example in the S1 unit Energy: 4.2 Energy changes; Core - simple energy changes; initial and final forms of energy in such processes, Suggested Activities - Energy conversion experiments; Extension - The intermediate forms of energy in some common energy changes, Suggested Activity- List the intermediate forms of energy in the course of energy changes.

The three courses available for S4-6 are similarly presented with extended general guidance on teaching and learning and on the structure of the course. The integrated science course is particularly complex in its intention to integrate the sciences, through topics which are set in everyday life contexts. As a result it is (intentionally) difficult to separate out the physics, but two of the eight compulsory modules major in physics: in mechanics and electricity. One of the three elective module covers energy. In Science in a Sprint, the familiar context of a sprint is used to demonstrate the laws and principles of mechanics in a sequence that is natural to the episode. In Science in a Sprint, the human body is viewed as a bio-machine with systems cooperating to enable effective movements. The physiology involved in providing sufficient energy for the sprint is also studied.
The specification shows how the ideas are developed and then are specified as detailed learning objectives (LO) with suggested learning and teaching activities (STLA), for examples:

3.1 Forces and sprinting LOs: Crouch start and starting block: Newton’s 3rd Law. How to accelerate: Newton’s 2nd Law. STLA: Watch video of a 100 metre race, observe carefully the motion of the sprinter at the different stages. Experience the different impulses produced at the starting blocks in crouch starts.

The physics course has a core of five modules, an elective of two from four modules and an investigative study: with a view to solving an authentic problem. The core modules are on heat, mechanics, waves, electricity and magnetism and radioactivity. The electives cover: Astronomy and Space Science; Atomic Physics; Energy and Medical Physics. Each part has a clearly defined study time, as well as LOs and STLAs, values and attitudes and STSE (science, technology, society and the environment) connections to be developed. These are all presented in substantial detail for example in mechanics: LO - state Newton’s Second Law of motion and verify \( F = ma \) experimentally. STLA - Using light gates or motion sensors to measure the speed and acceleration of a moving object.

The combined science course specifies physics, biology and chemistry separately so that a course can be followed including any two of these. The course time specified is 270 hours, identical with the other two options, that is, 135 hours for physics. The layout is identical to that for physics, but with only four topics (radioactivity is omitted) and no electives. The LOs for the remaining half of the content are identical with those of the physics course. The course also requires an investigation, for eight hours, half the time of that in the physics course.

In summary, the scope of the curriculum in secondary physics is well presented in its detail and widely conceived in its intentions.

Demand and Progression:
The demand of the curriculum is clear at each level, from the detailed specification of the LO, amplified by the matched STLA. The suggested approaches to teaching and learning and the complex integration of aspects such as investigation and STSE implications, have the potential to generate a high demand. There is consistent attention to the range of abilities at any stage, with core and extension suggestions. Teachers are encouraged and supported in their own course construction, so that demand may be matched to the range of abilities in a class.

Progression is apparent in the detail of the LOs for the different stages, and also in the general curriculum guide for P1 – S3 Sciences. This as noted above, provides summary Learning Outcomes for each of four key stages, within each of six strands. So in Energy and Change at Key Stage 3 (S1-3) there are LOs:

- to compare energy options available for particular purposes in the community.
- to identify forms and transformations of energy in sequences of interactions.

And at Key Stage 4:
• to describe systems whose purpose is to transfer energy efficiently.
• to apply ideas of energy conservation and efficiency to sequences of interactions.

In fact these statements do not capture the detailed nature of the progression from S1-3 to the various S4-6 courses, but perhaps help to draw attention to the general idea of progression.

Assessment:
Each curriculum guide has a helpful discussion of the roles of assessment and the value of formative and summative assessment, of school-based assessment and examinations.

For S1-3 all assessment is school-based (SBA) and teachers are encouraged to use a wide range of methods, including oral, practical and written assessments, including projects and portfolios of work and much guidance is available.

At S4-6, there is a terminal assessment, the Hong Kong Diploma of Secondary Education. This consists of examination papers worth 80% and SBA for the remaining 20%. The SBA is specified to include assessment of both practical and non-practical work. The advice includes how to cater for the needs of students with different aptitudes and abilities, and the value of formative assessment in providing feedback on learning and achievement to students and their parents.

In the public examination papers various kinds of items, including multiple-choice questions, short questions, structured questions and essays, are used to assess students’ performance in a broad range of skills and abilities. Multiple-choice questions permit a more comprehensive coverage of the curriculum, while basic knowledge and concepts can be tested through short questions. In structured questions, candidates may be required to analyze given information and to apply their knowledge to different situations. Finally, essay questions allow candidates to discuss issues in physics in depth and demonstrate their ability to organize and communicate ideas logically and coherently.

Sample and practice papers for the three examinations have been reviewed. These are generally of a demand appropriate to the curriculum, with a range of difficulty to permit discrimination. There are some variations between the three course examinations. Physics has a paper for the compulsory and a second for the elective topics. Each paper has a range of objective questions that provide, as intended, a good coverage of the content, with appropriately high demand. The second part of each paper requires extended answers to a small number of structured questions.

