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Aligned Instructional Systems: Cross-Jurisdiction Benchmarking Report

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Executive Summary

Background

In August 2013 the Center for International Education Benchmarking (CIEB), a program of the National Center on Education and the Economy (NCEE) in Washington DC, asked the University College London Institute of Education (IOE) to produce a comparative curriculum study across seven countries. The study set out to compare the instructional systems and to understand any impact the intended curriculum might have on the jurisdictions' international success.

The remit was to analyze the coherence and quality of the educational systems in the seven countries, concentrating on their overall system design and its contexts. It included goals, standards, curriculum frameworks, assessment systems, teacher training on the curriculum/assessment systems and the accountability systems.

The NCEE chose the jurisdictions on the basis of their high perform characteristics. It defined "high performing" in terms of the outcomes of the 2009 PISA tests (the 2012 test results were subsequently published in December 2013) in reading, mathematical literacy and scientific literacy. Participation in international assessments is largely predicated on the notion that knowledge and skills is a prime driver of a nation's economic performance. Most countries' policymakers believe that educational achievement is the key to economic success; such nations see themselves as competitors in a global market, with educational achievement one of the main tools for staying in and succeeding in the race.

The high performing countries (and jurisdictions within) selected were:

- Australia (New South Wales and Queensland)
- Canada (Alberta and Ontario)
- China (Hong Kong and Shanghai)
- Finland
- Japan
- Singapore.

In addition, the study also profiled the instructional system in the United States in two states: Massachusetts, which is a high performing jurisdiction, and Florida, which can best be described as a moderate performer.

Methods

There are a number of studies that cover education reforms on a system-wide basis and primarily concentrate on cultural underpinnings, leadership, teacher quality and the quality of resources. This study concentrates on the intended curriculum and its associated assessments. The overall

study is comparative in nature, describing, analyzing and comparing the elements and overall design of the systems.

The study began with intensive, country-based evidence gathering across the seven countries (including the US), primarily through desk research. Data were organized to allow senior researchers to delve into each jurisdiction's instructional system, concentrating on evidence that provided:

- A description of the context for each instructional system, including
 - an overview of the elementary and secondary education system
 - a description of how the instructional system developed and how it is governed including who has the authority to set the standards, curriculum and assessments
 - a description of the current structure of the system and how students move through it
 - a description of the accountability system for teachers and students specifying what they are held accountable for
 - the national approach to curriculum and its purpose.
- A description and analysis of each nation's instructional system, including
 - a description of what elements of the curriculum are required and which are elective, and how much time is allotted to each
 - a detailed description and analysis of the components of the instructional system for the required programs of study for elementary, lower secondary and upper secondary schooling for language of instruction (language arts), mathematics, social studies/history, science and applied and/or vocational learning
 - the standards and curriculum frameworks
 - how curriculum is organized based on what is important and why; curriculum content for each subject at each level and corresponding age
 - the nature of the assessments aligned with the curriculum; grading rubrics
 - an analysis of the distinctive characteristics of each country's instructional system.

Once the descriptive work was accomplished analyses took place on a subject basis, both at a single jurisdictional level and across the jurisdictions. This resulted in separate subject reports for each jurisdiction complemented by context reports for each jurisdiction. The latter, in draft form, were reviewed and checked for accuracy on a number of occasions by in-country experts, some of whom worked for the relevant ministries.

Limitations

It should be stressed that the reports and subsequent analyses cover the intended, rather than the taught or received curriculum. Because of the desk-based nature of the research, the project team was unable to ascertain how curriculum and assessment policy were realized in the classroom. Where possible, relevant academic literature was incorporated into the reports, but no claim is made that this was a systematic review of all available literature.

Gathering the data was easier for some jurisdictions than for others. While some had complete policy statements, syllabi, guidance documents and sample assessments on easily accessible websites, other jurisdictions did not, or only had some subjects' materials and not others. Past examination papers proved especially difficult to track down in a number of cases. For those jurisdictions whose language of instruction is not English, documentation in English often proved difficult or impossible to obtain. Where possible we worked with native speakers who could talk through on-line documentation with our subject experts. There were also both financial and physical difficulties in procuring some of the material that might have been analyzed, for example, even where there was only one set of permitted textbooks, it proved impractical to obtain them.

Elements of a curriculum

A curriculum can be viewed as having three elements:

- a set of content and performance standards that display the expected student achievements at specific points of time
- a set of pedagogic or teaching approaches
- a set of assessment processes.

The content and performance standards define what students should know, be able to do and which dispositions they should have acquired. Standards are generally expressed in statements of expected achievements or level-descriptors defining expected achievements. Knowledge of something is the traditional form a set of content standards takes, to which we can add knowledge of how to do something and dispositional knowledge, that is, knowledge which refers to relatively stable habits of mind and body, sensitivities to occasion and participation repertoires.

These standards are not the same as pedagogy, teaching approaches or assessment processes, hence the foundations of any curriculum are those content and performance standards that nations and jurisdictions have decided are the most appropriate forms of knowledge, skills and dispositions for learning in schools.

Approaches to organizing/structuring instructional systems among high performing jurisdictions

There were a number of factors that we identified as useful to compare across the jurisdictions. While we believe these are all important and help to build a comprehensive picture of the curriculum for the jurisdictions, there may well be other factors that we have not been able to examine. Given the problems of gathering sufficient data from all jurisdictions, it did not prove possible to provide equal input from all nations on each and every factor analyzed.

The aims of the education systems

Many of the jurisdictions share similar statements of aims for their education systems. Nonetheless, it is interesting to look deeper into how systems' aims balance what we might describe as 'education for education's sake' with a more instrumental view based on succeeding in a globally competitive world. Most of the jurisdictions under study strive to combine both the philosophical and the practical in their policy aims and vision. An emphasis on literacy and numeracy, problem solving, critical and creative thinking and citizenship as well as economic impacts pervades the aims.

Both Japan and Singapore clearly see their education systems as economic drivers in a much more systematic way than the other jurisdictions. Alongside economic achievement there is a clear nationalist element of loving and respecting one's country, and developing committed, capable citizens who can cooperate but also stand out by themselves in a globalized world. By far the most student-centered system is Finland, with a set of social aspirations based on equity and equality. The individual is seen as the cornerstone of a democratic society and education should aim to empower individual students, by fostering their potential and interests throughout life, in order to equip them with the knowledge and skills to develop an equal society. In contrast, the Australia and Canadian states and provinces, respectively, look forward and are the most dominated by OECD's conception of 21st century skills. They emphasize the basic skills agenda together with the problem solving, creative and entrepreneurial skills fit for an economy of the new millennium.

Although the aims and objectives of the 'high performing' jurisdictions differ in both detail and overall approach, they are all clear, strong and well thought through, suggesting that the more assertive the underlying principles, the easier it is to create a coherent curriculum to represent those aims.

Embedding 21st century skills in the curriculum

21st century skills, as defined by the OECD, are those considered necessary for citizens to thrive in a globally competitive marketplace and be responsible and contributing members of society. All of the jurisdictions studied have highlighted the essential skills and dispositions that they want all of their students to acquire by the time they graduate from upper secondary school, but their emphasis and prominence varies. Both centralized and decentralized systems have to decide how much choice schools have in incorporating these skills into everyday school life.

The Australian states, Canadian provinces and Finland seem to have the most developed approaches, with curricula that include a large range of skills, well developed cross curricular approaches and a commitment to implementation. They also have some history of developing competency based approaches. This contrasts with the US jurisdictions, where Florida, for example, does not appear to have an overt commitment to these skills.

All the East Asian countries to some extent seem to be trying to impose a top-down reform, encouraging their schools to loosen their strict subject boundaries and try integrated projects,

group and team working, problem solving and critical thinking. While we cannot judge how successful these reforms are, it is clear that in each jurisdiction there is resistance to these changes and a belief in their traditional systems and approaches to teaching and learning.

The balance between centralized and decentralized management of education

Levels of government prescription and control in managing school systems vary considerably among the jurisdictions studied. Regulation can consist of a mixed bag of national and local control, for example, with national curriculum guidelines that each locality or school can interpret for itself.

Some of the jurisdictions studied have a prescribed national curriculum, a policy recently enacted in Australia, while others have a core curriculum that allows for considerable local interpretation such as Finland. Defining curriculum and assessment can be coupled with other prescriptions such as centrally controlled textbook and other support material provision. Both Florida and Massachusetts are centered on the state level regulation, Florida perhaps more than Massachusetts. There, apart from some choice in buying textbooks and other teaching resources, local schools are very much on the receiving end of governor-centered policy. Singapore, like the Chinese provinces, is starting to move towards greater devolution of education responsibility to local and school level. However, as far as we can tell this remains the most centralized of the jurisdictions in this study. Unsurprisingly, Finland occupies the other extreme position, with a very even split of responsibilities across national, regional and individual school level, with all elements having an important part to play in establishing educational policy and priorities.

The two Chinese provinces and Japan all have a history of very centralized government-led education policies, which they are currently reforming in an attempt to liberalize and democratize their approaches. Nonetheless, the two Chinese provinces have only really started on their devolution of responsibility to the local level. In Japan, the main counterbalance to state control is arguably the parents via the media, which appears to have an important say in Japanese education policy.

Two of the federal countries have very different approaches, with Canada devolving almost all its educational policy making to the provincial governments, while in Australia there is a stronger common core, albeit with states able to take a variety of approaches. So in Australia we see a mix of responsibility between federal, state and schools for most aspects of policy, while in Canada it is largely shared between the provincial government and the elected school boards.

Most of the jurisdictions require textbooks to be centrally approved. Schools in Ontario, Alberta, Hong Kong and Singapore have to buy text books from an approved list; the same is true for Shanghai, although there are some freedoms for schools to buy elsewhere or develop their own resources. In Japan the government supplies textbooks for those in elementary and junior high schools while in Massachusetts schools can buy textbooks freely, but they need to be approved

by a regional superintendent. In Florida at least half of textbooks have to be state approved, Only in Australia and Finland can schools freely acquire text books from any source.

Accountability for schools, principals, teachers and students

Governments want both to influence and reliably gauge how well individual students, teachers, localities, regions and the nation itself are performing against education policy objectives. Many of the jurisdictions studied have developed assessment-based accountability policies in the belief that assessment outcomes are the fairest and most objective measure of national achievement.

In many cases politicians need to show positive outcomes of their assessment policies within a single election cycle. To achieve these aims they develop systems that attach rewards and sanctions – a widespread form of accountability measures – to the outcomes of their assessment policies. Some policymakers believe that such accountability systems provoke improvements in educational performance; assessment outcomes are also used to evaluate whether or not the programs and policies are working, meaning that there has been a shift from using tests as measurement instruments designed to produce information to the use of tests as a mechanism for changing behaviors within schools. We describe such testing as being high stake testing.

When assessment systems become high stake, even those that might be useful monitors of educational success can lose some of their dependability and credibility. In this way accountability policies can encourage schools to shift away from a curriculum to a test focus; what is not tested is either not taught or is given minimal time.

Both Australian states appear to have rigorous accountability processes conducted through extensive testing. In many ways NAPLAN appears to be a classic high stakes test. However, it is also argued that despite the wide dissemination of the results there is no great sanction available for use against a school that does not do well in NAPLAN testing.

In Canada regular testing is used to identify schools or districts that need greater support, but there does not seem to be a culture of blame on less well performing schools. Once again, the situation is complicated in the East Asian schools by the culture of high parental expectations and very high stakes school leaving/post-school/university entrance testing. So while Japan may have an external evaluation system that is similar to Finland, it works very differently because of the culture of the country where passing the university entrance exams is seen as a both a high achievement and a necessary one. Singapore, Florida and Massachusetts all carry out rigorous categorization of schools based on testing of students, and perhaps the highest stakes is for Florida schools for which a low grade really could mean the closing of a school.

Mandatory and optional subjects in programs of study

All jurisdictions must decide how much time to devote to in-school instruction and which subjects are mandatory in which grades and for how long. Generally there are regulatory requirements

regarding hours of instruction overall as well as hours spent on particular subjects. However, in some of the jurisdictions there is a certain amount of leeway for local autonomy in the organization of curriculum time or subject choice.

The OECD has gathered data on compulsory instruction time and the number of days in the school year for some of the jurisdictions under study. Superficially, there does not seem to be an association between hours and days spent in the classroom and high performance. For example, China, Finland and Japan have the smallest average hours per week direct instruction on compulsory subjects of the countries recorded. However, Japan has the longest school year. Teacher collaboration outside set classroom hours could possibly help explain the low numbers for China and Japan.

If we look at the time spent on certain subjects in different jurisdictions we can see some differences of emphasis. So, for instance, primary students in Finland appear to spend less time studying mathematics, science and home language than the other jurisdictions studied. For Year 8 students, Japan appears to allocate less time for language arts, mathematics and science than the other jurisdictions, while Shanghai and Singapore allocate the most.

It is interesting to note that New South Wales, Shanghai, Hong Kong and Japan all specify large periods of elective or flexible time in secondary school. It should perhaps be borne in mind that in many Asian countries students have traditionally spent a great deal of extra time in the classroom outside of normal hours, both doing extra studies at school or with private tutors. Also, jurisdictions such as New South Wales and Finland have a great deal of flexibility regarding how the time is spent in each grade; they have allocations of time across age bands, giving schools autonomy in how they actually use that time.

Balancing disciplines and integrated curricula

Whether or not, and in what way(s) to integrate curricula is not a straightforward subject. Protagonists of integrated curricula believe that it reinforces skill development and transfer and that it inspires student constructivist learning. Opponents believe that it detracts from serious disciplinary learning and can be a source of confusion for students.

Curriculum integration may range from strongly expressed curricula, as in the traditional approach, to weakly expressed networked approaches to curriculum planning. A strongly expressed curriculum has clear boundaries between the different subjects and thus cannot reasonably be thought of as integrated. Subject delineations are clear-cut, they are taught in separate blocks on the timetable, they have their own formal knowledge structure, and content is treated as distinctive and belonging to the specific area.

The most explicitly recognized approach to integrated approaches arises from the decision to embed 21st century skills in the curriculum. In almost all cases this development is a recent innovation and has been introduced from ministerial level. We know that in some jurisdictions the aspirations from the top have not necessarily been met with enthusiastic compliance from below.

Interestingly, while Queensland was a very early leader in developing integrated approaches, it has recently reined back a little from that position, both the Chinese provinces and Singapore have made dramatic progress, particularly in science, to introduce not just integrated curricula but integrated examinations in the case of Shanghai.

While in many cases it is too early to judge the success or otherwise of these concerted attempts to move away from subject oriented content towards more integrated and competency based study, there is a clear 'direction of travel' in favor of further integration of the curriculum and away from the classical fixed boundaries of the traditional subjects.

The balance between a curriculum that delivers knowledge and applied and/or vocational learning

Vocational learning, with hands-on 'applied' elements, especially in upper secondary and post-compulsory education, is often seen as a way of augmenting the participation rates of young people in education. Social equity and inclusion issues often come into play as well, with direct attempts to retain students who might otherwise have left school early. Gallagher (2013) notes a number of reasons why students may want to leave school:

- a lack of perceived relevance
- a need to see how learning can be applied
- a desire to integrate work-based learning or study subjects outside traditional disciplines
- lack of success in conventional programs
- wanting to enter a more "adult" environment
- dissatisfaction with the school experience.

While these are largely negative reasons for offering applied and/or vocational learning, that is, to counteract the sentiments expressed above, Green and Farazmand (2013) cite the positive impact of applied teaching in enhancing students' learning. They see applied and/or vocational learning, especially when it involves project work, as a bridge between theory and application that leaves students with a sense of satisfaction, achievement and effectiveness. 'Real world' experiences widen students' perspectives and can cause a positive behavior change as well as providing the foundation for future career success, encouraging the development of skills such as decision making, problem solving, team work and written and oral communication (Green & Farazmand 2013).

In each of the systems under study, some form of vocational/applied learning outside the usual skills based traditional courses such as design and technology and ICT are offered to some, but not all, students, sometimes in separate settings from academic schools and generally only at secondary (in some upper secondary/post-compulsory).

In all the jurisdictions studied there are vocational pathways open for students from around Grade10 onwards. While these pathways may be more or less vocationally oriented, they all

include a core element of academic subjects, most usually language of instruction and mathematics, sometime science, social studies and a foreign language (usually English) and in most there is an option of progressing to higher education if desired.

Overall the jurisdictions are trying to open up vocational pathways, which, while primarily designed to get students into work, can also allow progression through to higher education.

Differentiating curricula in terms of streaming, setting and/or ability grouping of students

Differentiating students is usually done by streaming, setting and/or ability grouping. All of the jurisdictions differentiate among some students at some point, largely in upper secondary. There are courses of different demand in mathematics – all students do not do pre-calculus and/or calculus in their final years of secondary study, but in all jurisdictions, some do. Ability grouping allows students to remain in heterogeneous classrooms, for example, through reading groups in primary education; setting means that a combination of heterogeneous and homogenous classrooms can be found in the same school, for example, ability groups in science but mixed ability groups in social studies; streaming is the most differentiated, when groups of students study with peers of their own ability group.

The efficacy of differentiating students by ability is a deeply contested area. Those who are positive about differentiating students believe that all students will be taught at the right level and have access to textbooks and resources that reflect their ability, and that for teachers ability grouping are easier to prepare for, teach and assess. On the other hand proponents of mixed ability classes argue that all children working together allows for the highest performance for all, where students can help each other out and higher achievers get challenged through aiding students who might not have grasped a concept as quickly as they.

The majority of jurisdictions studied have clear policies encouraging classes to remain together and to cover the same material. There may be explicit enhanced programs for the gifted and talented, or extra support, possibly extra tuition or students withdrawn to small groups, for those who are struggling. However, this differentiation is almost always within the class and at the teacher's discretion.

In general this approach ends at upper secondary level. In China and Japan different schools cater for students with different progression routes, in Canada there are alternative pathways leading to different outcomes for students, and in Finland students either enter general or vocational pathways. The Australian states have no explicit policies on setting or streaming, but devolve this to school or classroom level.

Singapore is the obvious outlier. Students are assigned different pathways from a much earlier age than in other jurisdictions, the basis being examination in Primary 4. While students can and do change pathways thereafter, for the majority their future is to some extent mapped out at an early age.

Pathways, gateways and qualifications

All of the jurisdictions studied have some sort of alternative pathway for upper secondary students, even if it simply consists of increasing the volume of vocational courses. One of the elements that sets some systems apart from others is the availability of separate subject/sector qualifications that have been externally assessed, most notably in Singapore, as opposed to general secondary school leaving certificates such as the high school diplomas in the US and the Canadian provinces. And while compulsory leaving age varies among the jurisdictions, this is not really an indication of who might stay on – Japan has a low leaving age, but the vast majority of its students stay on through some form of post or upper secondary education.

Assessment

Assessment may be defined as the process of gathering evidence and then interpreting that evidence in the light of some defined criterion in order to form a judgment. This definition covers both the summative (assessment of learning) and formative (assessment for learning) aspects of assessment that the jurisdictions studied use in order to ascertain if students have been successful at obtaining the knowledge, skills and understandings that define the intended curriculum¹. Summative assessment is a success measure of the outcomes of the end of a program of study; it is almost always a formal process and can include teacher judgment as well as testing. Formative assessment is the process of seeking and interpreting evidence for use by students and their teachers to decide where the students are in their learning, where they need to go and how best to get there. One of its key elements is feedback as part of the learning process.

All of the jurisdictions prescribe a combination of the two types of assessment, but the emphasis is different, from the school-based, largely formative assessment found in Finland and Japan to the high stakes testing in Singapore and the US. Queensland introduces another variable – assessment as learning, which sets in policy terms students' active participation in the assessment process.

The quantity, level and importance of testing vary significantly across the jurisdictions studied, from those that conduct literacy and numeracy tests most years to jurisdictions that conduct few or no external tests, and which do not publicize the results. Australia's rigorous regime of NAPLAN looks like a dominant, high stakes regime, although testimony from the country suggests that it does not have the same level of high stakes impact. Hong Kong is moving away from frequent territory-led testing, which is also the intention of Shanghai. However, the continuing dominance of the traditional Chinese *zhongkao* and *gaokao* exams can distort the teaching and learning process. Singapore conducts external tests in three stages – at the end of primary school, upper secondary and post-secondary. However, the nature of the system, with its

¹ Some scholars argue that the summative/formative distinction is not the same as the distinction between assessment of and assessment for learning, for example, see Bennett, R. E. (2011). Formative assessment: a critical review. *Assessment in Education: Principles, Policy & Practice*, 18 (1), p. 5-25.

large number of differentiated pathways and early setting regimes means that the system is characterized by intense, exam-driven assessment.

Curriculum approaches to subjects' programs of study

The project examined the curricula for a range of subjects across all the jurisdictions. The main foci of individual reports were:

- *Coherence and Clarity* – To what extent do the curricula contain clear and specific goals for each grade and each of the subjects? To what extent do the suggested learning activities and pedagogical materials support those goals? Are the levels of specificity in the curricula appropriate?
- *Scope* – What is the scope of material coverage and the strengths and weaknesses of the decisions made by the different jurisdictions? Is the number or amount of items or goals in the curriculum versus the depth of mastery proposed of each one suitable? Are there examples of jurisdictions that have the balance right? What makes them stand out?
- *Levels of Demand* – To what extent do the jurisdictions describe the items that comprise their curricula at the appropriate levels of difficulty? [An appropriate level of difficulty should be defined as one that builds sequentially on prior and existing knowledge and presents an achievable challenge to the average student. Consideration of appropriate levels of difficulty should also be set with consideration to the typical range of learning abilities in a typical classroom. It should be set in ways that allow for all students to learn while minimizing the time wasted by the faster learners.] Do some of the jurisdictions demand more of their average students than others? Is there a correlation between the level of demand and the outcomes of international tests?
- *Assessment* – In relation to both formative and summative assessments, what is their rigor, intensity and transparency. Do the assessment samples match the curricula? Do they adequately cover the upper ranges of taxonomies such as Bloom's?
- *Orientation* – What are the aims, goals and rationale for the subject/content area. What is the stated vision? Do the goals align with economic or other outputs? What is the purpose of the subject study?
- *Progression* – How smoothly and coherently do the learning goals and proposed content of a given curriculum in a given subject progress from one grade level to the next?
- *Key Competencies* – What is the level of development of a number of key competencies (sometimes called 21st century skills) in the current curriculum and textbooks (such as problem solving, teamwork, self-learning, creativity, and critical thinking competencies)? Do some jurisdictions feature these more than others, and if they do, does the curriculum and assessment match the rhetoric?