The physics paper in the combined science course is very similar to the core paper, but shorter in extent, consisting of the same questions from the content common to the full physics course.

The integrated science course also has two papers; the first is structured questions on the compulsory core and the second is multiple choice on the core and longer questions on the electives. The questions are generally of a high demand, and reflect the integrated nature of the course. Time allocations for the papers seem reasonable, except for the Integrated Paper
2. Here 32 multiple choice questions, most demanding reasoning and complex recall, are given a recommended 35 minutes leaving 55 minutes for two longer questions on the electives.

All three of the sample examinations seem to be of comparable demand, with some common questions. There are also available practice papers with marking guides for the longer questions.

Overall the assessments appear to be well suited to the general aims and the detailed LOs of each stage of the curriculum.

*Key Competencies:*

The purposes of the science/physics curriculum stress the wider competencies throughout the stages of secondary schooling. In particular, learning how to learn and inquiry-based learning features strongly, and is supported through the advice on formative and internal assessment. Learning objectives/targets are broad in scope, covering knowledge and understanding, skills and processes, and values and attitudes. These are provided as commentaries in each of the topic descriptions, ensuring a good awareness of the opportunities for these key competencies, for example in Physics S4-6, elective *Astronomy and Space Science: Values and Attitudes:*

- to accept the uncertainty in measurement and observation but still be able to draw meaningful conclusions from available data and information
- to recognize the importance of lifelong learning in our rapidly changing knowledge-based society and be committed to self-directed learning.

*Secondary: Social Studies History*

*Orientation:*

Secondary 1-3

The Personal, Social and Humanities Education (PSHE) Key Learning Areas (KLA) Curriculum Guide (2002) suggests an open and flexible curriculum framework for schools to plan and develop their curricula. The framework is comprised of six strands, which help to organize and integrate learning elements across different subjects. History, as one of the four PSHE discrete subjects (the other three are Chinese history, geography, life and society), is closely related to Strand 2 (time, continuity and change) and strand 3 (culture and heritage).

Strands are not disciplinary in nature, but subjects are. Schools in Hong Kong can offer traditional disciplinary subjects such as history, or offer an integrated curriculum called Integrated Humanities that includes learning elements in Strand 2 and 3, and beyond.

Both the generic and disciplinary elements can be found in the PSHE KLA curriculum framework. The PSHE KLA Curriculum Guide (2002) and the history curriculum for secondary 1-3 (1996) are compatible with each other. The subject curriculum provides the essential knowledge for student learning, which can be embedded in the open, flexible and holistic KLA curriculum framework. Schools, according to the diverse needs of their students, can make reference to both curricula and plan the learning experiences of their own students by adopting a disciplinary or integrative approach, or both.
Secondary 4-6
The 2007 Secondary 4-6 curriculum aligns with the aims of the 2002 curriculum document and is committed to the same overall curricular and pedagogic vision:

History is one of the six elective subjects in the Personal, Social and Humanities Education Key Learning Area (PSHE KLA). The study of history helps students to understand the human world through enquiring into its roots in the past. It contributes towards the development of all the generic skills involved in the study of humanities subjects, such as critical thinking and enquiry and aims to promote the essential skills of historical investigation during the three years of study.

Specific aims for history as a discrete subject are identified at Secondary 4-6 as follows:

a. discover where they stand in the contemporary world through understanding the origins and development of modern events
b. develop the skills of critical thinking, making sound judgments and effective communication through exploring historical issues
c. approach past and current events in an impartial and empathetic manner, using a variety of perspectives
d. understand the characteristics and values of their own culture, and appreciate the shared humanity and common problems of the world’s many peoples
e. cultivate both national consciousness and the consciousness of being citizens of the global community, and thus become rational and sensible members of the local community, the nation and the world
f. be prepared to explore in greater depth an issue of personal interest, or one that may be of relevance to their future careers and professional studies.

Coherence and Clarity:
Secondary 1-3
Strands are broken down into knowledge and understanding, skills and values and attitudes. The figure below extracts these for Key Stage 3 (11-14 years) for strands 2 and 3, those with the clearest historical connections:

<table>
<thead>
<tr>
<th>Strand 2</th>
<th>Strand 3</th>
<th>Skills</th>
<th>Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time, Continuity &amp; Change</td>
<td>Culture &amp; Heritage</td>
<td>1. to master ways of constructing a sequence of major historical events and the relationships between events and people as well as to make logical inferences on cause and effect</td>
<td>1. to make use of different sources of information for the understanding and comparison of the major features of different cultures to identify and analyze the impact of the spread of new technology</td>
</tr>
<tr>
<td>• Time and chronology</td>
<td>• Foundations of Culture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Understanding the past</td>
<td>• Customs &amp; traditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Change and continuity</td>
<td>• Challenges and repercussions in the modern world</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Historical interpretations</td>
<td>• Cultural diversity &amp; interaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge and understanding</td>
<td>Knowledge and understanding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. to understand the</td>
<td>1. to understand the</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. to understand that the past may be interpreted from different perspectives and points of view
3. to understand the positive and negative impact of change brought about by historical events