The subjects analyzed were:

- Language of study – which is not necessarily the first language of a jurisdiction
- Mathematics

- Science
- Social studies
- Applied and/or vocational learning.

Detailed reports for each jurisdiction can be found in the individual country reports (see [www....](#))

Common features of high performing countries' instructional systems

We could ascertain no overall *instructional system* patterns that the jurisdictions we studied had in common. Their curricula do not seem to be more demanding than other curricula with which we are familiar, they do not all have longer school days or longer school years, they begin formal teaching at different ages; some have high stakes testing throughout the school years, others have none at all except for school leaving or university entrance examinations and the amount of assessment data shared publicly varies.

Where the aims and objectives of the educational system are clear and discerningly defined, the values feed through the resultant curricula providing a coherent approach. For example, the Finnish overarching aims of equity and equality feed clearly into subsequent elements of the curriculum, from the lack of streaming through to a desire to exclude no student from progression to college or university.

Accountability systems differ widely, with some relying on internal mechanisms and others building in results of national assessments. The level of national scrutiny varies, even in federal systems, so while the Canadian provinces operate with almost total independence from the federal center, Australian states are required to have more alignment with the center. Differential grouping varies from early setting in Singapore's upper primary years to the more common upper secondary, when most jurisdictions introduce an element of differentiation in some, but not all subjects. Some jurisdictions separate students into different types of institution while others do not and the age of the separation varies. Some teach subjects separately from primary school; others integrate their curricula. Attitudes toward applied and vocational learning vary, but in most cases students have options for vocational or applied learning at upper secondary; generally it is clear that these are seen as the non-standard pathways for those who have not succeeded in academic subjects. And while all promote a combination of formative and summative assessment, the emphasis on the former differs. There are also differences in the proportion of school and teacher-based assessment that counts towards student outcomes.

All of the jurisdictions have recently reformed their instructional systems, albeit not all in the same direction. In the US, for instance, states such as Massachusetts and Florida are working to align their curricula with the Common Core State Standards.

In very general terms the reforms fall into three categories:

- systems that are attempting to de-rigidify, that is, attempting to move away from rote learning, over-prescribed curricula and an undue emphasis on examinations and testing
- systems that are in a steady state of reform, with planned instructional systems changes carried out over time
- systems that have introduced instructional system reform and have modified them in the face of professional and public unease.

It is probably safe to say that Western nations' educational systems are more influenced by the fluctuation of politics than Asian systems, with notable exceptions, such as Ontario. Some Western democracies seem to have a more "excitable" cycle in which election swings can drive reforms and patience for long-term change is limited.

Introduction

Remit from NCEE/CIEB

In August 2013 the Center for International Education Benchmarking (CIEB), a program of the National Center on Education and the Economy (NCEE) in Washington DC, asked the University College London Institute of Education (IOE) to produce a comparative curriculum study across seven countries as part of a four-part study commissioned by the NCEE - the other three being on Teaching Quality, Vocational and Technical Education, and Leadership. The study set out to find commonalities, compare the systems and produce both country and policy reports in an effort to understand the impact of what the countries set out to teach (the intended curriculum) and the context in which they teach it on their international success. It was hoped that the findings from this work could be important in analyzing current and future policy initiatives, particularly around standards, curriculum and assessment. They can also help to provide evidence of world-class curricula, assessments and standards in some of the highest performing jurisdictions in the world.

In *Surpassing Shanghai*, Marc Tucker (2011), President of the NCEE, argued that high performing nations have “abandoned the idea that only a few of their citizens need to have higher-order skills and creative capacities” (171). Instead, they have designed educational systems that include intellectually demanding curricula for all students, generally through the provision of national curricula set to the highest standards with some national assessment along the way. Those assessments generally include what Bishop et al (2000) called curriculum-based external exit examinations and they contain the following properties:

- they produce signals of accomplishment that have real consequences for the student
- they define achievement relative to an external standard, not relative to other students in the classroom or the school
- they are organized by discipline and keyed to the content of specific course sequences
- they signal multiple levels of achievement in the subject. If only a pass–fail signal is generated by an exam, the standard will likely be set low enough to forestall a political backlash that overturns the standard. A low pass–fail standard will not stimulate the great bulk of students to greater effort
- they cover almost all secondary school students ... The school system as a whole must be made to accept responsibility for how students do on the exams
- they assess a major portion of what students studying a subject are expected to know or be able to do (335).

The NCEE defined “high performing” in terms of the outcomes of the 2009 PISA tests (the 2012 test results were subsequently published in December 2013) in reading, mathematical literacy and scientific literacy. Over the last two decades countries have increasingly participated in international assessments of student achievement. This participation is largely predicated on the notion that knowledge and skills – human capital – undergird nations’ economic performance. Most countries’ policymakers believe that educational achievement is the key to economic

success; nations see themselves as competitors in a global market, with educational achievement one of the main tools for staying in and succeeding in the race. Hanushek and Woessmann (2010) argue that improvements in young people's cognitive achievements as evidenced in international student achievement tests increase long-run economic growth. Therefore, measuring educational outcomes, rank ordering nations' results and using those results to inform educational policy change have become commonplace.

The high performing countries identified by NCEE (and jurisdictions within) were:

- Australia (New South Wales and Queensland)
- Canada (Alberta and Ontario)
- China (Hong Kong and Shanghai)
- Finland
- Japan.
- Singapore.

In addition, the study also profiled the instructional system in the United States in two states: Massachusetts, which is a high performing jurisdiction, and Florida, which can best be described as a moderate performer.

The study aimed to analyze the coherence and quality of the educational systems in the six countries, concentrating on their overall system design and its contexts. It included goals, standards, curriculum, curriculum frameworks, assessment systems, teacher training on the curriculum/assessment systems, and the accountability systems for teachers, principals (heads) and schools.

There are a number of studies that cover education reforms on a system-wide basis and primarily concentrate on cultural underpinnings, leadership, teacher quality and the quality of resources. This study concentrates on the **intended curriculum** and its associated assessments. The overall study is comparative in nature, describing, analyzing and comparing the elements and overall design of the systems. We have written it in as accessible a manner as possible, with a minimum of jargon and technical terms in order to facilitate the communication of our findings beyond the academic community, reaching out to policymakers and practitioners, who might use its analyses to improve the design of their own systems.

Methodology

The subjects that the NCEE wished to be included were:

- language of instruction (language arts)
- mathematics
- science (integrated and the separate sciences of biology, chemistry, earth science and physics)
- social studies (history and geography)

- applied/vocational learning.

For applied/vocational, we mainly explored the subject(s) considered under this label at the system level, since one of the other NCEE projects was exploring issues in depth. For the subject-based aspects of the work we involved both primary (generalist and subject-based) and secondary specialists, as well as assessment specialists. In total over 40 academics from IOE and other London universities and UK institutions were involved in this analysis.

The study began with intensive, country-based evidence gathering across the seven countries (including the US), primarily through desk research – internet searches, web-based research, phone calls, mailings, etc. This phase of the work was carried out by two IOE PhD students, led by IOE subject and country experts, in consultation with international researchers where needed. Data were organized to allow senior researchers to delve into each jurisdiction's instructional system, concentrating on evidence that provided:

1. A description of the context for each instructional system:
 - Overview of the elementary and secondary education system including brief historical context and phases of development
 - Description of how the instructional system developed and how it is governed including who has the authority to set the standards, curriculum and assessments and the process for setting and updating them
 - Description of the current structure of the system and how students move through it
 - Description of the accountability system for teachers and students specifying what they are held accountable for
 - The national approach to curriculum and its purpose (the nation's vision for its curriculum based on social, economic and political goals including any recent trends and current issues in this arena).
2. A description and analysis of each nation's instructional system:
 - A description of what elements of the curriculum are required and which are elective, and how much time is allotted to each
 - A detailed description and analysis of the components of the instructional system for the required programs of study for elementary, lower secondary and upper secondary schooling (including but not limited to home language, mathematics, social studies/history, science and applied learning); the standards and curriculum frameworks; how curriculum is organized based on what is important and why; curriculum content for each subject at each level and corresponding age; and nature of the assessments (diagnostic, formative, and summative) aligned with the curriculum; grading rubrics
 - An analysis of the distinctive characteristics of each country's instructional system.

Documents gathered included:

- curriculum policy documents

- syllabi
- curriculum frameworks
- tests (past papers and sample assessment materials)
- academic literature.

After this first phase of evidence gathering (September through December 2013), the materials were organized and summarized according to a research framework (January 2014 through February 2014). Once the descriptive work was accomplished in-depth analyses took place on a subject basis, at a single jurisdictional level and across the jurisdictions (March through September 2014). Senior subject and country experts, both from the IOE and residents of the jurisdictions under study, carried out this work. It resulted in separate subject reports for each jurisdiction complemented by context reports for each jurisdiction. The latter, in draft form, were reviewed and checked for accuracy on a number of occasions by in-country experts, some of whom worked for the relevant ministries.

A Steering Group was convened to provide oversight and quality assurance. This group consisted of world-recognized leaders in curriculum and comparative education such as Tim Oates from Cambridge Assessment, Dennis Opposs from the Office of Qualifications and Examinations Regulation (Ofqual), Professor Alison Wolf from King's College London, Professors Michael Young, Dylan Wiliam and Chris Husbands from the IOE alongside other senior leaders from the IOE.

Outputs

In addition to this overview report, the team has produced eight other reports:

1. Australia jurisdiction report, featuring New South Wales and Queensland
2. Canada jurisdiction report, featuring Alberta and Ontario
3. Shanghai jurisdiction report
4. Hong Kong jurisdiction report
5. Finland jurisdiction report
6. Japan jurisdiction report
7. Singapore jurisdiction report
8. Aligned Instructional Systems: cross jurisdiction benchmarking report (this document)
9. Aligned Instructional Systems: curricular issues and choices.

The jurisdiction reports, which are between 30,000 and 70,000 words long, were compiled under the following headings:

- history and background
- structure of the education system
- policy aims and vision
- 21st century skills

- governance
- accountability
- setting standards
- teacher training
- the curriculum system
- assessment processes
- international testing
- detailed analysis of the curriculum
- references.

This overview report contains the following headings:

- executive summary
- introduction (remit, methodology, outputs, limitations, and curriculum)
- what do high performing countries' instructional systems have in common?
- different systems approaches among high performing jurisdictions (structure, policy aims and vision, 21st century skills, governance, accountability, standard setting, teacher training (ITT and CPD), assessment processes (in general); and national assessment frameworks)
- different curriculum approaches among high performing jurisdictions: (by subject, covering orientation, coherence and clarity, scope, levels of difficulty, integration, progression, assessment and key competencies)
- questions raised by analysis of curricula of high performing jurisdictions.

Regarding different systems approaches to the organization/structure of their instructional systems, in this report we focus on what high performing jurisdictions typically do regarding:

- the goals or aims of the education system and how these are carried out through the curriculum
- embedding those skills considered necessary for success in the 21st century in the curriculum
- the balance between centralized and decentralized management and control of the instructional system
- principles and methods of accountability
- the definition of what should be mandatory and what should be optional in programs of study
- balancing disciplines and integrated curricula
- the balance between a curriculum that delivers knowledge and applied and/or vocational learning
- differentiating curriculum in terms of streaming and/or setting students.
- pathways, gateways and qualifications

- assessment.

Regarding different curricular approaches to subjects' programs of study, in this report we focus on what high performing jurisdictions typically do regarding:

- orientation
- coherence and clarity
- scope
- levels of demand
- progression
- assessment
- key competencies.

All of the reports and other related materials can be found on the following website: www.cieb.cl.

Limitations

The findings are limited in a number of ways. One of the most important is that the reports cover the intended, rather than the taught or received curriculum. Because of the desk-based nature of the research, the project team was unable to ascertain how curriculum and assessment policy played out on the ground – that is, what actually went on in classrooms. So, for example, where jurisdictions emphasize embedding 21st century skills into the curriculum, but still maintain an examinations culture, it is impossible to say whether or not teachers take the time to foster those skills among their students. Where possible, relevant academic literature was incorporated into the reports, but no claim is made that this was a systematic review of all available literature. Nonetheless, insights from the literature helped shed light on the ministerial evidence collected.

Gathering the data was easier for some jurisdictions than for others. While some had complete policy statements, syllabi, guidance documents and sample assessments on easily accessible websites, others did not, or only had some subjects' materials and not others – in some cases the history curricula were especially difficult to get access to, even in the language of instruction. Past examination papers proved especially difficult to track down in a number of cases. For those jurisdictions whose language of instruction is not English documentation in English was patchy. Where very little evidence was in English we employed native speakers to sit down with our subject experts and read through curricular and assessment materials together – getting everything translated would have been both prohibitively expensive and a wasteful use of resources. There were also both financial and physical difficulties in procuring some of the material that might have been analyzed, for example, even where there was only one set of permitted textbooks (which actually was the exception rather than the rule), it proved impractical to get them.

Time constraints proved surprisingly challenging. Despite having up to 40 people working on the project at one time or another, 15 months was not enough time to do a thorough analysis and

review of all the evidence gathered. For example, while the contextual documents for each country were checked by at least two people outside the writing team and sometimes as many as five or six, there was not enough time or resource to have each of the subject documents verified by an in-country subject expert. Were the project to be repeated that is certainly something we would recommend, especially in subjects such as language arts, geography and history where so much of the content and context requires significant interpretation.

Lastly, and importantly, was the constantly moving policy and educational reform landscape in almost every jurisdiction studied. A decision was taken to evaluate the most recent curricular materials, even if they were not necessarily the ones from which students taking PISA, TIMSS or PIRLS assessments in 2012 and 2011 had been taught. The same was true with policy – the reports aim to discuss major policy events and changes through 2014, although no claim is made that every aspect could be covered off. Even in the final stages of the project significant changes are regularly announced which will have a major impact on several jurisdictions. What we believe is important, however, is the direction in which a jurisdiction is heading and it is our hope and intention that major policy drivers have been found and acknowledged.

What we mean by Curriculum

A curriculum is an intended program of learning and can be viewed as having three elements: a set of content and performance standards that display the expected student achievements (what they know, what they can do and what dispositions they have acquired) at specific points in time; a set of pedagogic or teaching approaches; and a set of summative assessment processes. This section concentrates on the first, referencing the second and third as they relate to those content and performance standards.

Content and Performance Standards and Standards for Curricular Comparisons

The content and performance standards define what children should know, be able to do and which dispositions they should have acquired. Standards are usually expressed as statements of expected achievements or level-descriptors defining expected achievements. These three elements then – knowledge, skill and disposition – need to be distinguished. Knowledge of something is the traditional form a set of content and performance standards takes, to which we can add knowledge of how to do something (that is, skills) and dispositional knowledge. Dispositional knowledge refers to relatively stable habits of mind and body, sensitivities to occasion and participation repertoires. These dispositions include characteristics of the person that persist across time, for example, for language arts, a positive self-concept as a reader, a desire and tendency to read, and an enjoyment of or interest in reading.

Content and performance standards are not the same as pedagogy or teaching approaches (those arrangements in schools we make to allow learning to take place, and this includes formative processes of assessment) or summative assessment processes (how we ascertain whether those content and performance standards have been met at set points in time). What this means is that the foundations of any curriculum are those content and performance standards that nations and jurisdictions have decided are the most appropriate forms of knowledge, skills and dispositions for learning in schools. Teaching, learning and assessment approaches derive their credibility from these content and performance standards.

Progression is a key element. Content and performance standards are usually written at different levels of achievement. Most forms of progression between these levels or grades in curricula around the world are based on a notion of extension, for example, at level one a student should be able to do this or that, at level two the student is expected to be able to do more of this or that, and at level three the student is expected to be able to do even more of this or that. However, there are other forms of progression between designated knowledge sets, skills and dispositions besides extension, and these can be marked out in a curriculum document. Indeed, some knowledge sets, skills and dispositions are appropriately placed at some lower-level or even some higher-level grades. For example, many countries, including some of those in our sample, have chosen not to start formal reading processes until at least seven years of age.

Pedagogic or Teaching and Learning Approaches

The content and performance standards do not specify how the knowledge, skills, and dispositions should be taught. As a consequence the teacher needs to rework the content and performance standards or learning outcomes into programs of learning.

There is a range of teaching and learning approaches or action sets including: observation; coaching; mentoring; peer learning; simulation; concept formation; reflection; meta-cognition; problem solving and practice. In each program of learning, formative assessment processes may be parts of teaching and learning programs. Assessment for Learning (based on a model developed by Paul Black and Dylan Wiliam) can be presented as five key strategies and one cohering idea. The five key strategies are:

1. Engineering effective classroom discussions, questions, and learning tasks
2. Clarifying and sharing learning intentions and criteria for success
3. Providing feedback that moves learners forward
4. Activating students as the owners of their own learning
5. Activating students as instructional resources for one another.

The cohering idea is that evidence about student learning is used to adapt instruction to better meet learning needs; in other words, that teaching is *adaptive* to the students' learning needs.

Learning and assessment practices on the program of learning can be regarded as formative if: there is evidence of the student's achievement; that evidence is *elicited*, *interpreted*, and *used* by the teacher, the individual student and his or her fellow students, and such evidence is used by the teacher with the specific intention of deciding on the subsequent steps in the teaching-and-learning process. The interaction between teachers and their students is formative when it influences the learner's cognition: the teacher's external stimulus and feedback triggers an internal production by the individual student.

Assessment Processes

Summative assessments summarize the inferences that can be made from those knowledge-sets, skills or dispositions that a student is required to have, and that are expressed in such a way that they can be tested in a controlled environment, such as an examination. A principal issue with the way assessment processes are used around the world is that testing a person's knowledge, skills and aptitudes can have wash-back effects on the original knowledge or skill set. Instead of the assessment process acting exclusively as a descriptive device, it also acts in a variety of ways to transform the content and performance standards it is seeking to measure with teachers using assessment to interpret the curriculum.

Assessment processes clearly can have an impact on content and performance standards and care must be taken to prevent them from having a detrimental effect on the curriculum and on the type and content of learning that takes place. However, one of the needs within any instructional system is that at certain points in time, national, state and district educational bodies need information about how well the system is doing. Assessment processes are different from content

and performance standards and have different purposes, for example, evaluation through auditing, monitoring, and inspection.

Curricular Aims and Purposes

The following are a range of possible curricular areas that constitute the aims and objectives of that curriculum, and are found, sometimes expressed differently, and with different emphases, in many of the jurisdictions studied:

- personal and social development, values/ethics/morals, and educational/spiritual development
- equal opportunities/multiculturalism
- basic skills such as literacy and numeracy
- scientific and technological skills
- citizenship
- nation building, cultural heritage
- economic growth, entrepreneurialism and competitiveness
- preparation for work
- creativity
- environmental concerns
- non-mother tongue language learning
- health/ physical well-being and leisure
- lifelong learning
- special learning needs.

The Essential Components of a Curriculum

The development of a curriculum can be seen as a number of sequential steps:

1. The aims and objectives of the educational program need to be set out and these are derived from the essential forms of knowledge, skills and dispositions that a society considers to be appropriate for living in the society as it is now and as its citizens would like it to be.
2. From these aims and objectives, a set of subject areas can be derived and a set of relations between those subject areas can be established. For example, language, literature, mathematics, physics, biology, chemistry, foreign language, physical education, history, geography, art, music and drama. This is an example of strong boundaries between different subjects. An example of weaker boundaries between different subjects is as follows: language studies, science, mathematics, humanities, arts, physical education and foreign languages.

3. From these aims and objectives and bearing in mind the decisions made about curriculum subjects and their integration, content and performance standards are derived. These can be subject-specific and written in such a way as to indicate to the student and the teacher what the student is required to know or be able to do, or have the disposition for, at the end of the learning program.
4. The next stage is to identify the most appropriate processes for the delivery of these content and performance standards. This is the identification of the pedagogic approach, and it involves a variety of teaching and learning processes. The important point to note here is that the pedagogic approach is derived from the content standard and not from the assessment approach.
5. The final stage is the development of summative assessment processes. These are also derived from the content and performance standards, which in turn were derived from the aims and objectives of the whole program. Formative assessment processes are usually constructed in different ways and have different purposes from summative assessment processes.

What do high performing countries' instructional systems have in common?

Possibly not surprisingly, we could ascertain no overall *instructional system patterns* that the jurisdictions we studied had in common. They vary in many of the ways we might have conjectured they had in common before the project started – their curricula do not seem to be more demanding than other curricula with which we are familiar; they do not all have longer school days or longer school years; they begin formal teaching at different ages; some have high stakes testing throughout the school years, others have none at all except for school leaving and/or university entrance examinations; the amount of assessment data shared publicly varies.

While they all have aspirational aims, it is not at all clear in some of the systems whether or not those aims are translated into curricular programs. Where the aims and objectives are clear and discerningly defined, however, the values feed through the resultant curricula. For example, the **Finnish** overarching aims of equity and equality feed clearly into subsequent elements of the curriculum, from the lack of streaming through to a desire to exclude no student from progression to college or university. All of the jurisdictions include some sort of 21st century competencies, but again it is sometimes not clear how they manifest in the curriculum. It is notable, however, that all of the jurisdictions studied, apart from **Florida** and **Massachusetts** included 21st century competencies as a high level curricular aim.

Accountability systems differ widely, with some relying on internal mechanisms and others building in results of national assessments. The level of national scrutiny varies, even in federal systems. The **Canadian** provinces operate with almost total independence from the federal center, while in **Australia** states are required to have more alignment with the center.

Differential grouping varies from early setting in **Singapore's** upper primary years to the more common upper secondary, when most jurisdictions introduce an element of differentiation in some, but not all subjects. **Alberta** is a good example of multiple tiers of the same course for different high school students. Some jurisdictions separate students into different types of institution while others do not and the age of the separation varies. Some teach subjects separately from primary school; others integrate their curricula. Attitudes toward applied and vocational learning vary, but in most cases students have options for vocational or applied learning at upper secondary; generally it is clear that these are seen as the non-standard pathways for those who have not succeeded in academic subjects. And while all promote a combination of formative and summative assessment, the emphasis on the former differs. There are also differences in the proportion of school and teacher-based assessment that counts towards student outcomes, again with **Finland** (almost wholly teacher assessed) and **Singapore** (almost wholly externally assessed once students reach upper and post-secondary) as the cases on either end of the continuum.