<table>
<thead>
<tr>
<th>values and attitudes</th>
<th>values and attitudes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. to support work relating to the preservation and conservation of our heritage</td>
<td></td>
</tr>
<tr>
<td>2. to develop a sense of national identity as well as a world perspective</td>
<td></td>
</tr>
<tr>
<td>3. to respect the customs and cultures of peoples from different communities, ethnic groups and of different religious backgrounds</td>
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<tr>
<td>4.</td>
<td></td>
</tr>
</tbody>
</table>

These objectives present a mixture of second order / conceptual-procedural objectives (Strand 2 Knowledge and Understanding 1-3, Strand 2 Skills 1-2 and Strand 2 Skills 1-2), dispositional objectives compatible with a disciplinary approach (Strand 2, Values and Attitudes 1-2), first order / substantive knowledge objectives (Strand 3 Knowledge and Understanding 1-3), identity engineering dispositional objectives (Strand 3, Values and Attitudes 1-3).

The second order objectives are compatible with disciplinary approaches common around the world. Strand 2, Knowledge and Understanding 2, for example, is similar to the approach taken to interpretation in the 2007 English national curriculum. The identity engineering objectives are not. Indeed, they are somewhat contradictory – students are to understand that interpretations are rooted in perspective, on the one hand, but, on the other hand, they are to come to espouse one particular interpretation – that Chinese culture is a singular and unitary rather than a plural entity and that it is unique.

No progression across the Key Stage is modelled in these objectives.

Extensive exemplification of pedagogic approaches is provided. The focus throughout is on changing the role of the teacher, that is, promoting facilitative rather than didactic pedagogies, on project work, on field visits and on cross-curricular work. It is not possible to know on the basis of the information provided, how effective these approaches are likely to be, however, it is possible that an a-disciplinary rather than an inter-disciplinary approach could result.

Secondary 4-6

(CDC, 2002, 32-33)
As in the previous phase, objectives are divided into knowledge and understanding, skills and values and attitudes.

<table>
<thead>
<tr>
<th>Knowledge and understanding</th>
<th>Skills</th>
<th>Values and attitudes</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) basic historical concepts, such as cause and effect, change and continuity, and similarities and differences; (b) diverse standpoints and perspectives inherent in different ways of representing and interpreting the past; (c) the beliefs, experiences and behaviours of their own nation as well as of other nations, and the ways in which they have shaped the development of the contemporary world; (d) the inter-relations of major events and movements that have occurred in the local community, the nation, Asia and the world in the 20th century; and (e) the major historical developments and trends that have shaped the contemporary world.</td>
<td>(a) distinguish fact from opinion; detect biased viewpoints, ambiguous assumptions and unsubstantiated arguments; and build up proper historical perspectives; (b) compare and interpret historical data; arrive at reasoned conclusions based on available evidence; and recognize the fact that history is subject to reassessment based on the interpretation of new evidence; (c) ascertain and explain the extent to which historical documents and archives reflect contemporary attitudes, values and passions; (d) present logical and coherent arguments through the proper selection and organization of historical data; (e) search for, select, analyze and synthesize information through various means, including the Internet, and consider various ways of arriving at conclusions and making appraisals; and (f) apply historical knowledge and skills in everyday life.</td>
<td>(a) appreciate the difficulties and challenges that humankind faced in the past, and to understand the attitudes and values that influence human behaviour; (b) tolerate and respect different opinions, and to recognize the fact that although different communities have different experiences and beliefs, there are values and ideals that are commonly shared by all humankind; (c) develop and maintain an inquisitive attitude towards human culture; and (d) become responsible citizens with a sense of national identity and a global perspective.</td>
</tr>
</tbody>
</table>
These aims are similar in character to those in the Secondary 1-3 curriculum. They have a more disciplinary character, however only one of the four values and attitudes objectives is now focused on identity engineering of a national kind, for example. The objectives build on those from the earlier phase of secondary also. Thus, for example, in both phases students are to learn to differentiate between fact and opinion but the later phase makes greater demand than the earlier – students are to ‘detect biased viewpoints, ambiguous assumptions and unsubstantiated arguments; and build up proper historical perspectives’ rather than simply to ‘form a better understanding and interpretation of historical events’.

As is often the case, however, progression modelling is in terms of increasing demand in the logic of tasks / modes of thinking rather than in terms of what research evidence tells us about how children’s thinking in history is likely to progress (Lee, 2005).

Very detailed advice is provided on pedagogy. Most of this advice is generic, but some is history specific and likely to develop historical thinking effectively, for example, the table of “Typical questions to be asked in analyzing a historical source.” The generic advice is given detailed subject specific exemplification, and, for example, on “Using interactive activities in teaching “Modernisation of China” and on “Using an enquiry approach in teaching “International economic cooperation” the advice is of a very high quality and certainly likely to help teachers develop historical thinking.

Scope:
Secondary 1-3
“Essential Content” objectives are provided that are relatively brief (the content for the two strands analyzed above are excerpted in the table below and describe learning outcomes across three years of secondary education.

<table>
<thead>
<tr>
<th>Key Stage 3</th>
<th>Key Stage 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strand 2: Time, Continuity and Change</strong></td>
<td><strong>Strand 3: Culture and Heritage</strong></td>
</tr>
<tr>
<td>Sub-strands:</td>
<td>Sub-strands:</td>
</tr>
<tr>
<td>• time and chronology</td>
<td>• foundations of culture</td>
</tr>
<tr>
<td>• understanding the past</td>
<td>• customs and traditions</td>
</tr>
<tr>
<td>• change and continuity</td>
<td>• challenges and repercussions of the modern world</td>
</tr>
<tr>
<td>• historical interpretations</td>
<td>• cultural diversity and interaction</td>
</tr>
<tr>
<td>• terms used in recording historical periods and the passing of time (e.g. AD, BC, era, early and late dynastic period)</td>
<td>• places/events in which Chinese culture is reflected (e.g. festival celebrations, folklore museum)</td>
</tr>
<tr>
<td>• significant historical periods in local, national and world history</td>
<td>• similarities and differences of customs and practices of people from different geographic, cultural, racial, religious and ethnic backgrounds</td>
</tr>
<tr>
<td>• the causes, consequences, and sequences of the major events and developments in local, national and world history</td>
<td>• how various cultures have adapted to their changing environments</td>
</tr>
<tr>
<td>• the part played by significant individuals</td>
<td>• forms of new technology that affect</td>
</tr>
</tbody>
</table>
and groups in history
• characteristic features of the local and the national community, and how their developments are linked with each other and with that of the wider world
• the nature of changes brought by significant historical events (e.g. rapid progress, economic recession, revolution, evolution, coup d’etat)
• the background and different interpretations of some significant historical events.

the preservation and conservation of culture and heritage
• emergence of “global culture” and its impact on local communities as well as the nation as a whole
• factors contributing to cross-cultural understanding or posing obstacles to it.

Secondary 4-6
The curriculum aims to cover ‘the broad sweep of local, national, regional and world history in the 20th century’. The table below summarizes the curriculum content.

| Introduction: |
| The making of the modern world |
| “from the 16th century, and to the formation of colonial empires in the 19th century” |
| • The foundations of Western supremacy |
| • western expansion and the formation of colonial empires |
| • Asia’s reactions to Western expansion |
| • towards international cooperation |

| Theme A: |
| Modernisation and transformation in Twentieth-Century Asia |
| • modernisation and transformation of Hong Kong |
| • modernisation and transformation of China |
| • modernisation and transformation of Japan and Southeast Asia |

| Theme B: |
| Conflicts and cooperation in the Twentieth-Century world |
| • major conflicts and the quest for peace |
| • the quest for cooperation and prosperity |

| Elective parts (students study one of the topics below) |
| • comparative studies E.g. China’s population problems and policies at different times in the 20th century |
| • issue-based studies E.g. “Terrorism” |
| • local heritage studies E.g. Business and trade (e.g. local brand names and trademarks, and the history of one selected industry or trade) |
As the outline indicates, the curriculum achieves its objectives. As is typically the case with European curricula, this curriculum provides a broad overview of world history in the twentieth century through the optic of the history of dominant world powers and other aspects of history are regionally focused. The themes are mostly political and, to a lesser extent, economic although social and cultural history does figure (for example in the electives).

The course looks very achievable in the time – 270 hours of lesson time – 210 hours for the core course, 40 for the elective and 20 hours of lesson time for museum visits / heritage tours.

*Levels of Demand:*
Secondary 1-3
It is hard to say very much about levels of demand. The curriculum is certainly likely to be accessible in a number of ways, given the focus of varieties of activity and the student-centered pedagogy. Attention is given to ensuring access and diverse modes of assessment are highlighted also in relation to access.

Secondary 4-6
The level of demand is appropriate to the age group. Again, explicit consideration is given to ‘learner diversity’ and to making the curriculum accessible. Features of the curriculum that enable both additional depth and a wide range of interests to be catered for are identified. Pedagogies likely to cater for student diversity are also recommended:

Students differ with respect to the extent of their attention span in class and in their ability to receive and interpret messages. Teachers should employ a range of pedagogical strategies to cater for the differences amongst students. Furthermore, teachers should promote enquiry learning and discussion to stimulate students' interest in history.

*Progression:*
Secondary 1-3
The curriculum appears to have little conceptual progression within Key Stage 3.

Secondary 4-6
Explicit advice for teachers on how to achieve progression is provided.