Some of the factors that successful systems have in common are beyond the scope of this project. For example, there seemed to be a pattern of support for teachers throughout their careers with initial teacher training aiming to attract 'the best and the brightest'; this is often supported by

serious mentoring programs during the first years of teaching, ongoing professional development and an emphasis on teaching and learning communities where teachers work together on lesson plans, delivery and assessment techniques, and are formally engaged in observing and learning from each other. Another factor beyond our work that must be recognized is the climate of high expectations in home environments. John Jerrim's (2014) recent work with ethnic Chinese students in **Australia** is interesting in this regard. He found that even in Western environments East Asian children outperform their counterparts, presumably due to out of school factors.

A major aspect that all of the jurisdictions had in common – but this included our lower performing foil, **Florida**, and almost every system that we know well outside the study – is a recent refreshing and renewing of the instructional system, albeit not all in the same direction, and with some recently modifying reforms that had been in place in the past. In the US, states such as **Massachusetts** and **Florida** are working to align their curricula with the Common Core State Standards and although there have been wobbles along the way (and continue to be so) both states are ensuring that their curricula reflect both university and career readiness.

In very general terms the instructional systems reforms fall into three categories (with the caveat that elements of any jurisdictions reforms can reflect any or all of the categories): systems that are attempting to de-rigidify, that is, are attempting to move away from rote learning, over-prescribed curricula and an undue emphasis on examinations and testing; systems that are in a steady state of reform, with planned instructional systems changes carried out over time; and systems that have introduced instructional system reform and have modified them in the face of professional and public unease.

In mainland **China** systemic reform to curriculum includes:

- replacing the subject-based curriculum with an integrative structure that consists of learning fields, subjects and modules
- decentralizing and encouraging school-based curriculum development
- allowing students to choose courses at upper secondary and adopting an elective course and credit system
- adopting new approaches to teaching and learning, for example, cooperative learning, self-regulated learning and inquiry-based learning
- cultivating students' communication, problem solving, team work and creative thinking skills
- establishing a formative student evaluation system that uses portfolio assessment (Yin, Lee & Wang 2014)

According to Yin, Lee and Wang (2014) many of these reforms were adopted from the West, such as curriculum integration, decentralization, formative assessment and the cultivation of skills. Many of these changes are apparent in **Shanghai**.

Since the 1990s **Shanghai's** educational focus has shifted from quantity to quality as enshrined in the Chinese government's policy document of 2010, *Long-term Education Reform and*

Development Plan (2010-2020) (Ministry of Education of the PRC, 2010). Overall the strategy up to 2020 is to develop a more student-centered and innovative education, three goals of which are to modernize, institute a learning society and build up human resources (Walker & Qian 2013). Tan (2013) argues that current curriculum reforms, rest on three breakthroughs – reducing schoolwork to increase quality, strengthening basic education and raising quality through character development. She stresses Shanghai’s internationalism, its focus on IT and its innovative spirit, and writes that Shanghai has managed to take learning beyond examinations and into community involvement and service.

While **Singapore’s** instructional system could be interpreted as very examinations oriented, its direction of travel is also toward freeing up curriculum, pedagogy and to a limited extent, assessment. Its *Thinking Schools, Learning Nation* policy asks that schools to respond to the needs of a knowledge economy by fostering innovation and creativity. Success of these initiatives would mean a highly educated workforce with the habits of mind, values, attitudes and skills needed to develop cutting edge products and services. Curricula and assessment are to move away from the overly fact-based chalk and talk model to something much more open and creative involving project work and skills development. Subject choice increased and specialist schools were created. *Teach Less Learn More* reinforced these new flexibilities by asking teachers to concentrate on the fundamentals of effective teaching in order to engage students, reinforce understanding and unlock potential beyond examination preparation through innovating curriculum (what to teach), pedagogy (how to teach) and assessment (how much students have learned) (MOE 2010). *Curriculum 2015* reinforces basic education through literacy, mathematics and science, but also stresses the need for 21st century skills.

Maintaining a reform momentum, **Australia** has recently adopted a national curriculum where none existed before; its national assessments were introduced in 2008. Its priorities feature strongly improving educational outcomes for Indigenous youth and disadvantaged young Australians, especially those from low socioeconomic backgrounds. Integrated within the subject areas are “general capabilities” – those skills essential for “students to live and work successfully in the twenty-first century,” that is, literacy, numeracy, information and communication technology, critical and creative thinking, personal and social capability and ethical understanding and intercultural understanding (ACARA 2013). Lingard and McGregor, however, see the changes as a manifestation of what Pasi Sahlberg calls GERM (Global Education Reform Movement), an approach to education reform that contains the following: prescribed curriculum, an emphasis on literacy and numeracy, test-based accountability, standardized teaching and learning and market-based reforms such as private sector management models and an emphasis on school and parental choice (Sahlberg 2011 as cited in Lingard & McGregor 2014). With the coming of a new, more conservative, Liberal-National coalition government in Australia, the Australian Curriculum, Assessment and Reporting Authority (ACARA) was charged in 2014 with evaluating the national curriculum in order to identify ways that the curriculum could be improved over time.

Ontario is an example of a system that put in place instructional priorities and instituted a curriculum reform program that ensures curriculum review in planned cycles.

Finland introduced a revised national curriculum framework in 2004, which while increasing guidance from the center at the same time provides support to strengthen the local curriculum development process in municipalities (Halinen & Holappa 2013). In 2012 the government issued new national goals for pre-primary and basic education, which in turn has led to the preparation of new basic education core curricula and the consequent renewal of local curricula. Revised core curricula will be ready at the end of 2014, and local curricula expected to be ready in 2016.

Examples of where instructional systems reforms have been watered down since their introduction include **Queensland**, **Alberta** and **Japan**, which of course does not mean that any of these systems has abandoned curricular developments. It could be argued that **Queensland** has back-pedaled on some of its more innovative assessments in the last few years, abandoning some of the systemic reforms that had been in place since the 1970s and dropping the New Basics approach. **Alberta** has suspended many elements of the AISI program, although it has introduced a *Curriculum Redesign*, the goals of which are to develop revised standards for future curriculum and a cohesive and collaborative process for curriculum development that will ensure that curriculum is responsive to a rapidly changing world.

Since the start of the new century the **Japanese** government has enacted several waves of educational reform, including a revision of the *Fundamental Law of Education* set alongside decentralization of administration. A primary objective has been to inculcate a “zest for life,” which has three aims: promoting solid academic prowess; being rich in humanity; and health and fitness. Another element of these reforms was *Yutori* (relaxed learning) reducing the overloaded curriculum and decreasing the intense competition in Japanese education, but this element got watered down in the 2011 reforms following intense criticism that reflected the deep seated belief among many in Japan that individuality is not inherent in Japanese culture and that the reforms flew in the face of tradition (Asanuma 2014). Reforms enacted between 2008 and 2012 resulted in the re-introduction of some of the older, more knowledge-based curriculum by re-emphasizing the building of a solid knowledge base without abandoning creative thinking. Foreign language (English) was introduced from Grade 5, elementary school textbooks increased in page length and the number of lessons at the elementary and lower secondary levels was increased in order to cover the expanded curriculum (OECD 2012; Pearson Foundation 2013).

It is probably safe to say that Western nations’ educational systems are more influenced by the fluctuation of politics than Asian systems, with notable exceptions, for example **Ontario**. Some Western democracies seem to have a more “excitable” cycle in which election swings can drive reforms and patience for long-term change is limited.

Approaches to organizing/structuring instructional systems among high performing jurisdictions

The goals or aims of the education system and how these are carried out through the curriculum

It is hardly astonishing that many of the jurisdictions share similar (if not almost identical) aims for their education systems. When developing educational aims, writers often look at other systems and cherry-pick those goals, purposes and ambitions that resonate with their own. Of course there are subtle differences as well. It is interesting to look deeper into how systems' aims balance what we might describe as "education for education's sake" or with what John Dewey referred to as "the intelligent management of life" with a more instrumental view based on succeeding in a globally competitive world through raising standards, getting students to achieve well in their courses and examinations/qualifications (Pring 2013, 32). The former set of aims is difficult to measure – getting students to understand the physical, social and moral world around them through the curriculum they are taught as well as other school-based and community experiences – the latter is measurable (up to a certain point) through formative and summative assessments. It comes as no surprise that even where educational systems stress the former in their aims policies, they are more likely to stress the latter when reporting out educational outcomes. Most of the jurisdictions under study strive to combine both the philosophical and the practical in their policy aims and vision. An emphasis on literacy and numeracy, problem solving, critical and creative thinking and citizenship pervade the aims.

New South Wales and **Queensland** share the *Educational Goals for Young Australians*, as enshrined in the Melbourne Declaration of 2008 (MCEETYA 2008). Their educational goals are set in the context of a 21st century Australia being able to compete in the global economy on knowledge and innovation. Intellectual, physical, social, emotional, moral, spiritual and aesthetic development and wellbeing are all emphasized in the context of ensuring Australia's economic prosperity and social cohesion (1). Pragmatic in nature, the goals state that globalization and technological change demand that Australians develop skills that will equip them for the jobs of the future. Those skills include being problem solvers, creative thinkers and confident ICT users. Literacy and numeracy, alongside other subject disciplines are the cornerstones of a good education, however, cross-disciplinary thinking is also accorded status as are national values such as democracy, equity and justice, honesty, resilience and respect for others.

The overall vision for **Alberta's** education system is that all students are inspired to achieve success and fulfillment as engaged thinkers and ethical citizens with an entrepreneurial spirit. Literacy and numeracy are stressed alongside the competencies of knowing how to learn, thinking critically, solving problems, managing information, innovating, demonstrating global and cultural understanding and applying career and life skills. Interestingly, among the literacies to be developed are those of personal finance.

Ontario's vision is based on the belief education must provide all students with the “skills, knowledge and opportunities to reach their full potential, to pursue lifelong learning and to contribute to a prosperous, cohesive society.” Its vision of student success emphasizes higher order thinking skills such as critical thinking, communication, creativity, collaboration and entrepreneurship. *Achieving Excellence: A Renewed Vision for Education in Ontario* (Ontario MOE, 2014a) stresses high levels of academic performance, citizenship, equity and well-being through three core beliefs, all of which support differentiation:

- all students can be successful
- success comes in many forms
- there are many pathways to success.

In the early years of the 21st century **Hong Kong** shifted its educational aims to 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 (CDC 2002, 2).

A recent senior secondary curriculum guide (CDC 2014, 1) put the aims in context, stressing Hong Kong's place within China as a nation by emphasizing the explosive growth of knowledge and the need for Hong Kong's population to respond to those challenges by developing their adaptability, creativity, independent thinking and life-long learning capabilities.

Shanghai's system goals reflect the overall educational aims and objectives of Chinese government policy, which include moving away from the system of rote learning, and emphasizing gaining deeper understanding, thinking critically and applying knowledge to solve new problems. There is greater focus on provision of content and support for student learning and putting in place systemic strategies. Shanghai's basic education system aims to reinforce quality and equity.

Finland's aims and values take on a different cast from the other jurisdictions. Its underlying values of education are “human rights, equality, democracy, national diversity, preservation of environmental viability, and the endorsement of multiculturalism.” Education is meant to promote responsibility, community and respect for individual rights and freedoms. Instruction should promote gender equality, regional equality, be non-denominational and politically neutral and students should be educated to understand their rights and responsibilities in society, working and family life.

Finland's educational mission statement reinforces social aims; education is a “tool for developing educational capital and enhancing equality and a sense of community.” Alongside opportunities for growth and learning an education should develop a healthy sense of self-esteem. Knowledge

and skills allow students to become involved citizens in a democratic society and “awaken a desire” for lifelong learning (National Board of Education 2004).

Japanese culture places a great value on education and skills, but also on group and social relations. “In Japan, there is a shared belief that if the individual works tirelessly for the group, the group will reciprocate.” (OECD 2010b, 138). The Basic Act on Education (2006) states that education should aim for development of personality and strive to nurture citizens, sound in mind and body, who can form a peaceful and democratic state and society. Truth seeking and a sense of morality are stressed alongside more familiar attributes of creativity, autonomy and independence, justice, responsibility, equality, mutual respect and cooperation. Students are expected to value labor, know the connections between career and practical life and actively contribute “in the public spirit” to building and developing society. Respecting traditions and culture, love of country and a desire to contribute to world peace round out the aims (MEXT 2006).

National wealth resides in its people and their commitment to the nation and to their communities according to **Singapore’s** aims. Students must be willing to “strive and persevere” and believe in their ability to think, achieve and do well. Singapore emphasizes citizenship and responsibility to family, society and country – these last two resonate throughout the system (MOE 2014a).

Thinking Schools Learning Nation (1997) foresaw a country filled with thinking, committed citizens who were able to meet future challenges, supported by a 21st century oriented education system. Schools would challenge assumptions and foster students’ and teachers’ participation, creativity and innovation culminating in a culture of lifelong learning. While encouraging all students to progress as far as they could, that progression depends on performance and merit as well as individual aptitude and interest. Flexibility within education is crucial since students matured ‘mentally, physically, emotionally and socially at different rates’ (MOE 2014a).

Students should value and respect honest work, learn the right values and attitudes, become self-reliant and individually competitive, while still working successfully with others. Character and citizenship education provides the governing framework with outcomes that are achieved through programs and subjects. Shared identity is critical alongside the willingness to defend Singapore’s national interests (MOE 2014a).

In 2012 **Florida** set out a five-year strategic plan for its education system. Its mission is to “increase the proficiency of all students within one seamless efficient system, by allowing them the opportunity to expand their knowledge and skills through learning opportunities and research valued by students, parents and communities.” Its vision statement is that “Florida will have an efficient world-class education system that engages and prepares all students to be globally competitive for college and careers.” And its goals are: higher student achievement; seamless articulation and maximum access; skilled workforce and economic development; and quality efficient services.

Massachusetts’ goals for education see learning as a meaningful and enjoyable activity that does not threaten students’ sense of security or self-esteem. It is committed to preparing all

students for success in the world that awaits them after high school, guided by the following mission (ESE, 2014):

To strengthen the Commonwealth's public education system so that every student is prepared to succeed in postsecondary education, compete in the global economy, and understand the rights and responsibilities of American citizens, and in so doing, to close all proficiency gaps.

Comparative analysis

Although many of the same words are used across all of the jurisdictions, there are some intriguing differences. Firstly, the lack of connection between the curriculum and the aims of both **US** states stood out. The aims read as aspirations rather than a set of carefully compiled key words and phrases and it is difficult to see how these aims could complement and support a clearly defined set of curriculum standards.

Both **Japan** and **Singapore**, while including sufficient personal development aims, clearly see their education systems as economic drivers in a much more systematic way than the other jurisdictions. Alongside achievement there is a clear nationalist element of loving and respecting one's country, and developing committed, capable citizens that can cooperate but also stand out by themselves in a globalized world.

By far the most student-centered is **Finland**, with a set of social aspirations based on equality. The individual is seen as the cornerstone of a democratic society and education should aim to empower individual students, by fostering their potential and interests throughout life, in order to equip them with the knowledge and skills to develop an equal society.

In their own ways the aims from both **Hong Kong** and **Shanghai** look backward at past practice. They each seek to draw a line in the sand and explicitly mark a moment of change and a break from the past. Both desire to move away from previous didactic approaches and seek more student centered and competency based systems of education. In contrast, the **Australia** and **Canadian** states and provinces look forward and are the most dominated by OECD's conception of 21st century skills. They emphasize the basic skills agenda together with the problem solving, creative and entrepreneurial skills fit for an economy of the new millennium.

Although the aims and objectives of the high performing jurisdictions differ in both details and overall approach, they are all clear, strong and well thought through, suggesting that the more seriously a system takes the underlying principles, the easier it is to create a coherent curriculum to represent those aims.

Embedding skills considered necessary for success in the 21st century in the curriculum

While there has been some disagreement about whether or not the skills characterized by the OECD as 21st century skills are actually new and different from skills needed in the 20th century and before (see Adamson & Darling-Hammond 2012; Tucker 2012; McGaw 2013; Suto 2013) all of the jurisdictions studied have highlighted the essential skills (see below for a typical list) and dispositions that they want all – or almost all – of their students to acquire by the time they graduate from upper secondary school. These skills and dispositions are those considered necessary for citizens to thrive in a globally competitive marketplace and be responsible and contributing member of society. As we have already seen, their prominence varies as stated in the aims of the jurisdictions, and we can see below that they vary somewhat in emphasis as well. There are different approaches to how the skills and dispositions should be taught and assessed – and if they should be assessed at all – as well as their importance within the instructional system. Both centralized and decentralized systems have to decide how much choice schools have in incorporating these skills into everyday school life. Curricular choices include developing explicit curricula for incorporating 21st century skills, adopting skills-centered pedagogy in which teachers explicitly teach the skills and addressing 21st century skills through extra-curricular activities and/or research projects (Suto 2013).

The *Assessment and Teaching of 21st Century Skills* project (Adamson & Darling Hammond 2012, 1) looked at various skills frameworks and developed a list of 10 essential skills organized within four headings:

<i>Ways of Thinking</i>	<i>Ways of Working</i>	<i>Tools for Working</i>	<i>Living in the World</i>
<ul style="list-style-type: none">• creativity & innovation• critical thinking, problem solving, decision making• learning to learn, metacognition	<ul style="list-style-type: none">• communication• collaboration (teamwork)	<ul style="list-style-type: none">• information literacy• ICT literacy	<ul style="list-style-type: none">• citizenship – local & global• life & career• personal & social responsibility, including cultural awareness & competence

Arguably, only ICT literacy is a new – or at least a 20th century – skill. As highlighted below, **Queensland, Finland and Singapore** were early adopters and placed these skills firmly within their curricula. Other jurisdictions have either explicitly (most of those studied) or implicitly incorporated their own versions of the 10 skills above.

Australia has been at the forefront in incorporating 21st century skills into its national curriculum working with businesses and academics as well as schools. One of the essential parts of the new Australian curriculum is “general capabilities” which include: literacy; numeracy; ICT capability; critical and creative thinking and personal and social capability; intercultural understanding; and ethical understanding.

Curriculum materials are being developed to integrate these general capabilities into the key learning areas so that teachers can incorporate them into their teaching. The national government has invested in the development of technology-based support that offers formative tools within an online system for assessment and curriculum materials. As well as assessing literacy and numeracy, Australia also has national assessments for ICT literacy and civics and citizenship.

New South Wales' 21st century skills include collaboration, problem solving, thinking creatively, and connecting through technology. Alongside core content knowledge schools are supposed to develop in students:

- confidence to know they can learn as part of a group and on their own
- the ability to solve problems both as individuals and collaboratively as part of a team
- the capacity to analyze what they see and hear, and know the difference between fact and myth
- confidence to use technology in all parts of their lives and to understand that technology should be a tool to enhance communication, learning and the quality of life
- the ability to communicate and express ideas in a clear and rational way
- interpersonal skills to enable them to relate effectively and appropriately to others
- creativity to help them look at the world and be innovative in dealing with challenges and making the most of opportunities
- ethical values, social responsibility, wellbeing and engaged citizenship (NSW Government 2013).

New South Wales is investigating how it can create a 21st century curriculum (Bruniges 2012). According to McGaw (2013a) the **New South Wales** curriculum is more traditional than the **Queensland** curriculum, with civics and citizenship absent from its key learning areas, fewer cross-curricular themes and less embedding of 21st century critical skills.

Queensland has adopted the Australian 21st century skills priorities enshrined in the “general capabilities,” as well as the cross curriculum priorities of Aboriginal and Torres Strait Islander histories and cultures, Asia and Australia’s engagement with Asia and sustainability. These skills have been embedded into its curriculum and it is developing strategies and ways of incorporating them in its teaching and assessment.

Even prior to the introduction of the national curriculum and the 21st century skills associated with it, Queensland took a radical approach with a *New Basics* framework with which it sought to align curriculum, pedagogy and assessment using a new conception of the domains of knowledge that involved curriculum organizers, productive pedagogies and “real world” or rich tasks (McGaw 2013a; McGaw 2013b). It was based not on academic disciplines, but on the “imagined future worker and citizen in a global context” (Lingard & McGregor 2014, 94). The New Basics approach exemplified one strand of educational thinking about globalization – one that meant that education must mold the dispositions and skills of workers and citizens. New Basics contrasted with the “old basics” of reading, writing and arithmetic and was to instead give students the skills

necessary for “new economies, new workplaces, new technologies, new student identities, diverse communities and complex cultures” (Education Queensland 2004, 2 as quoted in Lingard & McGregor, 99). Despite some successes, the New Basics program was never fully implemented.

Alberta describes 21st century competencies as “the attitudes, skills, and knowledge that contribute to students becoming engaged thinkers and ethical citizens with an entrepreneurial spirit.” Through the subject areas (and through inter-disciplinary learning) students are to develop critical thinking, problem solving, creativity, innovation, social responsibility, cultural, global and environmental awareness, communication, lifelong learning, self-direction and personal management, digital learning, and collaboration and leadership (Alberta Education 2014a). The key competencies are interwoven throughout the intended curriculum.

Ontario’s 21st century skills strategy has been combined with the strategy for literacy and numeracy. In this way there is a serious attempt to embed these skills and competencies within the curriculum. This is further evidenced by an emphasis on cross-curricular competencies and the inter-relationships between disciplines. The Ministry of Education sets out the following undertakings to respond to 21st century challenges:

- engaging students as partners in their own learning
- harnessing the capacity of technology to engage learners and to optimize and amplify student learning and achievement
- emphasizing and teaching important higher-order skills such as critical thinking, communication, collaboration, creativity and entrepreneurship
- supporting educators in preparing students for a rapidly changing, technology-driven, globalized world.

Ontario defines advanced literacy for the 21st century as

the ability to use language and images in rich and varied forms to read, write, listen, view, represent, and *think critically* about ideas. It involves the capacity to *access, manage, and evaluate information*; to think imaginatively and analytically; and to communicate thoughts and ideas effectively (emphasis ours).

What is interesting is the emphasis placed not only on the relationship between literacy and critical, creative and analytical thinking for communicating but also its relationship to equity and good *citizenship*:

Literacy includes *critical thinking* and reasoning to *solve problems* and *make-decisions* related to issues of fairness, equity and social justice. Literacy connects individuals and communities and is an essential tool for personal growth and active participation in a cohesive, democratic society (emphasis ours).

The government's definition of advanced numeracy is equally focused on higher order thinking and application, "through mathematical activities that are practical and relevant to their lives, students develop mathematical understanding, problem-solving skills, and related technological skills they can apply in their daily lives and in the future workplace" (Ontario MOE 2005, 3)."

This emphasis on critical thinking is not limited to language arts, mathematics, and science, but permeates all subjects in the **Ontario** curriculum, as does the development of *metacognitive skills* (thinking about thinking). It is also woven into the fabric of everyday life in Ontario's schools.

The introduction of 21st century skills in **Hong Kong** has been a priority of its educational reforms 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 21st century skills, which is designed to be interactive, creative and encourage students to synthesize and share (Singmaster 2012). Project-based assessments have been introduced, which represent a move towards developing skills in students.

Seven learning goals for students 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 2012). Information and communications technology (ICT) also forms the underpinning of the promotion of 21st century skills. 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 2014).

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 21st 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.

Since 1988 **Shanghai** has undergone large-scale curriculum reform with the aim of improving students capacity for creativity and self-development and to fully achieve their potential. Schools are encouraged to develop their own curricular materials to fit with their conditions. Students should engage in extracurricular activities in sports and the arts, where they are expected to learn organization and leadership. They are also assigned teamwork activities. Visiting rural villages or deprived social groups give them experience of social or service learning. All these activities are coordinated by the municipal education authority (OECD 2010a).

Since 2008, a new, inquiry-based curriculum has been implemented throughout the province, which, with teacher support and guidance, asks students to identify research topics based on

their experiences. It is hoped that through independent learning and exploration, students can learn to learn, to think creatively and critically, to participate in social life and to promote social welfare. These reforms are reflected in pedagogical as well as assessment reforms. Although not referred to specifically as such, the aim of these reforms fits with the 21st century skills agenda and aims at the implementation of these skills, strategies and attitudes (OECD 2010a). **Shanghai** is also using PISA-type tests in problem solving to introduce skills into schools.

Most of the 21st century skills are enshrined in the **Finnish** Core National curriculum as *Cross Curricular Themes*:

1. Growth as a person, which emphasizes the students' self-development as learner as well as to learn to function as members of a group or community (emphasis ours)
2. Cultural identity and internationalism, concentrating on the interpersonal skills of global and cross-cultural awareness
3. Media skills and communication, with an emphasis on participatory, interactive, and community communication and taking a critical stance towards contents conveyed by the media
4. Participatory citizenship and entrepreneurship of which one objective is to understand the importance, workings, and needs of the school community, the public sector, the business world and organizations, from the perspective of the functionality of society
5. Responsibility for the environment, well-being and a sustainable future, concentrating on raising environmentally conscious citizens who are committed to a sustainable way of life
6. Safety and traffic, which seems an odd 21st century skill, but which fosters taking personal and social responsibility for one's own and others' safety.
7. Technology and the individual, which looks not only at the instrumental aspect of ICT but in a critical way and in relation to moral issues of ethics and equality.

The themes represent the central emphases of education and teaching and are incorporated into numerous subjects. For each of the cross-curricular themes the goals, objectives, and core contents are set out.

Beginning in first grade, teachers place a major emphasis on students' meta-cognitive development. Students set their own educational objectives and evaluate their progress. The goal of this practice is to increase students' motivation to learn and curiosity, encouraging their activeness, self-direction, and creativity through presenting them with interesting problems and challenges."

Although the Finnish Ministry of Education has clearly embedded 21st century skills in its core curriculum for Basic Education in Finland as cross-curricular themes, the system is decentralized and decisions on how to integrate these themes into the local curricula is left in the hands of local authorities and schools. Currently there is a discussion around new iteration of the national curriculum and consideration is being given to adopting 21st century skills more explicitly (Adamson & Darling-Hammond 2012). The new version adds to the focus on 21st century skills

both in the curriculum documentation and also on adding specific sub-points that are codified under new legislation.

Japan is generally perceived to have a demanding curriculum which is quite narrow in scope and delivered through very traditional didactic pedagogies. Many of its recent reforms have had as an objective the need to open up a more questioning approach leading to greater understanding of concepts over traditional techniques of memorization. Perhaps the most relevant of these objectives is the introduction of the Period of Integrated Study. This is aimed to actively introduce experiential learning such as experience in nature, social life experience, observations, experiments, field study and investigation as well as problem-solving learning to learn about cross-sectional, comprehensive subjects like the environment, international understanding, information, health and welfare as well as subjects that interest students (MEXT 2002)."

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

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

Japan lags well behind the TALIS average for ICT use in the classroom. Vallance (2008) suggests that despite being a nation whose image is that of high technology, robotics and creative media, the actual uptake of technology in education in Japan, "remains comparatively low, and ICT does not appear as a priority in national education policy" (UNESCO 2007 in Vallance 2008, 279). While both 21st century skills and ICT education are prioritized in national policy documents, it seems that these are not easily being translated into actual approaches in the classroom.

In 2008 **Singapore** reasserted the need both for the basics and 21st century skills and attributes. *Curriculum 2015* (C2015) incorporates strong fundamentals as well as future learning (Kennedy 2013). The fundamentals are mathematics, sciences, languages and the humanities. Also important are a high quality work force, school leadership, collegiality and team work, school autonomy in decision making that complement the nation's direction and values. Undergirding the policy is the strong emphasis on citizenship, expressed through citizenship and character education.

Singapore's framework for developing 21st century skills and competencies emphasize the social and emotional competencies of "skills necessary for children to recognize and manage their emotions, develop care and concern for others, make responsible decisions, establish positive

relationships, as well as handle challenging situations effectively” (MOE 2014c) – respect, responsibility, integrity, care, resilience and harmony. A “middle” ring of social and emotional competencies of self-awareness, self-management, social awareness, relationship management and responsible decision-making is surrounded by an outer core of 21st century competencies considered necessary for thriving in a globalized world – civic literacy, global awareness and cross-cultural skills; critical and inventive thinking; communication, collaboration and information skills. Alongside regular course content, secondary curricula incorporate critical thinking, inquiry and investigating skills through project and practical work.

The **Florida** Department of Education website contains little evidence of development of 21st century skills or cross curricular themes. One area that appears to involve 21st century skills thinking is in regard to assessment and the provision of online resources that teachers can use. The most publicized area relating to 21st century skills in **Florida** appears to be the Florida Virtual School (FLVS), founded in 1997, which was the country's first, state-wide Internet-based public high school. FLVS serves students in Grades Kindergarten to Grade 12. A student can take some online courses while attending a traditional school or attend full-time through home schooling.

A task force formed in 2008 by the **Massachusetts** Department of Education to develop a set of recommendations for ways to integrate 21st century skills into the state's education program through improvements to existing standards, assessment tools, measures of accountability and professional development efforts advocated the integration of 21st century skills throughout the whole of compulsory education. Its recommendations included: recruiting and retaining high achieving teachers with up-to-date 21st century skills; embedding 21st century skills in to curriculum frameworks in every subject; integrating 21st century skills into MCAS, the state assessment system.

Massachusetts is also a member of the Partnership for 21st Century Skills (P21), a national organization that advocates for 21st century readiness for every student. P21 and its members provide tools and resources that incorporate 21st century themes into academic subjects, emphasizing critical thinking and problem solving, communication, collaboration, and creativity and innovation. P21 has created partnerships among education, business, community, and government leaders.

Massachusetts, like **Florida**, has set up virtual schools. It also has 21st Century Community Learning Centers in approximately 160 sites. The purpose of the program is to establish or expand community learning centers that operate during out-of-school hours and provide students with academic enrichment opportunities along with other activities designed to complement the students' regular academic program. Community learning centers may also offer literacy and related educational development to these students' families. A portion of the competitively awarded 21st CCLC programs can now support expanded learning time activities (during a longer school day).'

Comparative analysis

Although every jurisdiction claims to recognize the importance of embedding 21st century skills, there are clearly differences to the skills they have chosen to focus on, and the extent to which they are trying to implement them.

The **Australian** states, **Canadian** provinces and **Finland** seem to have the most developed approaches, with curricula that include a large range of skills, well developed cross curricular approaches and a commitment to implementation. They also have some history of following these skills, so they are not such a new idea for them.

There is a similar emphasis on competencies to be seen in the curricula of **China**, **Singapore** and **Japan**, although it is clear that this is part of a top-down process of reform encouraging their schools to loosen their strict subject boundaries and try integrated projects, group and team working, problem solving and critical thinking. There is a desire by governments across these states to move away from fact-centered, rote-learning, exam-oriented education systems. However, these approaches are well entrenched in the jurisdictional national cultures. By focusing on skills for the future, governments are trying to deliver a change in attitudes towards education. It is clear, however, that there is strong resistance to these changes and a belief in the traditional systems and approaches.

Both **Florida** and **Massachusetts** are working toward 21st century skills, the latter perhaps more than the former, and stand out for developing virtual schools. The federal goals of college and career readiness could, perhaps, stand proxy for 21st century skills.

The balance between centralized and decentralized management and control of the instructional system and its resources

Levels of government prescription and control in managing school systems, developing curriculum goals, content and modes of assessment as well as monitoring systems through inspection vary considerably among the jurisdictions studied. And the picture is not black or white – regulation can consist of a mixed bag of national and local control, for example, with national curriculum guidelines that each locality or school can interpret for itself. While governments might support centralization believing that this will raise (or maintain) standards, provide curricular coherence and/or generate economic prosperity; decentralization can reflect trust in school-based decisions and an acknowledgement of teachers' and principals' professionalism (Kuiper & Berkvens 2013).

Some of the jurisdictions studied have a prescribed national curriculum, a policy recently enacted in **Australia**; others have a core curriculum that allows for considerable local interpretation such as **Finland**. Defining curriculum and assessment can be coupled with other prescriptions such as centrally controlled textbook and other support material provision. Reliance on these materials can influence how much freedom actually manifests itself in individual classrooms. Governments may provide the 'what' of standard setting and materials provision, yet still encourage teachers to exercise autonomy through local interpretation using any space left over to suit their needs, for example, through **Singapore's** "white space" initiative.

Australia

In 2007 government introduced a national curriculum, framing the need in terms of globalization and creating and maintaining a competitive economy. Shared responsibility is the hallmark of standard setting in Australia. Although the states and territories are ultimately responsible for education, they work together to make decisions about curriculum, assessment and qualifications. The Australian Curriculum, Assessment and Reporting Authority (ACARA) develops the national curriculum, student assessment policies and national data collection and reports out on school outcomes. The Australian Institute for Teaching and School Leadership (AITSL) is responsible for overseeing school reform for teachers and school leaders. They are the main actors, but unions, industry groups, non-governmental groups and Indigenous and parent groups are also routinely asked to enter conversations/consultations about standards.

The Council of Australian Governments (COAG) helps to ensure that the state governments cooperate on education policy as well as the national evaluation and assessment framework. There is a national agreement on standard frameworks for reporting out key performance measures, the annual *National Education Agreement Performance Report*, published by the COAG Reform Council. States and territories make most education decisions, with intergovernmental cooperation defined through national agreements². States make the majority of planning, structure and resource decisions, including authority over staff.

² With the advent of the new government in September 2013, the role of National Agreements is under review.

Schools are almost as responsible for maintaining standards as the federal and state governments. They carry out self-evaluations complemented by external reviews, such as NAPLAN – the National Assessment Program Literacy and Numeracy – introduced in 2008. NAPLAN data are used in conjunction with teacher-based assessment, so teacher quality is seen to be of paramount importance in maintaining standards. Schools are answerable to state governments in terms of meeting targets for academic and engagement outcomes. It is the state governments that plan programs and initiatives to help meet states' own targets (each is slightly different) set by the federal government on education.

Development of the national curriculum was based on a number of principles: clarity, high standards, build on the early years framework, extend from basic to specialized knowledge and skills, provide an understanding of the past, be manageable in terms of time and resources, be concise, allow for the study of areas outside the national curriculum, permit adaptation to local contexts and student diversity, and apply evidence-based research on learning and pedagogy. Each subject incorporated foundational and deep knowledge, understanding, skills and values but would also reflect cross-curricular 21st century skills such as critical thinking and working with others. Depth was privileged over breadth and teachers were heavily involved in the development of this new curriculum, which was subject to wide consultation (Watt 2009). The ensuing national curriculum is subject oriented.

Individual states were able to time implementation of the national curriculum differently, so **New South Wales** embedded the curriculum into its own existing curriculum, while **Queensland** took up the full national curriculum. They were also responsible for assessment practices and support materials. There is a federal framework in each subject that outlines what to teach, alongside achievement standards for each grade. Integrated within the subject areas are “general capabilities,” as described in the previous section.

Until quite recently the **New South Wales** education system was characterized by a great deal of central control. Schools controlled less than 10% of their budgets, with funding determined by student numbers (Piccoli 2014). A *Local Schools, Local Decisions* (LSLD) education reform program began in 2012 with the intention of providing fewer and simpler policy guidelines for schools and giving schools more authority to make decisions across a range of areas such as teacher placement, performance management and budgeting. The intention is for schools to manage more than 70% of their budget and that funding should reflect a school's complexity as well as its student numbers. (NSW DEC 2014). LSLD was piloted in 2013 in 229 schools and the rest of the remaining 2000 schools will have decentralized school decision making in place by the start of the 2015 school year (Chakraborty & Blackburn 2013).

The Board of Studies NSW (BOSTES) develops state-wide curriculum standards for all schools in the state, both governmental and non-governmental, which spell out what students are required to learn. It develops, communicates and implements education policies and practices; sets the core curriculum through developing Kindergarten to Year 12 syllabuses; provides support materials for teachers and parents, manages the NSW Higher School Certificate Examinations; provides advice on grading and assessment policy and procedures; awards secondary school

credentials – the Record of School Achievement (RoSA), put in place in early 2012, and the Higher School Certificate (HSC).

Overall governance of **Queensland** schools is the responsibility of the Department for Education, Training and Employment (DETE). Regarding the curriculum, it works through the Queensland Curriculum and Assessment Authority (QCAA, formerly QSA) (Queensland DETE 2013a). Participation and feedback from each schooling sector in Queensland is included and coordinated by the QCAA. DETE's responsibility runs across early childhood education and care, school education and training, tertiary education and employment. Its overall aims are that:

- parents and caregivers are involved in their child's learning and development
- students, parents, caregivers, the community and industry are involved in decision making
- industry and employers are engaged in identifying and prioritizing the critical skills for the economy
- (we) build strong cross-sector relationships (Queensland DETE 2013b).

While there are no centralized procedures for adopting curriculum materials in any state or territory in Australia, some elements of centralization are found in **Queensland**. A network of teachers provides reviews of recommended curriculum resources to Access Ed, a branch of Education Queensland, which disseminates this information to schools on a searchable database known as *Classroom Resource Reviews*. The great bulk of material for students is bought by parents at commercial prices. Occasionally, a government-funded project such as *Discovering Democracy* provides material free for reproduction by schools.

Alberta

Canadian education policy is largely devolved to the provinces³. The primary responsibility for educating **Alberta's** students rests with 62 elected school boards. They are in charge of planning for the jurisdiction, setting priorities for the system in light of community wishes, manage available resources and sound educational practice. Their responsibilities include:

- setting goals for the jurisdiction
- evaluating the School Board Superintendent
- adopting an annual budget for the school system
- making policy to guide the administration and employees toward district goals
- communicating with the community and staff on behalf of the jurisdiction
- educating others, with a goal of ensuring education is given a high priority by the public and to make the community aware of the jurisdiction's achievements
- gathering information in order to make sound decisions
- adjudicating in policy disputes (Alberta Education 2014b).

Textbooks used by Alberta's public schools are developed commercially, and are approved by the province. A recommended list of approved titles is provided from which districts or schools can

³ The exceptions are First Nation education and adult literacy and Essential Skills.

choose. In addition, Alberta provides a database of all authorized learning and teaching resources, some of which are available digitally.

The Alberta Ministry of Education specifies compulsory acceptable levels of educational delivery through a series of Ministerial Orders. Alberta's curriculum is enshrined through programs of study as prescribed by the minister for each of Elementary Schools, Junior High Schools and Senior High Schools (Alberta Education 2014c). Mandatory requirements for programs and courses are outlined in the programs or courses of study.

In 2008, the government of Alberta started the process of planning a long-term vision for education in Alberta. The result was the 2011 Alberta Education *Curriculum Redesign*, which aims to ensure that Alberta's curriculum (programs of study, assessment, and learning and teaching resources) remains responsive and relevant for students.

Alberta Education is collaborating with school authorities and other education partners in development of future provincial curriculum. One of these processes is Curriculum Development Prototyping, which provides the opportunity for education partners to contribute in the process of curriculum development at an early stage. The prototyping partners represent more than 30 school authorities across the province, and the lead school authorities are involving a broad range of community members in their networks and partnerships. Implementation dates for new programs of study will be determined in collaboration with stakeholders and will include determining stakeholder readiness and supports for implementation of new programs of study (Alberta Government 2014).

Ontario

School education in **Ontario** is governed by the minister of education, an elected member of the provincial legislature appointed by the premier of the province. Locally elected school boards, representing language and religious diversity of the province are in charge of the administration of schools (Ontario MOE 2014b). The Ministry of Education is in charge of the necessary arrangements for funding elementary and secondary schools, and designing major policies in key areas such as curriculum and assessment, the teaching profession and accountability.

School boards are elected locally and are responsible for allocating their resources to support provincial priorities such as raising student achievement, closing the achievement gap between students and enhancing public confidence in education. The school districts are also in charge of appointing staff, hiring principals and senior administrators, and managing the budget allocated to schools.

The Education Quality and Accountability Office (EQAO) implements assessments in literacy and mathematics for all students, the main focus of which is to monitor students' achievements at key junctures. The information gathered by the EQAO is intended to provide the necessary independent and public scrutiny of the education system in the province, assuring transparency and accountability. Ontario's teacher performance appraisal is structured by the MOE, but administered by school administrators (principals and vice principals).

Local school boards are responsible for improving student achievement. They also use the results from EQAO tests to monitor and assess school and student performance, while this data are used by the MOE to identify and target areas, schools and school boards where support and resources are most needed.

Textbooks are approved by the Minister of Education and individual school boards are responsible for selecting textbooks from the list and approving them for use in their schools. Textbooks must be congruent with **Ontario's** curriculum policy, have a Canadian orientation and support a broad range of instructional strategies and learning styles.

Although curricular policy is in hands of the Ministry, Ontario has implemented curriculum reviews based on consultations with teachers and subject experts since 2003. The provincial government has determined that curriculum policy documents for each subject should be revised in a seven-year cycle to ensure that they remain current, relevant, age-appropriate and avoid content overcrowding.

Hong Kong

The Education Bureau (EDB) has the responsibility for formulating, developing and reviewing education policies at all levels of the system. An Education Commission (EC) 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. Alongside the EC is the Curriculum Development Council (CDC) which also provides advice about the school curriculum. Although this system of curriculum decision-making has been traditionally seen as centralized and bureaucratic, recent consultations over new academic structure (NAS) show that this process is becoming more participatory and collaborative.

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. 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 Hong Kong Examinations and Assessment Authority (HKEEA) decides how it will be assessed.

Responsibility for public examinations and assessment lie with HKEEA while the government regulates school operations, including curriculum design and delivery, and use of funds. Quality assurance inspections take place, and schools are subject to the auditing of their accounts.

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. Some findings from PIRLS have acknowledged the introduction of a school-based curriculum

which can be adapted from the central curriculum framework to cater to learner diversity, different contexts of schools and even home background of students (University of Hong Kong 2012).

While the government has well-established consultative processes, such as those for NAS reforms, it also uses various advice-giving committees. Morris and Adamson (2010) 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 and Adamson 2010).

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.

Shanghai

The Chinese Ministry of Education (MOE) retains central authority over key areas such as formulating policy and establishing the national curriculum. However, some responsibilities have devolved to localities, such as the ability to develop provincial curricula and course materials (Lam 2010). This complements Shanghai's traditional autonomy.

The Shanghai Municipal Education Commission (SMEC) is the main governing body for education in the province. Its main functions are maintaining internal structures and personnel management in accordance with overall national government legislation.

Some of its functions in the primary and secondary arenas are:

- to research, propose and promulgate the educational development and reform strategy for Shanghai and compile development plans and annual plans of various types and levels of education according to the overall planning of economic and social development of Shanghai
- to guide and coordinate the implementation of educational planning and programs
- to conduct overall planning and macro management of pre-school education, basic education, higher education, vocational and technical education, lifelong education, etc.
- to carry out overall planning, coordination and direction of the education system, school-running system and comprehensive reform of education and teaching as well as coordinate and manage the work of central ministries and commissions concerning universities in Shanghai
- to direct the development and reform of employment-oriented vocational education, compile professional catalogues, teaching guidance documents and teaching evaluation criteria of secondary vocational education as well as guide the teaching material improvement and vocational guidance of secondary vocational education
- to formulate the demands of setting, relevant standards and basic teaching requirements of various secondary, primary and pre-primary schools together with relevant departments, organize the compilation, examination and confirmation of the unified textbooks of middle

and elementary schools as well as draw out the planning of educational technology equipment and the supporting standards; to organize the work of educational supervision and assessment

- to guide ideological and political work, moral education, sports, health and art education as well as national defense education of schools at all levels in Shanghai
- to direct the development and construction of the scientific and technological innovation platform of institutions of higher education (Shanghai Municipal Government 2010).

However, the Commission has delegated power to districts and counties in the following aspects:

- the approval of establishment, annulment, and modification of private secondary vocational schools, primary and secondary schools, and kindergartens
- the formulation and implementation of continuing education for teachers from junior high schools, primary schools, and kindergartens
- the appraisal of professional titles for teachers in kindergartens, primary, and secondary schools
- the enrolment, registration, and daily instruction of regular high schools, professional high schools, senior and junior high schools for adults
- the annual inspection and appraisal of experimental or model senior high schools under different administrative bodies are carried out at the district/county levels according to the requirement set by the municipal education commission (Shanghai Municipal Government 2010).

In the late 1980s the Municipal Education Commission loosened its grip over school textbooks. In 1988 Shanghai established the “Curriculum and Teaching Material Reform Commission for Primary and Secondary Schools,” which is a fundamental part of the city’s comprehensive curriculum reform. Since that time, Shanghai has allowed some diversity in textbook and teaching material selection (Jinjie 2012).