*Assessment:*
Secondary 1-3
Both curriculum documents (PSHE KLA Curriculum Guide, 2002 & History Syllabus S1-3, 1996) advocate that a diversity of assessment modes should be employed in schools, including different modes of assessment (formative or summative, such as pen & paper tests, projects, oral presentation), or assessment by different parties such as teacher assessment, self and / or peer assessment. As there is no public assessment in junior secondary level, student performance is assessed at the school level, categorized as internal assessment.
Secondary 4-6  
Assessment is organized as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Weighting</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public examination</td>
<td>Paper 1 will consist of data-based questions, which will fall within the</td>
<td>50%</td>
<td>1 ¾ hours</td>
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<tr>
<td></td>
<td>Compulsory Part. All questions will have to be answered. Various types of</td>
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<tr>
<td></td>
<td>historical sources will be used, which may include extracts from written</td>
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<tr>
<td></td>
<td>sources, statistics, and visual materials such as maps cartoons and</td>
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<td></td>
<td>photographs.</td>
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<tr>
<td>Paper 2</td>
<td>Paper 2 will consist of seven essay-type questions, of which candidates may</td>
<td>30%</td>
<td>1 ¼ hours</td>
</tr>
<tr>
<td></td>
<td>attempt any TWO. The questions will fall within the Compulsory Part.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>School-based Assessment (SBA)</td>
<td>A two-task course assignment related to the candidates’ selected electives.</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The weightings of the tasks are as follows:</td>
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Components of the public assessment for History  
(CDI, 2007, 50)

There is scope for a range of assessment modes (as the SBA examples indicate). The specification provides extensive and detailed advice on assessment principles and practices, including, for example, advice on question stems appropriate for different purposes. Assessment for learning is advocated and explained and diverse modes of internal assessment are recommended to cater for a range of abilities and interests.

The source paper is comparable in demand to English Advanced level examination questions and possibly more demanding in the number of questions that candidates are expected to answer. A sample of questions in provided below:

a) according to Source B, what was the ‘true solution of the Chinese question’? (2 marks)

b) discuss the limitation of Source B in reflecting Sun Yat-sen’s revolutionary ideas in the first decade of the 20th century (4 marks)

c) what can you infer from Source D about the purpose of the cartoon? Explain your answer (3 marks)
d) do you think that Sun Yat-sen would have been satisfied with the development of China in the period 1912-20? Explain your answer with reference to Sources C and D, and using your own knowledge. (8 marks)

These questions make demands on students in a number of ways – requiring them to comprehend and extract information from sources (question a)), to evaluate a source in context (question b)), to make inferences from sources (question c)) and to synthesize information from their own knowledge and from sources provided (question d)). They are asked to answer questions on four topics covering the range of their syllabus and consisting of 11 questions in 105 minutes – which is quite challenging. No choices are possible indicating that good syllabus coverage is required in preparation.

The questions in the second paper are equally challenging – for example ‘How effective was the United Nations in solving environmental problems in the second half of the 20th century? (15 marks)’ and comparable to English A Level papers. Students answer two questions in 75 minutes.

Key competencies:
Secondary 1-3
The curriculum is almost entirely devoted to the development of competencies.

Secondary 4-6
By contrast with the Secondary 1-3 curriculum, there is little explicit focus on key competencies. This curriculum is much more focused on constructivism than on competencies.

Secondary: Geography

Geography Secondary 4-6
The context statement for Hong Kong (2002) Learning to Learn carried two major messages: the change of focus from “teaching” to “learning,” and a new emphasis on the process of learning rather than memorizing facts. Geography was more or less subsumed into a more generic curriculum focus. There is a question as to whether disciplinary knowledge is antithetical to a more student and skills centered approach. For example, to insinuate that disciplinary knowledge is NOT the basis to ‘acquire new knowledge and … solve problems’ is perverse and to suggest ‘bookish’ knowledge means rote learning is simplistic. Within this context therefore it is interesting to gauge the position of geography in the curriculum – even as an elective subject in the senior secondary school curriculum.

Orientation:
In the Curriculum and Assessment Guide for geography (a volume of the personal social and humanities education ‘key learning area’) the aims, which follow a lengthy rationale for geography, are as follows:

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6 At the time of writing the secondary 1-3 document appeared to be unavailable and impossible to access.
a) understand the Earth they inhabit, and enable them to recognize and interpret, from a spatial perspective, the arrangement of phenomena and features on Earth, the processes at work, the interactions that occur, the changes that result, and the issues and management responses that arise

b) develop the general intellectual capacity and generic skills needed for lifelong learning through geographical enquiry, and the ability to apply these in life situations

c) appreciate the wonder, interdependence and fragility of the local and global environment, and the importance of promoting sustainable development

d) develop a sense of citizenship, a global outlook, and readiness to take action for the betterment of society, the nation and the world.

This a bit of a mixed bag of generic skills, citizenship and discipline specific goals. These are then specified by 20 specific objectives and 10 learning outcomes.

**Coherence and Clarity:**
The document makes the point that continuity with previous programs is expected, but does not show how this is justified in the content selection for Secondary 4-6. Continuity is assumed as a given. Guidance is supplied in the form of principles for curriculum design – including suggested time allocations.