Considering these management and control arrangements, Tan (2013:92) characterizes the system as “decentralized centralism”, so while schools have some leeway to localize some of their curriculum, that leeway does not extend to the foundational (compulsory) examination courses that the municipal government controls.

Finland

At the national level, education is steered by the Ministry of Education and Culture (MEC), which is responsible for developing education policy, and the Finnish National Board of Education (NBE), a national development agency that is responsible for implementing education policy. The MEC is the principal decision maker for education policy: it oversees the annual state budget for education, prepares legislation, sets the education strategy and licenses and funds education providers. On the other hand, the NBE follows the development educational objectives, content and methods, and assists the Ministry in preparing policy decisions. The NBE has the following main tasks (Aho, Pitkanen and Sahlberg 2006):

- determining the National Core Curricula for preschool, primary and secondary education, vocational qualifications for upper-secondary vocational education and competence-based qualifications for adults
- implementing education development programs
- evaluating learner outcomes using sample-based assessments involving 5-10% of students
- maintaining national and international databases and information services on education and finance
- monitoring and anticipating vocational and professional education needs, overseeing student selection and the production of textbooks and other learning materials
- recognition and comparison of qualifications
- in-service staff training.

At the local level, administration rests with local authorities, which make decisions on the allocation of funding, local curricula and personnel recruitment. They also have the autonomy to delegate decision-making powers to the schools for some or all of these issues. Each local authority draws up a local curriculum based on the national core curriculum and in response to local needs. The local curricula must define the values, underlying principles and general educational and teaching objectives (Sahlberg, 2013; NBE, 2004; Vitikka, Krokfors and Hurmerinta 2012; OECD, 2010c). Each school develops its own programs of study, which it uses to develop annual work plans for the school, for each teacher and individual study plans for students when required (Halinen 2006). Local authorities are responsible for all practical arrangements, such as teaching arrangements, and are also responsible for the effectiveness and quality of the education they provide.

Teachers have pedagogical autonomy, deciding for themselves how to meet the expectations of the national core curriculum, teaching methods as well as what textbooks and instructional materials to use (OECD 2010c). There are no longer any school inspections – the system relies on the expertise of its teachers and other personnel to reach quality objectives, largely through self-evaluation.

Thus, the organizational model for education services in Finland can be described as a two-level system of governance: the Ministry of Education determining policy and the NBE overseeing policy implementation, curricula and qualifications at the national level; and local authorities (municipalities) and schools developing curricula and implementing policy at local level.

Finally, it is worth noting that education is commonly seen as a joint concern of government, parents, employers and society in general. There is a strong trust in a school's capability to manage education and little concern over their children's welfare. There is an unwritten agreement between home and school that parents are responsible for raising their children according to their own values, while school restricts itself to the academic and social education. While this situation has come under some tensions with recent immigration patterns, this open communication between parents and schools remains a fundamental element of the governance of Finnish schools (Aho et al 2006).

Currently, there are no explicit processes of state approval for textbooks, but this follows a period of tight regulation of textbook form and content. Approval may have stopped but use of the approved books (and the impact on the shape and content of the school curriculum) did not cease overnight, on the date that textbook approval ended.

The current standards setting system in Finland therefore is based on three essential ideas:

- management by goals given in legislation and in the national core curriculum
- autonomy of local authorities in providing and organizing local curriculum
- freedom for teachers, as valued experts, to develop the local curriculum in their classrooms.

The core curriculum is revised approximately every 10 years.

Japan

Administration of education is shared between national and local government at prefectural and municipal levels, but the educational agencies are independent of each other. Each of them participates in the administration of the education system and policy making is on a consensus basis. Central government, through the Ministry of Education, Culture, Sports, Science and Technology (MEXT), formulates national education policy through the courses of study, which are synonymous with national curricular standards in Japan; it administers public schools, sets salary scales for teaching staff, and establishes supervisory services.

Responsibility for school budgets, specific educational programs, school appointments and the supervision of schools is the responsibility of local boards of education (INCA 2011). Each of the country's 47 prefectures has a board of education that is responsible for the establishment and management of upper secondary schools and special needs schools. In addition, there are approximately 1700 municipalities that have their own Municipal Boards of Education that are responsible for the management of elementary and lower secondary schools. Boards of education are independent from government, and decide on the fundamental direction on education administration. They are guarantors of political neutrality and provide long term continuity and stability (OECD 2012). However an amendment to the Local Education Administration Law passed in 2014 is likely to mean that political influence over the Boards of Education will become stronger⁴.

The teachers themselves have a great deal of influence over how the curriculum is taught and schools are able to set local curricula and assessments within the national curriculum framework.

School textbooks are the main instructional material in Japanese classrooms. Japanese schools are required to use textbooks in the classroom teaching of each subject. The content of the course of study is reflected in textbooks, teachers' manuals and programs of work. The central

⁴ <http://www.japantimes.co.jp/opinion/2014/01/13/editorials/keep-power-in-boards-of-education/>

government provides all students in compulsory education a complete set of new textbooks at the beginning of each school year, no matter whether they are being educated in Japan or in another country. Upper secondary school students have to buy their own textbooks (INCA 2011). MEXT approves the textbooks, but the policies established in the 1980s reduced the Ministry's role to ensuring textbooks' neutrality and that they cover the correct topics for their grade.

The five year education plan developed in 2008 included standard setting activities through fostering children's "solid academic abilities" including fundamental knowledge and skills, abilities to think logically as well as critically, to pass fair judgments and to express themselves well and motivation to learn' (MEXT 2008). The National Assessment of Academic Ability was reinforced, with the government using the outcomes to gauge learning conditions in schools. Schools themselves were to use the outcomes to address any problems, give the public successful examples of school improvement and to ensure their accountability to parents. In order to assist schools in these efforts, the government supported flexible class-formation standards, the introduction of small-group education, the use of special teachers, the introduction of school choice and the development of original teaching materials (MEXT 2008).

One way of maintaining standards is ensuring that what is taught follows closely on from the intended curriculum. The national curriculum is revised about every 10 years and is a fundamental link in the standards chain. MEXT sets the curriculum, using university professors and ministry staff as writers. The prefectures follow the national curriculum closely. Teachers teach based on the national curriculum standards, going over the entire textbook for that term in each subject. According to the OECD (2012) the fact that everyone covers the curriculum no matter what school they are in or what region they are located in makes it easier to hold the system accountable. While teachers adapt, they do not change the curriculum. Performance data used to monitor teachers are common in just over half of Japanese schools, generally complemented by direct principal/senior staff observation.

Singapore

The education system is very centralized in Singapore, with the MOE at the helm of almost all curriculum, assessment, teacher training, and planning matters, for all primary, secondary and post secondary schools and institutions. The Ministry sets national educational goals and coordinates the country's education program. It is led by a political appointee – the education minister. Because there has only been one party in charge since independence, the government has been able to provide stability and continuity to education policy, and Singapore's education policies complement the government's national economic priorities (Tan 2013; Tucker 2012).

The MOE's curriculum division designs and reviews syllabuses and monitors their implementation, promotes pedagogical approaches that line up with curricular intent and designs assessments that support learning outcomes. It also produces and approves instructional materials and provides advice to schools, ministries and publishers on curriculum related issues (MOE 2014a).

Regionally, there are four zonal school branches that oversee the management of primary and secondary schools and junior colleges. Schools are grouped in clusters, each with its own superintendent. Superintendents are quite powerful in that they ensure schools within their clusters are networking and collaborating. They have responsibilities for finance and personnel, including identifying future leaders and their necessary career development. In addition there is a school appraisal branch which is responsible for the implementation of the School Excellence Model (SEM) and the MOE Recognition System. It consults with schools on their self-assessment and conducts the external validation of schools to ensure continuous school improvement.

The MOE produces some of the textbooks used by Singaporean children and also works with private publishers to develop materials based on the Curriculum, Planning and Development Division's (CPDD) subject syllabuses. These textbooks have to be approved by the Ministry, after which they can be placed on an approved textbook list. Schools are able to supplement the textbooks with their own materials. Teachers' guidebooks are widely used; guidebooks and textbooks mean that teachers can spend less time on basic lesson planning than in many other nations, but more on marking and planning.

In recent years, schools have gained more autonomy. For example, the institutional structure is based on guidelines drawn up by the MOE, but determined by individual schools. School principals have control of their own budgets so have autonomy to plan and coordinate the individual school's educational programs. The cluster system consisting of around 13-14 member schools, including both primary and secondary schools, is in place to support the principals. Tan (2008) points out, however, that MOE's adoption of more school flexibility in the areas of critical and creative thinking, use of ICT, citizenship education and administrative excellence does not mean that the state has lessened its control over education, rather it remains an interventionist force in all areas of education.

Singapore's government maintains a tight rein on standards, through national curriculum and assessment as well as policy initiatives, such as:

- *Thinking Schools, Learning Nation*, which promotes a shift from content mastery to mastery of skills, values and competencies
- *Teach Less Learn More*, which seeks to cut back on quantity in order to support school-based interdisciplinary curriculum development create "white space" in the curriculum that gives schools and teachers room to introduce their own programs, reflect more, and have more preparation time
- *ICT Masterplan*, which ensures that all school include technology in as many lessons as possible
- *Project Work*, which is a way of integrating critical and creative skills across the curriculum through collaboration, communication and independent learning
- *National Education*, which promotes civic values and patriotism.

Florida

Florida's governor appoints members of the State Board and the Commissioner of Education; those choices are then confirmed by the Florida Senate. In 2000 the Florida Legislature pared down many of the education agencies, boards and commissions and gave the governor most of the responsibility for the actions of the education system. Each of the 67 school districts has a school board; there is an elected district Superintendent in 44 districts and an appointed (by the district school board) Superintendent in 23 districts.

Each district school board must provide instructional materials for all students, including textbooks, for the core courses in mathematics, language arts, social studies, science, reading and literature. Those materials must be in line with district goals and objectives as well as match the state course descriptions. On a rotating basis, the state adopts instructional materials for courses in the subjects above, after a tendering procedure that sets out to ensure that any materials adopted meet the Florida state standards.

The Commissioner works with three state or national subject matter experts to review potential books. School districts can then appoint a teacher or curriculum specialist to review the recommendations that the state experts have made; 50% of the textbook budget must be spent on state approved books. Florida has been a very powerful influence on major textbook publishers because of the size of its student population.

Building on the Sunshine State Standards between 2007 and 2012, partially as a result of federal reforms such as the No Child Left Behind Legislation and the Race to the Top funding, a major review was done to the state standards resulting in the Next Generation Sunshine State Standards (NGSSS) for all content areas, and NGSSS Common Core in English Language Arts (ELA) and mathematics. In terms of assessment, Florida joined a number of states in the Partnership for Assessment of Readiness for College and Careers (PARCC), which aimed to develop Common Core aligned instruments. However, in 2013, Governor Rick Scott issued an executive order to the Commissioner of Education to withdraw from PARCC and develop Florida's own assessments to measure NGSSS. In January of 2014, Florida announced that it was developing its own mathematics standards rather than relying exclusively on the Common Core State Standards.

The standards-based NGSSS and CCSS between them define the content, knowledge and abilities students need to have in each subject area. They provide grade-level or course expectations, include guidance for teachers about the depth of knowledge and other instructional goals, and provide the framework for state-adopted instructional materials and assessments. They are intended to help ensure that all students are college and career ready in literacy and numeracy no later than by the end of high school.

Massachusetts

The 1993 Massachusetts Education Reform Act (MERA) aims were to equalize school spending, and improve student achievement through setting high standards, assessing students' achievement based on those standards, and providing sufficient resources for districts to help

students meet the standards. Charter schools were introduced, which are public schools or part of public schools that operate on a charter granted by the Massachusetts Board of Education (BOE) and approved by the school committee and the local collective bargain unit. Another feature of MERA is the introduction of a framework of standards for what students should know and be able to do, and a high-stakes assessment system (Massachusetts Comprehensive Assessment System – MCAS) based on these standards. The introduction of standards and the MCAS meant a stronger emphasis on students' outcomes, for which schools and districts are accountable.

The BOE is responsible for interpreting and implementing laws relevant to public education, including granting and renewing charter school applications, developing and implementing MCAS, submitting yearly budget proposals for public education to the Massachusetts General Court, setting the standards for and certifying teachers, principals, and superintendents, and monitoring — as well as intervening to ameliorate — the achievement of underperforming districts.

Principals, under the direction of the superintendent, are responsible for selecting and purchasing textbooks and other educational materials and supplies to be used by students in the school. The superintendent's involvement in the process is to ensure that the books and materials selected for any particular school are consistent with the educational goals and policies established by the school committee.

The Commissioner has the responsibility for drawing up curriculum frameworks for core subjects that includes broad pedagogical approaches and strategies for assisting students in developing skills, competencies and knowledge enshrined in the standards. Teachers, parents, university faculty are all part of the consultative process. The frameworks are meant to guide teachers, administrators, publishers, software developers and other interested parties in curriculum, textbook, technology and other instructional material development. The Board is able to review and recommend instructional materials.

Comparative analysis

The above represents a complex picture of differing ways of organizing, managing and controlling instructional systems. The two federal countries have very different approaches, with **Canada** devolving its educational policy making to the provincial governments, while in **Australia** there is a stronger common core, albeit with states able to take a variety of approaches. So in **Australia** we see a mix of responsibility between federal, state and schools for most aspects of policy, while in **Canada** it is largely shared between the provincial government and the elected school boards.

The two **Chinese** provinces and **Japan** all have a history of very centralized government-led education policies, which are currently reforming in an attempt to liberalize and democratize their approaches. Nonetheless, the two Chinese provinces have only really started on their redistribution of responsibility to the local level. In **Japan** the main counterbalance to state control is arguably the parents via the media, which appears to have an important say in Japanese education policy.

Both **Florida** and **Massachusetts** are centered on the state level, **Florida** perhaps more than **Massachusetts**. Apart from some choice in buying textbooks and other teaching resources, local schools are very much on the receiving end of governor-centered policy. **Singapore**, like the Chinese provinces, is starting to institute policies that promote a greater devolution of education responsibility to local and school level. However, as far as we can tell this remains the most centralized of the jurisdictions in this study. Unsurprisingly **Finland** occupies the other extreme position, with a very even split of responsibilities across national, regional and individual school level, with all elements having an important part to play in establishing educational policy and priorities.

Most of the jurisdictions require textbooks to be centrally approved. Schools in **Ontario, Alberta, Hong Kong** and **Singapore** have to buy text books from an approved list; the same is true for **Shanghai**, although there are some freedoms for schools to buy elsewhere or develop their own resources. In **Japan** the government supplies textbooks for those in elementary and junior high schools while in **Massachusetts** schools can buy textbooks freely, but they need to be approved by a regional superintendent. In **Florida** at least half of textbooks have to be state approved. Only **Finland** and **Australia** operate a clear free market, and in the case of the former, this after a long period where their textbooks were systematically reformed and improved from the center.

Principles and methods of accountability

Governments want both to influence and reliably gauge how well individual students, teachers, localities, regions and the nation itself are performing against education policy objectives. Increasingly the measure used is some form of assessment outcomes. Many of the jurisdictions studied have developed assessment based accountability policies in the belief that assessment outcomes, generally but not always achieved through tests, are the fairest and most objective measure of national achievement. Many policy makers have come to believe that tests can be progressive, equitable, rational and reasonable and can be used as instruments for educational reform. This view is not shared by all jurisdictions, with Finland's accountability system standing out as the most different.

Testing can be a quick fix, externally mandated, rapidly implemented and the results can be publicly reported. In many cases politicians need to show positive outcomes of their assessment policies within the lifetime of an election result. To achieve these aims, they develop systems that attach rewards and sanctions – a widespread form of accountability measures – to the outcomes of their assessment policies. Policymakers believe that such accountability systems provoke improvements in educational performance but assessment outcomes are also used to evaluate whether or not the programs and policies are working, which means that there has been a shift from using tests as measurement instruments designed to produce information to a reliance on tests to influence policy and instruction. When assessment systems become high stake, even those that might be useful monitors of educational success can lose some of their dependability and credibility.

Accountability policies can encourage schools to shift away from a curriculum to a test focus, with students endlessly practicing on old tests; what is not tested is either not taught or is given minimal time. In an attempt to counteract accountability policies' negative effects, Baker and Linn (2002, 19-24) developed standards for accountability systems, including:

- accountability systems should employ different types of data from multiple sources
- accountability systems should include data elements that allow for interpretations of student, institution, and administrative performance
- accountability expectations should be made public and understandable for all participants in the system
- decisions about individual students should not be made on the basis of a single test
- if tests are to help improve system performance, data should be provided illustrating that the results are modifiable by quality instruction and student effort
- if test data are used as a basis of rewards or sanctions, evidence of technical quality of the measures and error rates associated with misclassification of individuals or institutions should be published
- if tests are claimed to measure content and performance standards, evidence of the relationship to particular standards or sets of standards should be provided.

Australia

Both the Melbourne Declaration and the National Education Agreement put forward a case for increased accountability for the use of public education funding. Included in this accountability regime are improved reporting about student achievement and school performance both on an individual school and a comparative basis as well as reporting on the performance of overall Australian schooling (ACARA 2009).

State governments committed themselves to report publicly in a manner that focused on improving performance and student outcomes, was locally and nationally relevant, timely, consistent and comparable. All schools have to report student progress to parents, including an assessment against national standards and for each subject studied, an assessment against a five point grading scale and relative to the student's peer group. Schools also have to make these publicly available in an annual report.

National accountability measures include a nationally comparable data collection for all schools to support evaluation, accountability and resourcing decisions. Responsibility for national accountability reporting lies with ACARA. It collects, manages, analyzes and publishes student assessment data and other school related data and publishes them in a National Report on Schooling in Australia.

One of the main accountability measures is the outcomes of the National Assessment Program – Literacy and Numeracy (NAPLAN) tests for students in Years 3, 5, 7 and 9. The reports are broken down by state and territory, gender, language background, ethnicity, parental education and income. They are also published for each school on the *MySchool* website. Website information is wide-ranging, including a description of the school, student numbers, staffing numbers, attendance rates, NAPLAN performance data, senior secondary outcomes and a report out on student socio-economic status so that comparisons of school performance can be made between schools with students from statistically similar backgrounds (ACARA 2009).

In 2013 a *National Plan for School Improvement* was published in which transparency and accountability forms one of five main pillars, which shifts some of the accountability for performance to the states, each of which has to report out how it is progressing against the national priorities listed above through an augmented *MySchool* reporting system (Commonwealth of Australia 2013).

The accountability system in **New South Wales** parallels that of Australia as a whole. In addition, school principals are directly accountable for what happens within their schools under the *Leading and Managing the School* (LMS) policy of 2000 (NSW DEC 2004). Under LMS, principals have seven main accountabilities, of which two are directly related to curriculum policy – educational programs and learning outcomes. Through the former, the principal must ensure that the curriculum meets student needs, that syllabuses are consistent with the current state and national syllabuses, that learning and teaching programs are relevant and varied and that student outcomes form part of any evaluation of those programs. Regarding learning outcomes, the principal is accountable for the school's teachers maximizing student learning outcomes and ensuring that those outcomes are analyzed based on school-based and system-wide assessment

data. These accountabilities complement the recent moves towards greater school autonomy, which sees the role of the principal as key (NSW DEC 2004).

Queensland conducts an extensive audit of teaching and learning in each **Queensland** state school. This audit consists of the eight elements – an explicit improvement agenda; analysis and discussion of data; a culture that promotes learning; targeted use of school resources; an expert teaching team; systematic curriculum delivery; differential classroom learning; and effective teaching practices – and the schools are ranked against each of these eight elements on a four point scale from Outstanding to Low (ACER 2014; Lingard and Sellar 2013).

Alberta schools operate under an “Accountability Pillar” that attempts to ensure equitable education across the province. It is complemented by two other pillars, “Flexibility” and “Funding,” which give local authorities more control over decision-making. School authorities are accountable for the use of resources and results achieved.

The accountability pillar rests on the use of data sets, including student achievement K-12, but is not reliant solely upon those data. Other aspects include: preparation for life-long learning, employment and citizenship; involvement; continuous improvement; safe and caring schools; and student learning opportunities. These are measured through student, parent and teacher input. Results are reported out by each school authority to its local community.

There is a common set of student achievement measures province-wide that compares past and present performance based both on achievement and improvement. The achievement standard is measured based on comparative results across Alberta using a baseline of three years’ data; the improvement data rest on each school’s own data over three years. These are combined in order to report out at the following levels: excellent, good, acceptable, issue and concern. After the results are published, local authorities are obligated to work with schools to seek necessary improvements (Alberta Education 2010).

Unlike many jurisdictions, Canada has less strict evaluation requirements for teachers once they have been certificated. Teachers receive certificates for life upon graduation from teacher training programs and are not required to participate in continuous professional development (CPD) in order to keep their certification current. In 2014 a task force recommended that Alberta teachers get re-certificated every five years. At the time of this writing it is unclear if that recommendation will be put into effect (Alphonso & Maki 2014).

In **Ontario**, the Education Quality and Accountability Office (EQAO) is responsible for province-wide assessments in literacy and mathematics for students in Grades 3, 6, 9 and 10. The tests’ main objectives are to provide data that can be used both for accountability and improved teaching and learning.

Using the data and other information such as demographics and program descriptions, districts and schools prepare reports and school improvement plans. Assessment outcomes are published on the EQAO’s website and reported widely in the media, which publish schools’ rank

order. The EQAO has developed an Education Quality Indicators Framework that was more subtle than test data alone; it contains information gleaned from the student, teacher, and principal questionnaires that accompany the tests as well as from school board student information systems under the heading of four broad factors: contextual factors that may be beyond the direct control of the educational system; input factors such as student attendance and teachers' qualifications; process factors such as teachers' CPD; and output factors such as student attitudes and achievement.

In 2013, the government introduced the K-12 *Effectiveness Framework*, which broadened the notion of what made a successful school. It includes:

- assessment for, as and of learning
- school and classroom leadership
- student engagement
- curriculum, teaching and learning
- pathways, planning and programming
- home, school and community partnerships.

Indicators of success in these areas are supposed to assist with strategic planning, the allocation of resources and determining capacity-building needs through school self-assessment and district reviews. Schools are encouraged to form professional learning communities (PLC), thus supporting professional 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.

Schools conduct self-evaluation as the internal quality assurance mechanism and are also subject to inspections by the Education Bureau (EDB). Schools submit 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 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 HKDSE (EDB 2003).

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 be used for accountability purposes through the schools'

self-evaluation reports (Cheng 2009). Complementing other accountability measures, the EDB 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.

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 (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 2010a).

Teachers in government schools are civil servants. 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.

Shanghai has systems of quality assurance, in the managerial sense, with no shortage of performance indicators and appraisal mechanisms. The education system is transparent. Parents have a powerful influence on schools, both through their choice of schools and through the media, which reports frequently on education-based issues. Parents receive constant feedback from their children's schools, often through technological means. Principals and teachers therefore must balance administrative accountability, client accountability and professional accountability. The Chinese Ministry of Education has recently (2012) accentuated principal accountability by adding five items into their professional standards: prevention of increasing the difficulty of the curriculum; decreasing the time students study; discouraging undue emphasis on academic performance; preventing teachers from offering paid-for tutorials; and preventing promotion of commercial goods and services to students (Law 2014).

Each school has a three-year development plan and must produce yearly implementation plans. The municipal government sends in inspectors to ensure that schools carry out these plans and schools also self-appraise. In regard to the teacher management targets, schools are assessed on the "teaching-research system for lesson preparation, lesson delivery, lesson appraisal, system for student school work inspection, system for teaching quality assurance (Tan 2013, 102)." Schools are held accountable for how well they carry out the second phase of educational reform, which features nurturing students' innovative spirit, practical ability and character development as well as examination preparation.

Finland's accountability system is different from most other nations' in that the primary locus of control is within the schools, supported by their local authority, although there is national policy on

some aspects of education such as the curriculum frameworks. Teachers largely self-evaluate. There is no inspectorate in Finland. Local authorities are required to evaluate their schools and the education provided, to ensure its effectiveness and quality. The evaluation system relies on the professionalism and expertise of teachers (Galloway 2008).

According to Sahlberg (2010), the word accountability is not used in Finland's education system. Contrasting the Finnish accountability system with global education reform trends, he described it as being based on:

- flexibility and loose standards that build on good practices and innovations in school-based curriculum development, learning targets and networking (in contrast to centrally prescribed performance standards for schools, teachers and students)
- broad learning with creativity, based on deep learning that gives equal value to an individual's personality, morals, creativity, knowledge and skills (in contrast to a focus on basic reading, writing, mathematics and natural sciences)
- intelligent accountability, with policies that gradually build a culture of trust within the education system that values teachers' and principals' professionalism in judging what is best for students and in reporting their learning progress (in contrast to raising student achievement through processes of promotion, inspection and rewards/punishments for schools and teachers based on outcomes of standardized testing).

Nonetheless, this culture of "trust" is underpinned by a comprehensive evaluation program (Simola et al, 2009). For although traditional forms of control over teachers' work, such as inspections, a detailed national curriculum, officially approved teaching materials and the like have been eliminated, this does not mean that there is no evaluation of learning, teaching and assessment or the activities that support these. Municipal and national authorities are required by legislation to evaluate their schools and the education provided, and to participate in external evaluation (Galloway 2008).

Japan's accountability system is different from most other OECD nations', a distinction it shares with Finland. There is accountability, but it is not a system of administered accountability, and it is not test-based. Japan did introduce assessments of 6th and 9th Grade students in 2007 but these are not used directly for school accountability. There are entrance tests for upper secondary schools and universities and a student's future rests heavily on the outcomes of those. Magazines frequently publish the results, which may be considered a form of public accountability. The rankings of upper secondary schools attract considerable attention, but there is less interest in which lower secondary schools send more students to prestigious upper secondary schools, since only 15% of municipalities have introduced school choice.

Instead of accountability through the results of frequent testing, in Japan there is an understood group accountability consisting of the student, the family, teachers and other educators and other students in the year group. Teachers' reputations are wrapped up in their former students' success, and students have a homeroom teacher who might be with them for a number of years and will be involved in the student's life outside the classroom. Communication with parents is

frequent and Japanese society holds the mother responsible for her children's success to a far greater extent than elsewhere. Students are under intense pressure to succeed since the reputations of the adults in their lives depend on it. Even without a formal test-based accountability system, the OECD argues that there is strong accountability in Japan with students accountable to teachers and parents, teachers accountable to each other, and success in getting students placed in the right upper secondary school or university a matter of public knowledge (OECD 2010b).

In **Singapore**, school accountability is focused on performance; however, schools are allowed autonomy from central control with freedoms in hiring and firing, admissions policies and curriculum development. The aim is to focus on quality rather than only quantity as well as innovation, and to do so some quality assurance functions devolved to schools. In 2000 the School Excellence Model (SEM) was introduced, which incorporated self-appraisal, although it did include centrally developed performance indicators as well as an external inspection/validation from the appraisal branch of the MOE every five years.

The SEM model contains nine quality criteria against which schools are judged: leadership; strategic planning; staff management; resource management; student-focused processes; administrative and operational results; staff results; partnership and community results and student results. For each criterion schools must show:

- a sound and integrated approach for systematic, continuous improvement for all criteria of quality
- a systematic deployment of the approach and the degree of implementation
- a regular assessment and review of the approaches and their deployment, based on monitoring and analysis of the results achieved and on-going activities
- an identification, prioritization, planning and implementation of improvement activities
- a set of appropriate and challenging performance targets
- a continuous improvement of results over three to five years
- a benchmarking of performance against comparable schools
- an identification of the causes of good or bad results (Ng 2008, 242-43).

While SEM has devolved many accountability measures to the schools themselves there is still some central control. All schools do a self-appraisal using the above model, which an external MOE team validates every six years. Validation requires evidence to justify the school's judgments as well as evidence of continuous improvement through trend analyses.

Ng (2013) found that vice-principals believed that schools were primarily accountable for: students' holistic development; site, funding and staff management; national survival and nation building; humanity and the future. Ng recounted that some of the vice-principals thought that national survival and nation building were the main functions of schools in Singapore and therefore for what they should be most accountable.

Teachers are held accountable under an *Enhanced Performance Management System* (EPMS) that requires teachers to receive reviews once a year with a supervising education officer, with two other formal meetings serving as a performance planning session and a mid-year check-in session. Teachers set targets and expected results and plan their development and training with their supervisor. After three reviews, which include a holistic view from a panel of peers as well as the supervisor, teachers are ranked from A to E and salary increments, performance bonuses and career development opportunities are directly related to the grade they receive. Promotion decisions are based on the teacher's performance, knowledge, experience and potential (Dimmock and Tan 2013).

Each school in **Florida** is assigned a letter grade ranging from A (making excellent progress) to F (failing to make adequate progress) based on student outcomes on Florida Comprehensive Assessment Tests (FCAT). A school receives an F if it fails to achieve the minimum criteria in all three FCAT subjects – reading, mathematics and writing; it receives a D if it fails the minimum criteria in one or two subject areas and a C if it passes the minimum criteria in all three subjects. This A+ Plan also instituted school vouchers, called “Opportunity Scholarships,” for students that wished to move from failing public schools to a different public school, or an eligible private school (Feng, Figlio & Sass, 2010; Chakrabarti & Schwartz 2013). If students (and their parents) take advantage of the voucher system, then schools that are graded F are in serious danger of losing both revenue and reputation. FCATs have been replaced with FCAT2, which set the cut scores for passing higher, thereby issuing a greater accountability challenge for schools.

Florida introduced new accountability legislation in 2011 in the form of the Student Success Act, which established a comprehensive evaluation system for teachers and principals based on measures that were qualitative – for example, measuring student growth through observation of educator practice – and quantitative, for example tying compensation to student achievement results beginning in 2014-1015 as well as eliminating tenure for those who had not yet got it (RTTT report 2013).

Massachusetts' accountability system measures each school and district's progress toward the goal of reducing proficiency gaps by half between the 2010-11 and 2016-17 school years. Massachusetts uses the Progress and Performance Index (PPI) and school percentiles to classify schools into one of five accountability and assistance levels. All schools with sufficient data, including charter schools, are classified into Levels 1-5. Schools making sufficient progress toward narrowing proficiency gaps are classified into Level 1, while the state's lowest performing schools are classified into Levels 4 and 5. Districts are classified into a level based on the level of their lowest performing school.

The PPI combines information about narrowing proficiency gaps, growth, and graduation and dropout rates into a number between 0 and 100. A PPI of 75 or higher indicates that a group, school, or district is on track toward meeting its proficiency gap-narrowing goals. All districts, schools, and groups with sufficient data are assigned an annual PPI based on two years of data and a cumulative PPI based on at least three annual PPIs. The cumulative PPI generally represents a performance trend over four years.

The Department of Elementary and Secondary Education (ESE) has developed a Model System for evaluating administrators and teachers that districts can choose to adopt or adapt. Districts may also choose to revise an existing evaluation system to meet the new regulatory requirements. By September 2013, all districts were required to adopt “district-determined measures” that permit comparison of student learning, growth, and achievement for each grade and subject, district-wide. The process includes self-assessment, goal setting and planning, implementing the plan, and formative and summative evaluation, in which teacher are judged on curriculum planning and assessment, teaching all students, family and community engagement and professional culture. Principals are judged on instructional leadership, management, family and community partnerships and professional culture. Evidence can come from the Massachusetts Comprehensive Assessment System (MCAS) and observations (including unannounced).

Comparative analysis

In general, all the jurisdictions studied have comprehensive processes in place for measuring school standards. In most cases this involves some form of regular testing of students on a national program, varying in terms of its coverage of grades, cohorts and subjects. These measures of students’ outcomes tend to be the central feature of the accountability systems in our jurisdictions, but they are often complemented by a range of other issues like use of resources, students’ wellbeing or community involvement.

Regarding schools’ accountability, both **Australian** states appear to have rigorous accountability processes conducted through extensive testing. In many ways NAPLAN appears to be a classic “high stakes” test. However, it is also argued that despite the wide dissemination of the results there is no great sanction available for use against a school which does not do well in NAPLAN testing. Similarly in **Canada** where regular testing is used to identify schools or districts which need greater support, there does not seem to be a culture of blame or failing schools. Once again, the situation is complicated in the East Asian schools by the culture of high parental expectations and very high stakes post-school testing. So **Japan** may have an external evaluation system that is similar to **Finland**, but it works very differently because of the culture of the country, where passing the university exams is seen as a both a high achievement and a necessary one.

Singapore, Florida and **Massachusetts** all carry out rigorous categorization of schools based on testing of students, and perhaps the highest stakes is for **Florida** schools for which a low grade could mean the closure or reconstitution of a school.

Compulsory testing of literacy/numeracy (not including end of school assessments)

	NSW	Queens- land	Alberta	Ontario	Hong Kong	Shanghai	Finland	Japan	Singa- pore	US
Grades 10 - 12										
Grade 9										
Grade 8										

Grade 7										
Grade 6										
Grade 5										
Grade 4										
Grade 3										
Grades 1 - 2										

The definition of what should be mandatory and what should be optional in programs of study

The major set of instructional decisions that all jurisdictions must face is how much time to devote to in-school instruction and which subjects are mandatory in which grades and for how long. Generally there are regulatory requirements regarding hours of instruction overall as well as hours spent on particular subjects. However, in some of the jurisdictions there is a certain amount of leeway for local authorities, schools, teachers and/or student in the organization of curriculum time or in subject choice. Not surprisingly, flexibility for schools and teachers, although not necessarily for students, is more common in primary schools (OECD 2014).

New South Wales

In primary students must study each of the key learning areas (KLA): creative arts; English; human society and its environment (HSIE); languages; mathematics; personal development, health and physical education (PDHPE); science and technology. 50% of the time must be spent on mathematics and English and 40% on the other key learning areas and sport.

For Years 7 – 10 the minimum requirements for government schools when providing curriculum are:

- 500 hours per subject for English, mathematics and science, over Years 7 – 10
- 400 hours for HSIE, including in Years 7 - 8, 100 hours for geography and 100 hours for history and, in Years 9 – 10
- 100 hours for Australian history and 100 hours for Australian geography,
- 100 hours of one language in a continuous one-year period
- 200 hours for technology (mandatory) over Years 7 and 8
- 100 hours for music and 100 hours of visual arts
- 300 hours for PDHPE, over Years 7 – 10, in each of the years
- 400 hours for additional studies (electives) which may involve Board Developed courses or school developed Board-Endorsed courses
- 80 – 120 minutes per week for sport in each of the Years 7, 8, 9 and 10 (NSW DET 2006).

Students in Years 11 and 12 aim for a Higher School Certificate (HSC). The only compulsory subject is English. Courses are expressed in units; most of them are two units. To be eligible for the award of the HSC a student must have satisfied the requirements in at least twelve preliminary level units, and at least ten HSC level units, with the additional requirements that:

- at least two must be English units
- at least six units must be Board of Studies-developed courses
- at least three courses are of two unit or greater value
- at least four subjects have been completed
- no more than six units of science are studied.

In addition, schools must provide students with a 25 hour personal development and health education course, *Crossroads*.

Queensland

Hours per year over 37-40 weeks per year (40 weeks 2014-2016)						38 weeks
Learning area	P- Year 2	Year 3-4	Year 5-6	Year 7-8	Year 9	Year 10
English	250-270 (280)	203-220 (280 Y3; 240 Y4)	185-200 (240)	111-120 (Up to 240 Y7; Up to 140 Y8)	111-120 (Up to 140)	105-114 (133)
Mathematics	166-180 (200)	166-180 (200)	148-160 (200)	111-120 (Up to 200 Y7; Up to 140 Y8)	111-120 (Up to 140)	105-114 133
Science	37-40 (40)	64-70 (70)	64-70 (70)	92-100 (100)	111-120 (120)	105-114 (114)
Health & PE	74-80	74-80	74-80	74-80	74-80	70-76
History	18-20 (20)	37-40 (40)	37-40 (40)	46-50 (50)	46-50 (50)	43-48 (48)
Geography	18-20	37-40	37-40	46-50	46-50	43-48
Economics & business			18-20	18-20	46-50	43-48
Civics & Citizenship		18-20	18-20	18-20	18-20	17-19
Arts	37-40	46-50	46-50	74-80	74-80	70-76
Languages	46-50	46-50	46-50	74-80	74-80	70-76
Design & Technology	18-20	37-40	55-60	74-80	37-40	35-38
ICT					37-40	35-38

Most of the curriculum time is allocated, but unallocated time rises in the later grades. While Prep to Year 8 has over 70% of curriculum time allocated, excluding options, Years 9 and 10 have just under 50% allocated. During 2014-2016 curriculum time in non-national curriculum subjects will be determined by the schools.

In order to achieve a Queensland Certification of Education, in Years 11 and 12 students have to amass 20 credits (at one credit per semester per course) at a passing standard in a set pattern of at least 12 credits from a completed core course – of which there are myriad options, both academic and vocational, and can include vocational education and training (VET) and apprenticeship courses – plus eight additional credits from a combination of any courses of study, plus meeting literacy (from four English courses) and numeracy (from four mathematics courses) requirements. There are numerous vocational alternatives that can also count toward the literacy and numeracy requirements.

Alberta

The following are the recommended time allocations for each subject area for Grades 1 - 9.

	Grades 1 – 2 (Percentages)		Grades 3 – 6 (Percentages)		Junior High School (Hours)	
	English language	French language	English language	French language	English language	French language
English language Arts	30%	Combined 30%	25%	Combined 35%	150	Combined 250
Mathematics	15%	15%	15%	15%	100	100
Science	10%	10%	15%	10%	100	100
Social Studies	10%	10%	10%	10%	100	100
Art & music	10%	10%	10%	10%		
Physical education	Combined	Combined1	10%	10%	75	75
Health & life skills	10%	0%	10%	10%	50	50
Other subjects	15%	15%	15%	10%	variable	variable

Senior high school programs include a range of course, both vocational (career and technology studies) and academic. Time allocations are below:

Senior High School Graduation Requirements: Diploma (English)

100 credits including the following:

English Language Arts – 30 level [ELA 30-1 or 30-2]
Social Studies – 30 level [Social Studies 30-1 or 30-2]
Mathematics – 20 level [Mathematics 20-1, 20-2 or 20-3]
Science – 20 level [Science 20, 24, Biology 20, Chemistry 20 or Physics 20]
Physical Education 10 (3 credits)
Career and Life Management (3 credits)
10 credits in any combination from: <ul style="list-style-type: none"> • Career and Technology Studies • Fine Arts • Second Languages • Physical Education 20 and/or 30 • Knowledge and Employability courses • Registered Apprenticeship Program courses • Locally developed/acquired and authorized course in CTS, fine arts, second languages or Knowledge and Employability occupational courses
10 credits in any 30-level course (in addition to a 30-level English Language Arts and a 30-level Social Studies course as specified above)
These courses may include: <ul style="list-style-type: none"> • 30-level locally developed/acquired and authorized courses • Advanced level (3000 series) in Career and Technology Studies courses • 30-level Work Experience courses • 30-level registered Apprenticeship Program courses • 30-level Green certificate Specialization courses • Special Projects 30

Senior High School Graduation Requirements: Certificate of Achievement (English)

80 credits including the following:

English Language Arts – 20 or 30 level [ELA 20-2 or 30-4]
Social Studies – 10 or 20 level [Social Studies 10-2 or 20-4]
Mathematics – 10 or 20 level [Mathematics 10-3 or 20-4]
Science – 10 or 20 level [Science 14 or 20-4]
Physical Education 10 (3 credits)
Career and Life Management (3 credits)
5 credits in: <ul style="list-style-type: none">• 30-level Career and Technology Studies• 30-level Knowledge and Employability courses, or• 30-level locally developed/acquired and authorized course with an occupational focus
AND
5 credits in: <ul style="list-style-type: none">• 30-level Knowledge and Employability Workplace Practicum course, or• 30-level Work Experience course, or• 30-level Green Certificate course• Special Projects 30
OR
5 credits in <ul style="list-style-type: none">• 30-level Registered Apprenticeship Program course

Ontario

The Kindergarten curriculum is play-based and concentrates on six learning areas: personal and social development; language; mathematics; science and technology; health and physical activity; and the arts. Grades 1 through 8 must offer instruction in the arts, French as a second language (for English language schools), health and physical education, language, mathematics, science and technology and social studies. In Grades 7 and 8 international languages and work related activities may be offered and social studies can be separately taught as history and geography. Subjects do not necessarily have to be separate – it is possible to offer inter-disciplinary learning (see discussion on integrated learning).

In order to graduate from high school students must complete the following compulsory courses:

- 4 credits in English (one credit per grade), which may come from successful completion of the *Ontario Secondary School Literacy Course* (for those who failed the OSSLT and opted to take the course instead of repeating the test) to meet either the Grade 11 or Grade 12 requirement, or the Grade 11 *Contemporary Aboriginal Voices* course
- 3 credits in mathematics, with at least one credit in Grade 11 or 12
- 2 credits in science
- 1 credit in the arts, which may come from the Grade 9 *Expressing Aboriginal Cultures* course
- 1 credit in Canadian geography (Grade 9)
- 1 credit in Canadian history (Grade 10)

- 1 credit in French as a second language (or a Native language course)
- 1 credit in health and physical education
- 0.5 credit in career studies
- 0.5 credit in civics.

In addition, students must complete three additional credits consisting of one credit from each of the following groups:

- Group 1: English, French as a second language, classical languages, international languages, native languages, Canadian and world studies, native studies, social sciences and humanities, guidance and career education, cooperative education
- Group 2: French as a second language, the arts, business studies, health and physical education, cooperative education
- Group 3: French as a second language, science (Grade 11 or 12), computer studies, technological education, cooperative education.

Finally, students also must earn 12 optional (or elective) credits. Courses can vary according to each school's program and can be locally developed. In order to pass a course for credit, students must achieve at least a 50% mark. There is a variety of pathways open for students to follow in Grades 9 through 12. Schools boards are required to ensure that students in Grades 11 and 12 have access to an appropriate destination-related course in at least English, mathematics, and science.

Hong Kong

Hong Kong's Curriculum is structured around seven learning goals, four key tasks, eight Key Learning Areas (KLA) and five essential learning experiences. The seven learning goals revolve around students' ability to participate in civic society, be independent critical thinkers, lead a healthy lifestyle and possess a breadth and foundation of knowledge in the eight KLAs. They do this through moral and civic education reading to learn, project learning and information technology for interactive learning. The five essential learning experiences include moral and civic education, intellectual development, community service, physical and aesthetic development and career-related experiences.

The eight Key Learning Areas are:

- 1) Chinese language
- 2) English language
- 3) mathematics
- 4) personal, social and humanities
- 5) science
- 6) technology
- 7) arts
- 8) physical education

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. 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 is below:

Suggested Lesson Time

Key Learning Area		Lesson Time (over three years)		
		P1 – P3	P4 – P6	S1 – S3
Chinese Language		594-713 hours (25-30%)	594-713 hours (25-30%)	468-578 hours (17-21%)
English Language		404-499 hours (17-21%)	404-499 hours (17-21%)	468-578 hours (17-21%)
Mathematics		285-356 hours (12-15%)	285-356 hours (12-15%)	331-413 hours (12-15%)
Science	General Studies for Primary Schools	285-356 hours (12-15%)	285-356 hours (12-15%)	276-413 hours (10-15%)
Personal, Social and Humanities				413-551 hours (15-20%)
Technology				220-413 hours (8-15%)
Art		238-356 hours (10-15%)	238-356 hours (10-15%)	220-276 hours (8-10%)
Physical Education		119-190 hours (5-8%)	119-190 hours (5-8%)	138-220 hours (5-8%)
Sub-total of the lower range of lesson hours over three years		1925 hours (81%)	1925 hours (81%)	2534 hours (92%)
Flexibility		Flexibility of 19% (about 451 hours over three years) is provided for:		Flexibility of 8% (about 220 hours over three years) is provided for:
		<ul style="list-style-type: none">• Moral and Civic Education/Guidance to complement values education across KLAS• Additional common reading time• School assembly/Class teacher period to complement values education across KLAS• Remedial or enhancement studies in KLA(s) or across KLA(s)• Other broadening learning experiences such as community service, co-curricular activities to complement life-wide learning		
Total number of lesson hours over three years		2376 hours 792 hours x 3 100%	2376 hours 792 hours x 3 100%	2754 hours 918 hours x 3 100%

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

Senior secondary 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). Suggested lesson time is as follows:

Subject	Suggested Time Allocation	Compulsory	Elective
Chinese	12.5 – 15% (338 – 405 hours)	67 – 75% of total (225 – 304 hours)	25 – 33% of total (85 – 135 hours) Three to four elective modules chosen from ten proposed modules Approximately 28 hours per module
English	12.5 – 15% (338 – 405 hours)	Up to 75% (approximately 305 hours) Nine suggested modules comprising 19 units	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 32 – 36 hours per module
Mathematics	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	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	One of two modules Calculus and Statistics Algebra and Calculus
Liberal Studies	Minimum 10% (270 hours)	Six modules (30 hours each) Personal & interpersonal relationships Hong Kong today Modern China Globalization Public health Energy & the environment	Independent Enquiry Study (90 hours) Suggested themes include Media Education Religion Sports Art Information & communication technology (ICT)

Total Core Subject Time Allocation	45 – 52.5% of curriculum time	
Elective subjects (students take two or three – and up to eight)		A wide range of academic and applied learning subjects

(adapted from CDC 2014)

Shanghai

Subject disciplines are organized into eight learning domains: language and literature; mathematics; natural science; social sciences; technology; arts; physical education; and practical skills (OECD 2010a). The curriculum has three components: a basic, compulsory, curriculum; an enriched, mainly elective, curriculum; and an inquiry based, outside school hours, curriculum. As part of the last element, students conduct research the aims of which are to help them “learn to learn,” think critically and creatively, do community service and promote social welfare.