**Scope:**
Very detailed content guidance is supplied for the compulsory topics. In summary these are:

Living with our physical environment
1. opportunities and risks – is it rational to live in hazard-prone areas?
2. managing rivers and coastal environments: a continuing challenge – facing changes in the human environment
3. changing industrial location – how and why does it change over space and time?
4. building a sustainable city – are environmental conservation and urban development mutually exclusive?

Confronting global challenges
5. combating famine – is technology a panacea for food shortage?
6. disappearing green canopy – who should pay for the massive deforestation in rainforest regions?
7. global warming – is it fact or fiction?

These topics provide good breadth of topic and considerable opportunity to develop themes in depth via elective topic (from tectonics, meteorology, transport and an intensive regional study of Zhujiang Delta).

Fieldwork is to ‘infuse’ the teaching.
**Level of Demand:**
This appears to be appropriate for senior secondary school. The program has clear disciplinary expectations and rigor. There is extensive guidance on teaching and learning. It is noted that an extensive list of references, including topic specific books and articles, give some weight to the academic credentials of the document.

**Progression:**
A section on progression is unclear and confusing – even on what is understood by progression. Much is left to the teacher, who is able to teach the content over three years is any order.

**Assessment:**
There is extensive guidance on the principles of assessment, placing due emphasis on assessment for learning.

A separate section outlines the principles (including the need for alignment) and then the required practice of public assessment for geography. From 2014 this will include a School Based Assessment (SBA) based on fieldwork and a written report. This is justified in terms of raising validity (it counts for just 15% of the total marks).

The specimen paper demonstrates a balance between multiple choice, short answer and one essay question. This is well aligned to the intentions of the curriculum to promote breadth of coverage and depth. However, some would argue that the essay questions are encouraging ‘regurgitation’ rather than application of understanding.

**Vocational education**

**Orientation:**
From 2005 China has implemented a policy of expanding vocational programs (Huang & Shi 2008) and developments in Hong Kong certainly reflect this. The upper secondary curriculum has very strong, detailed programs of study for creative studies, media and communication, business, management and law, services, applied science and engineering and production. Three technical campuses have also been developed to provide further education as part of a modernization program to promote access to employment (Lumby 1999). There is a range of higher education programs providing around 44,000 full-time places. The vocational curriculum is managed by a Vocational Training Council with the intention to ensure a comprehensive system of vocational education and training to meet local employment requirements.

In 2001 the Hong Kong Ministry of Education set these aims:

- to move away from pure knowledge transmission towards fostering learning attitudes and values
- to move away from discipline-based knowledge, towards more comprehensive and balanced learning experiences
• to move away from pure “bookish” knowledge and to improve relevance and interest in the content of a curriculum
• to move away from repetitive and mechanistic rote-learning towards increased student participation, real-life experience, capacity in communications and teamwork, and ability to acquire new knowledge and to analyze and solve problems
• to de-emphasize the screening and selective functions of assessments and instead to emphasise their formative and constructive functions
• to move away from centralisation, so as to leave room for adaptation to local relevance and local needs.

These are broadly compatible with the development of a comprehensive vocational curriculum. In 2008 a Qualifications Framework was launched that set forth a quality assured seven-level hierarchy separating out academic, vocational and continuing education qualifications. This was updated in 2014.

Coherence and Clarity:
The Vocational Training Council works with education and training providers. There is a strong and fully documented secondary curriculum. In addition the Youth College offers programs for Secondary 3 and Secondary 6 school leavers, built around a credit-based program, the Diploma in Vocational Education for school leavers.

The 2007 secondary curriculum is clear and described in great detail. In Secondary 1-3, the focus is on technology. It is an entitlement of every student. It is described as the learning of how human beings solve their daily problems and how to replicate and transfer the process to solve new problems that arise from time to time. Areas of study are specified, but the development of detailed programs is the responsibility of schools.

• technology is the purposeful application of knowledge, skills and experiences in using resources to create products or systems to meet human needs.
• technology influences and is influenced by the cultures of people, is part of our daily life and has impact on the individual, family and society.

The aims are described as:

• technological capability to identify needs, problems and opportunities; communicate and evaluate solutions; and make informed decisions
• technological understanding to understand the interdisciplinary nature of technological activities; the concepts, knowledge and processes of different technologies
• technological awareness to be aware of the cultural and contextual dependence of developing technologies and their impact on the individual, family, society and environment.

Specific knowledge to be covered is prescribed as:
The upper secondary curriculum is based upon recommendations of the Education and Manpower Bureau. The preamble stresses the need to promote lifelong learning and whole-person development. The curriculum is related to the analysis of the main requirements of the Hong Kong economy: financial services, producer services, logistics and tourism. “To maintain both our competitive edge and economic sustainability as a service-oriented and knowledge-driven economy, Hong Kong needs a workforce which can transform ideas into high value-added services.” The program of study for Business and Financial Services describes business as:

…the process of creating value through commerce and production. Business education aims to nurture students' interest and talent in business by developing in them the necessary knowledge and skills, positive values and attitudes to create value through identifying needs, generating ideas and transforming them into business opportunities. Business and financial activities constitute an integral part of our daily lives as we work, consume, save and invest. Besides providing students with knowledge and skills for dealing with business and financial activities in adult life, business education should also aim to promote qualities of citizenship.