Shanghai’s plan for educational reform and development for 2020 calls for an increase in school-based curricula as well as a credit system at the senior secondary level to make learning more individualized and flexible (OECD 2010a).

Primary students in Shanghai have lessons in eight major domains: language and literature (including Chinese and English); mathematics; natural sciences (including nature); social sciences (including conduct and society, geography, history and political thought); arts (including song and dance and art); technology; sports and fitness and integrated practice (including social practice and community service).

The 2010 lower secondary curriculum plan included⁵:

Subject/Lessons per week		Grade 6	Grade 7	Grade 8	Grade 9
Fundamental subjects ⁶	Chinese	4	4	4	4
	Mathematics	4	4	4	5
	English	4	4	4	4
	Thoughts and virtues/Morals	1	1	2	2
	Science	2	3		
	Physics			2	2
	Chemistry				2
	Life science (or biology)			2	1
	Geography	2	2		
	History		2	2	
	Society				2

⁵ Translated from the Chinese by K. Carruthers, UCL Institute of Education.

⁶ Schools must guarantee that extended subjects and research-based subjects will be taught, with fundamental subjects not exceeding a total of 27 lessons per week.

	Music	1	1		
	Painting and drawing	1	1		
	Arts			2	2
	P.E.	3	3	3	3
	Labor technologies	2	1	2	
	IT	2			
	Lessons per week	26	26	27	27
Extended subjects	Academic subjects and activities (inc. P.E.)	5	5	4	4
	Themes seminar or class based activities	1	1	1	1
	Community service/field work	2 weeks per year: compulsory and can be a block of lessons or individual lessons			
	Lessons per week	6	6	5	5
Research based/Exploring/discovering type of subjects		2	2	2	2
Morning or lunch meeting		15-20 minutes per day			
Physical exercise and eye exercise		40 minutes per day			
Lessons per week		34	34	34	34

The 2010 upper secondary curriculum plan is:

Subject/lessons per week		Grade 10	Grade 11	Grade 12
Fundamental subjects ⁷	Chinese	3	3	3
	Mathematics	3	3	3
	English	3	3	3
	Physics	2	2	
	Chemistry	2	2	
	Life science (or biology)		3	
	Science			2
	Thoughts and politics	2	2	2
	History	2	2	
	Geography	3		
	Society			2
	Arts	1	1	1
	P.E.	3	3	3
	Labor technologies	1	2	
	IT	2		
	Lessons per week	27	26	19
Extended subjects	Subjects and activities (inc P.E.)	5	6	13
	Themes education or activity as a class unit	1	1	1
	Community service/Field work	Two weeks per year		
	Lessons per week	6	7	14
Research based subjects		2	2	2

⁷ Schools must guarantee that extended subjects and research-based subjects will be taught, with fundamental subjects not exceeding a total of 27 lessons per week.

Morning meeting or lunch meeting	15-20 minutes per day		
Physical exercise and eye exercise	40 minutes per day		
Lessons per week	35	35	35

Finland

The NBE issues curriculum frameworks that schools need to take account of when they create their own, complementary, curricula. The subjects that students must study are listed below.

Pre-Primary Education

- language and interaction
- mathematics
- ethics and philosophy
- nature and the environment
- health
- physical and motor development
- art and culture.

Basic education – Comprehensive schools (to Grade 9)

- mother tongue and literature
- the other national language
- foreign languages
- mathematics
- environmental studies
- biology and geography
- physics and chemistry
- health education
- religion/ethics
- history and social studies
- music
- visual arts
- craft
- physical education
- home economics
- optional subjects decided locally by schools

The minimum number of lessons in annual weekly lessons (Kaihari-Salminen 2006):

Subject	1	2	3	4	5	6	7	8	9
Mother tongue and literature	14		14			14			
A-language	----- 8					8			
B-language	----- 6								
Mathematics	6		12			14			

Environmental and natural studies	9								
Biology and Geography						3		7	
Physics and Chemistry						2		7	
Health education								3	
Religion/ethics	6					5			
History/Social studies	----- 3					7			
Music	4					3			
Visual arts	4					4			
Craft/Technical work/Textiles	4					7			
Physical education	8					10			
Home economics	-----					3			
Educational & vocational guidance	-----					2			
Elective subjects	(13)								
Minimum number of hours	19	19	23	23	24	24	30	30	30
Optional A-language	(6)						(6)		

The present distribution of lesson hours was confirmed in 2004 and it is currently in use; there is also a new distribution that was confirmed in 2012 and it is expected to be implemented in 2016 together with the new core curriculum that will move away from subjects towards competencies (NBE 2014).

For Upper secondary (Years 10-12) the distribution of lesson hours for general education (approximately 51% of the cohort) is as follows:

Subject or subject group	Compulsory courses	Number of national courses offered as specialization courses
Mother tongue and literature	6	3
Languages		
• A language	6	2
• B language	5	2
• Other languages		16
Mathematics		
• Basic syllabus	6	2
• Advanced syllabus	10	3
Environmental and natural sciences		
• Biology	2	3
• Geography	2	2
• Physics	1	7
• Chemistry	1	4
Religion or ethics	3	2
Philosophy	1	3
Psychology	1	4
History	4	2
Social studies	2	2
Arts and physical education		

• Physical education	2	3
• Music	1-2	3
• Visual arts	1-2	3
Health education	1	2
Educational and vocational guidance	1	1
Compulsory courses	47-51	
Minimum total of specialized courses	10	
Minimum total number of courses	75	

For vocational upper secondary the NBE decides the national qualification requirement for each vocational qualification. Students choose from among 52 upper secondary vocational qualifications, including 120 different study programs. They must complete 120 credits (40 credits equal one year's full time study). Twenty of those credits come from core subjects, of which 16 are compulsory. The common core subjects are very similar to those listed above, but also include business and labor market subjects, ICT and entrepreneurship. Vocational students must do on-the-job training as well as a project.

Japan

Japan's curriculum is organized by subject and contains considerable amounts of factual matter that students have to master. MEXT prescribes, through the courses of study, what subjects, and the topics within those subjects, students must be taught.

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

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

Elementary School (from 2011)

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
Japanese Language	306	315	245	245	175	175
Social Studies			70	90	100	105
Arithmetic	136	175	175	175	175	175
Science			90	105	105	105
Living Environment Studies	102	105				
Music	68	70	60	60	50	50
Art and Handicraft	68	70	60	60	50	50
Home Economics					60	55
Physical Education	102	105	105	105	90	90
Moral Education	34	35	35	35	35	35
Foreign Language Activities					35	35

The Period for Integrated Studies			70	70	70	70
Special Activities	34	35	35	35	35	35
Total	850	910	945	980	980	980

Lower secondary students must study Japanese, social studies, mathematics, science, music, art, physical education, technology and home economics and foreign languages (usually English). Moral education, special activities and Integrated Studies are also offered.

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

Lower Secondary School (from 2012)

	Grade 7	Grade 8	Grade 9
Japanese Language	140	140	105
Social Studies	105	105	140
Mathematics	140	105	140
Science	105	140	140
Music	45	35	35
Art	45	35	35
Health and Physical Education	105	105	105
Technology and Home Economics	70	70	35
Foreign Languages	140	140	140
Moral Education	35	35	35
The Period for Integrated Studies	50	70	70
Special Activities	35	35	35
Total	1015	1015	1015

Those who have completed nine-year compulsory education in elementary and lower secondary school may go on to upper secondary school leading to a certificate of the upper secondary education. Upper secondary school courses can be classified into three categories: general, specialized and integrated courses.

General courses provide mainly general education suited to the needs of both those who wish to advance to higher education and those who are going to get a job but have chosen no specific vocational area.

Specialized courses are mainly intended to provide vocational or other specialized education for those students who have chosen a particular vocational area as their future career. These courses may be further classified into: agriculture, industry, commerce, fishery, home economics, nursing, science-mathematics, physical education, music, art, English language and other courses.

Integrated courses were introduced in 1994. These courses offer a wide variety of subject areas and subjects from both the general and the specialized courses, in order to adequately satisfy students' diverse interests, abilities and aptitudes, future career plans, etc.

Singapore

From Primary 1 to 4 the core curriculum includes English (33% of curriculum time), mother tongue (Chinese, Malay or Tamil) (27% of curriculum time) and mathematics (20% of curriculum time). Science is introduced in Primary 3. English usually includes general topics such health education and information literacy.

Primary 1 to Primary 4⁸

Subjects		Number of 30-minute lessons per week			
		Primary 1	Primary 2	Primary 3	Primary 4
English, including health education and information literacy		17	17	15	13
Chinese/Malay/Tamil Character & Citizenship Education' (CCE)		15	13	12	11
Mathematics		7	9	11	11
Science		-	-	3	4
Social studies		1	1	1	2
Subjects		Number of 30 min periods per week			
		Standard	Foundation		
Examinable Subjects					
English Language	12-13	16			
Malay/Chinese/Tamil	8-10	4			
Mathematics	9-10	13			
Science	5	3			
Non-examinable Subjects					
Character & Citizenship Education' (CCE)	3			2	2
Social Studies	3				
Art & Crafts	2				
Music	1				
Project Work	Generally one project of 20-25 hours' duration				
Physical Education	2				
Health Education	1				
Assembly	1				

⁸ Time allocations for the Singapore curriculum are taken from the International Review of Curriculum and Assessment Frameworks (INCA) database, last updated in 2011 (INCA 2011).

Total	49				
Art and crafts					
Music		2	2	2	2
Physical education		3	3	3	3
Assembly		1	1	1	1
TOTAL		48	48	49	49

Primary 5 and Primary 6

Secondary 1 and Secondary 2 (12 to 14 year olds)

	Special and Express	Normal Academic
Lesson (35-40 minutes) per week		
English	6	6
Chinese/Malay/Tamil	6	6
Mathematics	5	6
Science	6	5
Literature	2	2
History	2	2
Geography	2	2
Art & Crafts	2	2
Design & Technology/ Food and Consumer Education	3	
Character and Citizenship Education	2	2
Physical Education	2	2
Music	1	1
Assembly	1	1

Secondary 1 and Secondary 2 (12- to 13-year-olds) Normal (Technical)

Examination Subjects: 31 lessons (35-40 minutes) per week	
English	8
Basic Chinese/Malay/Tamil	3

Mathematics	8
Computer Applications	4
Science	4
Design & Technology / Food and Consumer Education	4
Non-Examination Subjects: 6 lessons (35-40 minutes) per week	
Social Studies/Character and Citizenship Education	2
Physical Education	2
Art and Crafts	1
Assembly	1

Secondary 3 and Secondary 4 (14- 16 year olds) Express

Compulsory/Core Examination Subjects: 24-26 lessons (35-40 minutes) per week The compulsory examination subjects are English Language, Chinese/Malay/Tamil (Special course students study Higher C/M/T), mathematics, a combined humanities subject, a science subject.	
Optional Examination Subjects: 8-10 lessons (35-40 minutes) per week Students must choose between two and four subjects from: second mathematics (for example additional mathematics); humanities (literature, geography, history); sciences (biology; physics; chemistry; science/integrated science); third language; others (including arts, religion, design and technology and food and nutrition.)	
Compulsory Non-Examination Subjects: 6 lessons (35-40 minutes) per week	
Character and Citizenship Education	2
Physical Education	2
Music	1
Assembly	1

Secondary 3, 4 and 5 (14-17 year olds) Normal (Academic)

Compulsory/Core Examination Subjects: 20 lessons (35-40 minutes) per week	
English Language	8
Chinese/Malay/Tamil	6
Mathematics	6
Elective Examination Subjects: 3 to 8 lessons (35-40 minutes) per week Students must choose between two and four subjects from humanities (literature, geography, history); sciences (biology, physics and chemistry, physics and biology, chemistry and biology); others (including arts, religion and design and technology and food and nutrition	
Compulsory Non-Examination Subjects: 6 lessons (35-40 minutes) per week	

Character and Citizenship Education	2
Physical Education	2
Music	1
Assembly	1

Secondary 3 and Secondary 4 (14- to 16-year-olds) Normal (Technical)

Compulsory/Core Examination Subjects: 25 lessons (35-40 minutes) per week	
English	9
Basic Chinese/Malay/Tamil	3
Mathematics	9
Computer Applications	4
Elective Examination Subjects: 3 to 9 lessons (35-40 minutes) per week Students must choose between one and three subjects from Design & Technology; science; food studies;; elements of office administration; and arts and crafts	
Compulsory Non-Examination Subjects: 6 lessons (35-40 minutes) per week	
Character and Citizenship Education	2
Physical Education	2
Music	1
Assembly	1

Post-secondary in junior colleges (16-18+ year olds)

Compulsory Core Examination Subjects: 8 hours per week	
General paper	4
Chinese/Malay/Tamil	4
Elective Examination subjects: Students choose 3-4 Advanced Level Subjects at H1, H2 or H3 level.	
English Language and Literature, languages, history, combined humanities, geography, mathematics, additional mathematics, biology, chemistry, physics (as well as physics and chemistry, physics and biology, and biology and chemistry), arts subjects, design & technology, accounting, a number of applied subjects, business studies, computer studies, physical education, economics and drama.	4-6 hours per subject
H1 and H2 have the same level of demand, but H1 covers 50% of the content of an H2; H3 (available in fewer subjects than the other two) is for exceptional students.	

Compulsory Non-Examination Subjects: 4 hours per week	
Character Development program	1
Physical Education	2
Assembly	1

INCA 2011

Florida

Elementary school students (pre-Kindergarten through 5th Grade) subject areas include art, computer education, dance, drama, health education, language arts, mathematics, music, physical education, science, social studies and world language.

Middle school students (6th through 8th Grades) take courses within 17 subject areas including the arts, career and technical basic courses, technology education, computer education, dance, drama, exploratory and experiential education, health, language arts, library media, mathematics, music, physical education, research and critical thinking, science, social studies and world languages.

High school students (9th through 12th Grades) take courses within 21 different subject areas, which must meet the requirements of the Florida high school diploma. They include courses in the arts, basic vocational courses, computer education, dance, drama, experiential education, health education, humanities, language arts, leadership skills development, library media, mathematics, music, physical education, research and critical thinking, ROTC and military training, safety and driver education, science, social studies, world languages.

In order to graduate from high school, a student must successfully complete a minimum of 24 credits, an IB or an Advanced International Certificate of Education curriculum. The 24 credits must include 16 core credits: four in English (with major concentration in composition, reading for information and literature); four in mathematics, one of which must be Algebra I or its equivalent, geometry or its equivalent and Algebra II or its equivalent. The student must pass an end of course algebra and geometry tests; three credits in science, two of which must have a laboratory component, one must be in Biology I or its equivalent plus a test and one must come from a chemistry or physics course or one deemed equally rigorous; three credits in social studies including one credit in US history, one credit in world history, ½ credit in economics and ½ credit in US government; one credit in fine or performing arts; one credit in physical education; plus eight elective credits.

Massachusetts

The Center for Curriculum and Instruction develops learning standards and resources and tools to support those standards. It develops the Massachusetts Curriculum frameworks in the arts, English language arts, engineering, foreign languages, history and social science, mathematics science, technology. It also helps develop the MCAS tests in ELA, history and social science, mathematics, and science and technology/engineering.

Local districts have a lot of discretion in choosing curriculum requirements for graduation. Most require their high school students to take four years of English (98%), three years of mathematics (78%), three or more years of science (66%), and three years of history/social science (87%) to receive a diploma. Thirty-six percent have a foreign language requirement.

Of the vocational, technical and agricultural high schools 100% require four years of English and a minimum of three years of mathematics, 76% require at least three years of science, 72% require three or four years of history/social science.

Comparative analysis

For some jurisdictions, we have been able to look in further depth at the time spent on the core subjects. Looking again at Grade 4

Hours spent per year on key subjects - Year 4 (P4)⁹

	NSW	Queensland	Alberta	HK	Finland	Japan	Singapore
Language of instruction	50% to English & mathematics	240	240 (25%)	220	133	185	260 (6.5 hr/w)
Mathematics		200	140 (15%)	160	114	130	220 (5.5 hr/pw)
Science		70	140 (15%)		64	80	80 (2 hr/pw)

Ontario offers no published guidance on time spent for each subject, but states that Grades 1 through 8 must offer instruction in the arts, French as a second language (for English language schools), health and physical education, language, mathematics, science and technology and social studies.

It is difficult to compare time spent on the language of instruction, as the table includes Chinese, Japanese and Finnish as well as English, and in **Singapore** although English is the language of instruction it is essentially a second language for most students. In general **Finland** appears to live up to its reputation for having low teaching hours compared to most other countries. Primary students in **Finland** appear to spend less time studying mathematics, science and home language than the other jurisdictions studied.

Hours spent per year on key subjects - Year 8 (S2)¹⁰

	NSW	Queensland	Alberta	HK	Shang hai	Finland	Japan	Singapore ¹¹
Language of instruction	125	140	150	175	160 (4 l/wk)	133	120	160 (4 hr/wk) (Normal technical 220)
Mathematics	125	140	100	125	160	133	90	140 (3.5

⁹ A number of assumptions have been made to create a common format for all jurisdictions. We have assumed that Finland has on average 38 weeks of school per year and lessons of 45 minutes, that Singapore has on average 40 weeks of school per year and Alberta has 950 hours of instruction per year

¹⁰ An additional assumption for this table was that Shanghai has an average of 40 weeks of school per year and that lessons are on average of an hour.

¹¹ For Singapore, the first figure is for Special and Express pathways, the figure in brackets is the Normal technical pathway.

					(4 l/wk)			hr/wk) (Normal technical 160)
Science	125	100	100	110	160 (4 l/wk)	160	120	160 (4 hr/wk) (Normal technical 120)
Elective/ flexible/ integrated	100			70	80 (2 l/wk)		60	

Once again, we have not been able to find specific allocations of time spend per subject for **Ontario**. However, in Grade 8, as well as studying the arts, French/English, health and physical education, language, mathematics, science and technology and social studies, international languages and work related activities may be offered and social studies can be separately taught as history and geography. Subjects do not necessarily have to be separate – it is possible to offer inter-disciplinary learning.

For Year 8 studies, **Japan** appears to allocate less time for language arts, mathematics and science than the other jurisdictions while **Shanghai** and **Singapore** allocate the most. It is interesting to note that **New South Wales, Shanghai, Hong Kong** and **Japan** all specify large periods of elective or flexible time. It should perhaps be borne in mind that many Asian countries have traditionally spent a great deal of extra time in the classroom outside of normal hours, both doing extra studies at school or with private tutors. Also, jurisdictions such as **New South Wales** and **Finland** have a great deal of flexibility as regards how the time is spent in each grade; they have allocations of time across age bands, giving schools great autonomy in how they actually use that time.

The overall conclusion must be that there is little apparent correlation of teaching hours with assessment results. Simple measurement of time spent in the classroom does not appear to be an answer when divorced from what actually happens within the classroom. That said it is notable that apart from Ontario each of these jurisdictions does allocate time (or minimum numbers of lessons) to these subjects. We do not have a comparison with jurisdictions that do not offer this guidance.

Most of the jurisdictions studied have extensive documentation on their subject curricula. While most of this supports coherence and aids clarity, documentation that is full of generic advice and instruction can obscure the distinctiveness of the stage or course. The level of detail varies significantly between jurisdictions and there are differences of complexity particularly in the post-compulsory stage. **Singapore** is probably the most complex with several partially overlapping routes. **Australia** has a document for each year, **Shanghai** for each two-year period. Conversely, **Queensland** physics documents for Years 8, 9 and 10 each contain only one page of physics content within a 50-page document. The specification in these cases is rather broad and unspecific.

Balancing disciplines and integrated curricula

The following section looks at the integration of subject knowledge, skills and understandings within and across subjects, although integration of skills policies will be noted along the way. Even jurisdictions without integrated curriculum policies have some subjects where integration is evident and examples of those are noted.

Whether or not, and in what way(s) to integrate curricula is not a straightforward subject. Protagonists of integrated curricula believe that it reinforces skill development and transfer and that it inspires student constructivist learning. Opponents believe that it detracts from serious disciplinary learning and can be a source of confusion for students.

Robin Fogarty (1991) identified ten models of curriculum integration and these range from strongly expressed curricula, as in the traditional approach, to weakly expressed networked approaches to curriculum planning. Between the two extremes she identifies eight other points on the continuum: connected; nested; sequenced; shared; webbed; threaded; integrated and immersed. The fact that she labels the strongly classified curriculum as “fragmented” (a pejorative term) should be noted. More recently, Michael Young (2011, 2013) has provided a strong defense for disciplinary-based “powerful” knowledge that “enables students with access to subject-based concepts to generalize beyond their experience and provides the educational rationale for the curriculum and its links to the broader purposes of schooling (Young 2013, 110).”

A discipline-based curriculum has clear boundaries between the different subjects and thus cannot reasonably be thought of as integrated. Subject delineations are clear-cut, they are taught in separate blocks on the timetable, they have their own formal knowledge structure, and content is treated as distinctive and belonging to the specific area. Most of the jurisdictions studied timetable subjects separately.