There is a strong emphasis placed upon the ethics of business. Students “have to be conversant with the business environment, so as to make effective decisions, not only as members of the business world, but also as socially responsible citizens.”

**Scope:**
Building on the general studies curriculum of the primary phase, which covers science, technology and health, the lower secondary curriculum focuses specifically on technology as discussed above, within the categories of exploration, experiencing and familiarization. The upper secondary curriculum has five options: Business, Accounting and Financial Studies, Health Management and Social Care, Technology and Living, Design and Applied Technology and Information and Communication Technology. Thereafter students may progress (at Senior 3 or Senior 6) to the Diploma of Vocational Education. This includes generic modules in vocational English, mathematics, vocational Chinese for the workplace and information technology, together which what are described as “whole person development modules” together with vocational modules.
Levels of Demand:
The vocational curriculum in the secondary phase is examination based. Papers are set by the HKEAA. Typically there are two or three papers, the first being multiple choice. The questions are of a reasonably complex nature. For example in Business, Finance and Accounting:

Mike wants to set up a yoghurt shop in Mongkok. Which of the following factors is he considering if he conducts a survey on the tastes and preferences of his target customers?

a) technological factors
b) physical factors
c) economic factors
d) social and cultural factors.

However, there is a sense that some answers are politically correct:

Effective management can:

(1) improve staff morale
(2) guarantee company profits
(3) enhance operational efficiency.

a) (1) and (2) only
b) (1) and (3) only
c) (2) and (3) only
d) (1), (2) and (3).

And some are of a factual, rote learning nature:

For products traded on the Hong Kong Exchanges and Clearing Limited, if an investor suffers financial losses on investment due to default of an authorized intermediary, from which of the following institutions should a remedy be sought?

a) investor compensation company limited
b) Hong Kong deposit protection board
c) Hong Kong exchanges and clearing limited
d) securities and futures commission.

The second, written paper is more stretching, and includes material that would be developed as assignments, rather than examinations, in other systems. There are a series of questions requiring written feedback, of a stretching and technical nature:
A business should be responsible to various stakeholders. List three types of stakeholders in a construction company and explain how the company can fulfil its social responsibilities to each of them.

Glassy Ltd and Pearl Ltd are competitors in the same industry. Based on the following information, comment on the liquidity of Glassy Ltd in 2011. (6 marks)

Glassy Ltd Pearl Ltd industrial average
Current ratio 2.8:1 2.0:1 1.9:1
Quick ratio 1.0:1 1.1:1 1.0:1

Ms Li is considering purchasing a mobile phone at a price of $4800, using an instalment plan. The following instalment plans are available:

Plan A: 12-month interest-free instalments with a handling fee of 5% on the price of the mobile phone. The handling fee is spread equally over the instalment period and payable at the end of each month with the instalment.

Plan B: 12-month equal instalments with an interest of 1% per month on the outstanding principal payable at the end of each month. (The present value of an annuity of $1 for 12 periods is 11.255).

(a) calculate (to two decimal places) the respective amount of monthly instalment to be paid under Plan A and Plan B. Show your workings.
(b) which instalment plan should Ms Li adopt? Explain.

The Technology for living examination follows a similar pattern, seeking to test largely practical conceptual skills through a written test. Again there is a mixture of multiple choice and full written answers.

1. Which of the following descriptions of body measurement is correct?

   a) when measuring, the person taking the measurement should stand directly in front of the one being measured
   b) ‘the shoulder point’ is the basic checking point of measuring the shoulder and sleeve length
   c) ‘shoulder to waist’ is the length between waist line and the hip line
   d) ‘chest width’ is the measurement from right to left of the upper chest.

2. Fashion designers have to take a lot of things into consideration when developing a new design. Which of the following is not correct?

   a) velvet has gloss and direction of pile. The most important consideration when using velvet is the direction of the pile
   b) the same colour scheme means to use different intensity
c) the use of bias cut can create the best draping effect  
d) triad colour matching method is a strong, dramatic and fashionable colour combination.

1. You are going to join a fashion design competition with the theme ‘City Rhythm’. You are required to design a set of summer outfits with matching accessories.
   a) draw a coloured ‘fashion sketch’ to show the total image of the design.  
   b) according to your design above, draw a ‘production sketch’ and label all the design features.

2. In Hong Kong, there have been a number of economic changes in the past four decades. These changes have had a significant impact on families’ lifestyle.
   a) state and explain briefly three factors which have led to economic change in Hong Kong. (6 marks)  
   b) referring to the factors you have mentioned in (a), suggest two considerations when choosing household textile products. Name two household fabrics with fabric finishes. (4 marks)

In contrast the Diploma in Vocational Education in built around programs of credit based modules set within the Hong Kong Qualifications Framework. The Diploma programs are in three major areas, Business Services, Engineering and Design and Technology. Students leaving at Secondary 3 would take a further three years to complete the DVE program. The modules a built, locally, around levels 1, 2 or 3 of the 7 level qualifications framework, based upon industrial/commercial criteria. Students may choose clusters of modules to receive a Basic Craft Certificate (level 1), Technician Foundation Certificate (level 2) or the Diploma (level 3).

Progression:
Students may opt to leave school at the end of the lower secondary phase and may then begin study with in qualifications framework, at craft certificate, technician certificate or diploma level. Students leaving upper secondary have direct access to the Diploma in Vocational Education. The Diploma program has the twin objectives of preparing students for further study and enhancing their employability. Those with a Diploma may then apply for admission to a Higher Diploma program, to the City University of Hong Kong, the Hong Kong Polytechnic University and 26 institutions offering self-financing locally accredited sub-degree, degree and top-up degrees. Undergraduates can opt for industry specific modules in the curriculum. There are also a large number of private colleges offering a range of international qualifications.

Assessment:
Hong Kong has a single accreditation authority, the Hong Kong Council for Academic and Vocational Qualifications (HKCAAVQ). In its presentation on various web sites it gives equal weighting to both academic and vocational qualifications. In the lower secondary phase, which focuses on technology, the emphasis is on the development of specific skills, for example:
• the development of manipulative skills in handling tools and equipment in using various materials and in constructing systems
• the ability to observe safety measures when using tools, equipment and machines
• the ability to apply concepts and principles in the design and realization process when formulating technological solutions
• the ability to use the language of technology appropriately, as well as visual forms of presentation for communicating ideas effectively
• the development of generic skills, values and attitudes
• the understanding of the concepts and principles involved in selected knowledge contexts
• the ability to apply concepts and principles in both actual and hypothetical situations
• the development of awareness of the impact of technology on the individual, family, society and environment
• the ability to integrate various TE learning elements to process, interpret and solve complex issues related to technology.

The curriculum is locally determined within schools. Teachers are encouraged to incorporate project work assessment and task-based assessment for both essential manipulative skills and assessing knowledge and conceptual understanding. For example:

(When) developing the manipulative skills of sawing and chiselling, it is important for the teacher to provide immediate feedback to students regarding correct body coordination and appropriate safety habits when performing the cutting action. The teacher can use an observation checklist to collect evidence of student learning of various skills such as holding tools, fixing work pieces, applying a striking force and working safely and then providing feedback to students on their bad practices.

The requirements at this stage are highly flexible:

With clear and agreed learning objectives, students may assess and report their own learning while teachers verify and confirm it.

The approach taken in the upper secondary phase, within schools, is more rigid through an examination based upper secondary vocational curriculum monitored by the HKCAAVQ. In contrast students who chose to leave at Secondary 3 and follow a course accredited through the credit based qualifications framework have a different experience. The language of the qualifications framework implies a very flexible approach closely linked to the needs of commerce and industry. It refers to locally designed assignments. Assessment is described as collecting information for feedback, and there is reference to assessment of and assessment for learning.

Key competencies:
In the lower secondary curriculum technology is given a particularly high status. In is described in universal and rather strident, terms:
Technology Education in the Hong Kong school curriculum focuses on how human beings solve their daily problems and how the processes involved can be replicated and transferred to solve new problems. In the 21st century, technology has become an integral part of our life. Citizens of today require much more than a basic ability to read, write, and do simple mathematics. To live in the modern world, we must understand how technology affects us. In this regard, we must be equipped to use technology effectively and flexibly to solve daily problems with positive attitude at home, in the community, and around the world; and to create new solutions, products, and services for the well-being of humankind.

By studying the related subjects developed in TE Key Learning Area, our students will be better prepared to meet the uncertainties and challenges of the future with regard to social, economic, ecological, scientific and technological changes, both locally and globally. Their studies in this area will help them to lead a healthy lifestyle in adulthood and to contribute to building a caring and harmonious society.

This breadth of vision is carried through to the upper secondary curriculum. The program of study states that “the knowledge and skills that students acquire from senior secondary Technology and Living can be consolidated, extended or applied in learning tasks related to languages, mathematics, sciences, humanities, arts and even physical education. This will help them to develop a more holistic and coherent understanding of the world around them.”

It is made explicit within the various vocational options that students should develop wider ecological and social concepts. For example in the fashion technology course students should:

- respond sensitively to diversity among individuals and families
- take social justice and ecological sustainability into account when considering issues and actions in the contexts of food and clothing
- develop positive values and attitudes to make informed decisions that foster a healthy lifestyle and contribute positively to the social and economic future of society
- develop an aesthetic sense through the design and production processes of fashion, clothing and textile products.
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