The jurisdictions studied take a variety of approaches to integrating their curricula. From desk research it is often impossible to ascertain where along the continuum of integration a particular jurisdiction’s curricula fell. And, importantly, as highlighted in some of the analyses of the curricula reviewed for the project, the intended integration and its delivery cannot be ascertained solely by desk research.

Australia integrates 21st century skills into its national curriculum under the term “general capabilities.” Curriculum materials are being developed to integrate these general capabilities into the key learning areas so that teachers can incorporate them into their teaching. The government has invested in the development of technology-based support that offers formative tools within an online system for assessment and curriculum materials.

Queensland’s promotes integrated school-based assessment and had in its now defunct New Basics project set up a system of integrative rich tasks. With the advent of a new government in 2013, the school system in Queensland is, however, under review.

In the lower secondary, career and technology provision is an integrated part of the curriculum. There is an interdisciplinary social studies curriculum, Studies of Society and the Environment (SOSE) that integrates the themes of: time, continuity and change (mainly history); place and space (mainly geography); culture and identity (mainly citizenship); political and economic systems (mainly government and politics/civics).

In **New South Wales**, the situation is different from Queensland. According to McGaw (2013) the NSW curriculum is more traditional than the Queensland curriculum, with civics and citizenship absent from its key learning areas, fewer cross-curricular themes and less embedding of 21st century critical skills. Although schools have some flexibility in how they deliver the curriculum, there are guidelines regarding the time dedicated to specific subjects. For example, English and Mathematics are prioritized with 50% of teaching time dedicated in primary; in lower secondary, Human Society and its Environment is divided in history and geography with a specific focus on the Australian context; and in upper secondary, there is a long list of subjects that student take in order to obtain the HSC.

Alberta has had an integrated curriculum policy for Grades K through 3 since 2007, with explicit guidelines for multi-disciplinary and interdisciplinary teaching and learning. It defines curriculum integration as a curriculum approach that purposefully draws together knowledge, skills, attitudes and values from within or across subject areas to develop a more powerful understanding of key ideas. Curriculum integration occurs when components of the curriculum are connected and related in meaningful ways by both the students and teachers.

The aim is for Alberta's future curriculum for Kindergarten to Grade 12 students to be built on a foundation of literacy and numeracy and to be digitally based. It emphasizes the development of cross-curricular competencies to ensure that students develop an interrelated set of attitudes, skills and knowledge that can be drawn upon and applied for successful learning, work and living. In the future, subjects will increasingly become a means to an end – the vehicles through which students develop literacy, numeracy and competencies. A less prescriptive curriculum is being developed that is supposed to enable teachers to meet better students' diverse learning styles and local community needs.

While the emphasis in **Ontario** is literacy and numeracy, the government promotes integrated learning in the classroom.¹² Researchers and teachers have explored curriculum integration as a way to meet the many demands of 21st century curriculum and to make classroom instruction more manageable and more engaging. Ontario curriculum documents have built on this foundation, identifying opportunities to link related content and/or skills in two or more subjects and to give students practice in meeting expectations from two or more subjects within a single unit, lesson or activity. These documents suggest that for curriculum integration to be effective, emphasis must be on the underlying concepts and skills that strengthen student learning and achievement in all areas.

¹² The following is from *Integrated Learning in the Classroom* (2010) www.edu.gov.on.ca/eng/literacynumeracy/inspire

A good example of this is the section in the science and technology curriculum document on *Cross-curricular and Integrated Learning*. This refers to the opportunities for environmental education within the science and technology curriculum. Opportunities for the development of critical thinking and critical literacy and for the use and development of skills in literacy, numeracy and ICT are identified.

The mathematics curriculum is presented as a set of expectations that relate to content, and a more limited set that relates to mathematical processes and applies across all content areas. Teachers and schools are expected to weave these together into integrated programs that balance “concept development, skill acquisition, the use of processes, and applications.” These four areas overlap partially with the four categories that are generic to assessing achievement in all subjects:

- knowledge and understanding: subject-specific content, and comprehension of its meaning and significance
- thinking: use of critical and creative thinking skills/processes
- communication: conveying of meaning in various forms (written, oral, visual)
- application: use of knowledge and skills to make connections within/between different contexts
- the seven mathematical processes identified in this curriculum are problem solving, reasoning and proving, reflecting, selecting tools and computational strategies, connecting, representing, and communicating. They are well developed throughout the curriculum because they are integrated into the content expectations.

Hong Kong’s curricula exhibit a number of opportunities for integration. For example, primary science is an integral part of the general studies curriculum alongside personal, social and humanities education and technology education. 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.

The integrated secondary 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.” It 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 in order 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. While integrated science has an interdisciplinary approach, combined science has a “combined approach,” where the three sciences are distinct.

The secondary mathematics curriculum 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.

Humanities also follow an integrated approach. There are three modes of delivery: discrete subjects approach, an integrated approach or a mixed approach and models are provided of each. For example, history is not recognized as a discrete discipline with discrete aims but is incorporated within the wider curriculum heading *Personal, Social and Humanities Education* (PSHE), which

- provides learning experiences through which students acquire social literacy and necessary social enquiry skills
- calls for an understanding of human beings as both individuals and groups in relation to time, space and the environment and their place in the cultural and material world.

Since 1985, **Shanghai** has produced integrated examination papers that cross disciplinary boundaries and test students' capacity to apply their knowledge to real-life problems. Sometimes examination questions provide students with information not covered in the syllabuses in order to test their abilities in applying what they know to new problems (OECD 2010a).

Shanghai has been at the forefront of education reform in China, often being the first area to pilot and/or implement curricular and systems change. The aim was for students to become less passive as learners in order to foster creativity, problem solving and self-development. Natural sciences were integrated with humanities and traditional subject disciplines were re-organized into eight learning domains: language and literature; mathematics; natural science; social sciences; technology; arts; physical education; and practical skills (OECD 2010a).

The curriculum introduced to support this new emphasis on student-centered learning has three components: a basic, compulsory, curriculum; an enriched, mainly elective, curriculum; and an inquiry based, extra-curricular, curriculum. As part of the last element, students conduct research the aims of which are to help them "learn to learn," think critically and creatively, do community service and promote social welfare. Primary and secondary schools in Shanghai have strengthened their emphasis on students' development, with more varied teaching and learning activities, and an increased emphasis on practical skills. Shanghai's plan for educational reform and development for 2020 calls for an increase in school-based curricula as well as a credit system at the senior secondary level to make learning more individualized and flexible (OECD 2010a).

The integrated science curriculum, found in Grades 7 and 12, goes beyond the boundaries of disciplines, has integrative design of the whole system, and pays attention to the relation and penetration among separate science subjects. Integrated science is helpful to students to learn science and the nature, to study scientific method, to develop their inquiry ability, to understand science, technology and society.

Like other jurisdictions, **Finland's** integrated curriculum approach can best be seen in the sciences. Earth science is not referred to as a separate subject, but is contained mainly within a strong geography curriculum, and within the natural sciences. Integration and connection between subjects, such as science and geography, is a strong principle:

Environmental and natural studies is an integrated subject group comprising the fields of biology, geography, physics, chemistry and health education. Instruction in the subject group includes the perspective of sustainable development. The objective of instruction is that the students get to know and understand nature and the built environment, themselves and other people, human diversity, and health and disease.

In **Japan**, a set aside period of integrated studies is intended to focus on learning that permits enhancement of thinking abilities and that moves away from Japanese traditional emphasis on memorization and test preparation. It aimed to "...actively introduce experiential learning such as experience in nature, social life experience, observations, experiments, field study and investigation as well as problem-solving learning to learn about cross-sectional, comprehensive subjects like the environment, international understanding, information, health and welfare as well as subjects that interest students." There has been considerable teacher resistance to it, and after almost a decade after its introduction the time allocated to it was reduced in 2011 (Abiko 2014). Curriculum revisions in 2008 did, however, advocate more experiential learning particularly in moral education and Integrated Studies.

Singapore's IT Masterplan integrates information technology in all subjects and its National Education plan enshrines citizenship and values education throughout the curriculum (Gopinathan & Mardiana 2013). Success of these initiatives is meant to reinforce a highly educated workforce with the habits of mind, values, attitudes and skills needed to develop cutting edge products and services.

In 2009 a primary review was carried out and although the subjects in the new curriculum look the same, there is a new emphasis on knowledge skills that focus on thinking, process and communication skills – integrated within the subjects rather than taught separately – and character development, which emphasizes instilling sound values. Two other recommendations include Program for Active Learning, which gives greater emphasis to sports and outdoor education, and performing and visual arts and Holistic Assessment to better support learning, where there is greater emphasis on providing qualitative feedback to students and parents¹³.

Following the primary review, Singapore also conducted a review of Secondary education, which made a range of recommendations including:

- implementing character and citizenship education
- enhancing student learning through co-curricular activities

¹³ <http://www.moe.gov.sg/media/press/2009/01/strong-fundamentals-for-future.php>

- providing greater support to strengthen language and mathematical skills
- expanding the integrated program landscape¹⁴.

Some subject-specific examples include a clear statement about mathematical processes that says the teaching of process skills should “be deliberate and yet integrated with the learning of concepts and skills.” Process skills are classified as “reasoning communication and connections,” “applications” and “thinking skills and heuristics.” The primary social studies program is integrated and adopts an issues based framework as a strong pedagogic access point to academic studies of (mainly) *environment and resources* including water and energy, and *urban living*. In geography, the curriculum guidance provides ten pages of definitions of 21st century competencies and an audit that maps these to the geography program with benchmarks. They are well integrated into the curriculum for geography without undermining the disciplinary integrity of the subject.

Florida had a middle school integrated curriculum teacher certification, but it was repealed in 2011.

Massachusetts has no integrated curriculum policies, but individual schools’ websites highlight their use of integrated curriculum, for example, one district has structures in place for collaborative team time for teachers to work on the integration of academic and career-related curriculum and develop integrated curriculum maps for all subject areas.

Comparative analysis

Explicitly recognizing integrated approaches in the curriculum of the jurisdictions studied is largely an effect of trying to introduce 21st century skills. In almost all cases this move is a fairly recent innovation and has been introduced as a top down reform. We know that in some jurisdictions the aspirations from the top have not necessarily been met with enthusiastic compliance from below, the problems in **Japan** associated with integrated studies being a good example. The **Australian** and **Canadian** states and provinces have the most developed policies of integration.

Queensland was a very early leader in developing integrated approaches, although it has recently reined back a little from that position. **Alberta** has the ambition of developing an integrated curriculum based on strong foundations of literacy, numeracy and digital competence. Both **Chinese** provinces and **Singapore** have made dramatic strides recently, particularly in science, to introduce not just integrated curricula but integrated examinations in the case of **Shanghai**. Neither of the **US** states appear to have a definitive policy on integrated studies, although it has clearly been looked at in **Florida**.

While in many cases it is too early to judge the success or otherwise of these concerted attempts to move away from subject oriented content towards more integrated and competency based study, there is a clear “direction of travel” in favor of further integration of the curriculum and away from the classical fixed boundaries of the traditional subjects.

¹⁴ http://planipolis.iiep.unesco.org/upload/Singapore/Singapore_SERI_2010.pdf

The balance between a curriculum that delivers knowledge and applied and/or vocational learning

Applied and/or vocational learning, especially in upper secondary and post-compulsory education, is often seen as a way of augmenting the participation rates of young people in education (or education with training). Social equity and inclusion issues often come into play as well, with direct attempts to retain students who might otherwise have left school early. Gallagher (2013) notes a number of reasons why students may want to leave school:

- a lack of perceived relevance
- a need to see how learning can be applied
- a desire to integrate work-based learning or study subjects outside traditional disciplines
- lack of success in conventional programs
- wanting to enter a more 'adult' environment
- dissatisfaction with the school experience.

While these are largely negative reasons for offering applied and/or vocational learning, that is, to counteract the sentiments expressed above, Green and Farazmand (2013) cite the positive impact of applied teaching in enhancing students' learning. They see applied and/or vocational learning, especially in the form of project work, as a bridge between theory and application that leaves students with a sense of satisfaction, achievement and effectiveness. 'Real world' experiences widen students' perspectives and can cause a positive behavior change as well as providing the foundation for future career success, encouraging the development of skills such as decision making, problem solving, team work and written and oral communication (Green & Farazmand 2013).

In each of the systems under study, some form of applied and/or vocational learning outside the usual skills based traditional courses such as design and technology and ICT are offered to some, but not all students, sometimes in separate settings from academic schools and generally only at secondary (in some upper secondary/post-compulsory). In almost every case, applied/vocational learning is offered in tandem with core learning – language of instruction and mathematics, sometime science, social studies and a foreign language (usually English).

The issues surrounding vocational learning are analyzed below (p. 225-227), namely:

1. The moral panic about young people
 - a. The inclusion of some form of career education program
 - b. Embedding core skills, soft skills and 21st century skills/competencies within both general and vocational programs
2. The status of vocational education
3. Assessment

What is noted here is the direction of travel for applied and/or vocational learning – whether it is offered, to whom and when.

Australia

At age 15-16, students may usually choose whether to continue in secondary school or to enter a range of technical or vocational courses at colleges of technical and further education, senior colleges or rural training schools. At this post-compulsory stage, students generally have more scope to specialize and a range of elective studies is usually provided. Although there are no compulsory subjects as such, the vast majority of senior level students do study English and mathematics throughout their senior secondary course. Post compulsory education also takes place at Technical and Further Education (TAFE) institutions. These provide a wide range of predominantly vocational tertiary education courses, mostly qualifying courses under the National Training System, the Australian Qualifications Framework and the Australian Quality Training Framework.

Hoeckel et al (2008) state that in Australia there is a high level of support for the VET system. Industry bodies strongly influence policies and priorities, and employer surveys show that they are very satisfied with the quality of graduates. The system allows for a fair degree of local autonomy and experimentation at both state and institution level. However, there are marked differences among states and territories.

New South Wales

Years 7 – 10 of compulsory school primarily consists of general courses, but students can choose vocational courses for their electives. In Years 11 and 12, some academic courses include vocational options, for example, the general mathematics course is designed to prepare students for vocational pathways or to undertake higher education courses in the areas of “the humanities, nursing and paramedical sciences.” The general mathematics pathways are oriented towards the development of skills and techniques with direct application to “a broad range of human activity,” making an explicit contrast with the more abstract orientation of the other Stage 6 courses. This orientation is reflected in the inclusion of “focus studies” on themes such as “Mathematics and Driving,” and “Mathematics and the Human Body.”

However, students in Years 9 and 10 are cautioned that they should only undertake a VET course if it suits their individual needs. “It is not necessarily appropriate for all schools, or for all students. It should be seen as one strategy within a suite of strategies used by schools to address engagement, retention and participation in education and training.”

Queensland

In 2013, the Queensland Government released a five year action plan to reform the state’s further education and training sector entitled, *Great skills: Real opportunities*, which contains an ambitious skills and training reform program that includes:

- fee-free training for Year 12 graduates in selected high priority courses
- competitive-based funding for high quality providers to deliver priority Certificate III level

qualifications

- prioritizing qualifications that match job opportunities
- creating 10,000 extra apprenticeships
- establishing TAFE Queensland as an independent statutory body with a commercially focused board (Queensland Government 2013).

Students still in school can participate in vocational education and training and VET qualifications are found at levels throughout the AQF – Certificates I, II, III and IV, Diploma, Advanced Diploma, Vocational Graduate Certificate, and Vocational Graduate Diploma. VET courses at school provide credit toward the Queensland Certificate of Education and can count toward the tertiary selection rank (Queensland Government 2014). Like New South Wales, Queensland has upper secondary mathematics courses with a high vocational/practical orientation, Functional Mathematics and Prevocational Mathematics. These can count towards the Queensland Certificate of Education but are not used for university entrance. The Prevocational Mathematics course focuses on developing numeracy in order to solve problems and make decisions in “everyday life, work or further learning.” Interestingly, it also aims to build students’ confidence and help them “overcome difficulties with or negative attitudes towards mathematics.” Functional Mathematics is designed for those students who are not yet functionally numerate. It may serve as a bridging course to Prevocational Mathematics.

Alberta

Technical vocational education and training (TVET) is taught to all students across Canada. The Learn Canada 2020 program has been established nationally, but each province has its own approach to TVET within that framework. Both Alberta and Ontario recognize the vocational/apprenticeship route as a means of accessing higher education. However, the Alberta High School Diploma is recommended as the preferred route for those able enough to access it (Alberta Education 2013).

In senior high school vocational education is built around two programs, Career and Life Management (CALM) and Career and Technology Studies (CTS). These are intended to help students to make well-informed choices in all aspects of their lives. At present CALM focuses on students becoming “responsible, caring, creative, self-reliant and contributing members of a knowledge-based and prosperous society. CTS is much more specifically related to the national qualifications framework definition of occupational skills.

Graduation from high school requires three credits in CALM, the same as for PE, which may be taken in Grade 10, 11 or 12, plus 10 credits in any combination from: career and technology studies, fine arts, second languages, physical education, knowledge and employability courses, a recognized apprenticeship, or locally developed provision in CTS, fine arts, second languages or knowledge and employability occupational courses.

Ontario

Technological education is an important part of the curriculum from Grade 9 in order to enable students to meet the challenges of the 21st century. By Grade 10, some industry specific practical

work is introduced. The introduction to the options for Grades 11-12 emphasizes the practical nature of the technological curriculum, but this is not expressed as being “non academic.”

Hong Kong

The Vocational Training Council (VTC) is the main governance body for vocational education. It develops and operates a variety of schemes to train operatives, craftspeople, technicians and technologists, sometimes under an apprenticeship scheme. There are vocational training programs for both Secondary 3 and Secondary 6 school leavers, including 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. The 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.” Vocational English, mathematics, vocational Chinese for the workplace and information technology are included.

Those with a Diploma may 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.

Shanghai

At age 15 students take the *zhongkao*. Based on results students enter either an academic or a vocational upper secondary school. Vocational schools offer coursework for two to four years in a number of occupational areas, including skills for managerial and technical personnel as well as in more traditional vocations such as agriculture. In order to maintain a thriving economy Shanghai has put in place an accelerated program of adapting its vocational provision to the service industry, the advanced manufacturing industry and emerging strategic industries. Employers to work directly with vocational schools and regional vocational education groups have been established. The relative success of students from vocational schools in entering the job market has led the Education Commission to increase its support for vocational schools, aligning them with emerging industries. Students who go on to upper secondary vocational and technical schools can progress to regional polytechnic colleges, which provide both on-the-job training and classroom-based learning (NCEE 2013).

Finland

Almost 40% of Finnish students go on to vocational training after completing their basic education. There is a relatively high status for vocational qualifications, with a parity of esteem built in to the system and its progression pathways. The aim of VET is to improve the skills of the work force, to respond to skills needs in the world of work and to support lifelong learning.

Vocational qualifications have been designed to be close to the work place and respond to labor market needs. Qualifications are based on working life occupations and the competencies required in these occupations. There are no dead-ends. From the late 1990s the vocational track has given eligibility to access polytechnics and universities. With this reform upper secondary vocational education and training became equal to general upper secondary education as a pathway to higher education. To facilitate this all vocational qualifications have core elements, common to all qualifications. These are studies in:

- the native language
- the other national language and a foreign language
- mathematics
- physics and chemistry
- social, business and labor-market subjects
- health education; physical education
- arts and culture; environmental studies
- ICT; ethics, other cultures
- psychology and entrepreneurship (Surrismi 2013).

Japan

Upper secondary schools offer general, specialized or integrated curricula. The general course is for those who want to proceed to higher education as well as to those wishing to transition to work but do not have a specific vocational area they want to pursue. Specialized courses are mainly intended to provide vocational or other specialized education for students who have chosen a particular vocational area. Integrated courses offer a wide variety of subject areas and subjects from both the general and the specialized courses, in order to satisfy adequately students' diverse interests, abilities and aptitudes and future career plans. Japan has specialized training colleges and “miscellaneous schools”, which offer a variety of practical vocational and technical education programs. Students who have completed an upper secondary course lasting three years or more of specialized training colleges designated by the Minister are entitled to apply for a university place.

About 25% of 15-18-year-olds attend senior high schools with a focus on vocational education. In these schools, 50-70% of class time is spent on vocational and technical subjects, with the remaining class time devoted to mathematics, Japanese and foreign languages. Students who graduate may apply to universities, though the majority of them go on to two-year vocational institutions if they pursue higher education.

At upper secondary, or post secondary, about 30% of students opt to study in a specialized training college or a miscellaneous school, which offer courses in a variety of practical vocational and technical education programs in response to market forces. Progression may be to university, in a minority of cases, but is largely to employment.

Singapore

Singapore's vocational system is largely post-secondary and state of the art.

Many polytechnic graduates who have done well go on to university. Students with O or N levels can take skill-based certificates in technical or vocational subjects at the Institute of Technical Education (ITE). Outstanding ITE graduates can also go on to polytechnics or universities.

Students are tracked into pathways early. In 2013 66.7% of students started Secondary 1 in the Express track, 19.9% in the Normal (Academic) track and 10.9% in the Normal (Technical) track. The other 2.5% either re-take the tests in hopes of entering one of the above programs or embark on vocational education. For secondary students there is no purely vocational route although students on the Normal (Technical) route follow a more applied pathway than their peers on the Express and Normal (Academic) routes. For 14-16 year olds (upper secondary) on all routes, applied subjects such as design & technology, food & consumer studies, food & nutrition and computer applications are available.

For post-compulsory students (from around age 16) those who follow a vocational route get a state-of-the-art education in the ITE. There has been rapid development of post-16 vocational education and training, with 65% of the cohort taking some form of vocational course. Successful graduates have the option of going to university, but many go straight into employment. The ITE works closely with industry partners, many of them global, such as Cisco, Conrad Centennial, Hewlett Packard, IBM, Microsoft, Rolls Royce, Siemens, Singapore Airlines Engineering and Yokogawa.

Comparative analysis

Across all the jurisdictions studied, there are vocational pathways open for students from around Grade 10 onwards. While these pathways may be more or less vocationally oriented, they all include a core element of academic subjects, most typically mathematics and languages. In several jurisdictions these pathways are developed with business partners, and in most there is an option of progressing to higher education if desired. **Alberta** is perhaps typical in having two more vocationally focused pathways which sit alongside the more academic as alternative routes to matriculation.

The proportion of students opting for the vocational pathways varies with **Finland**, at 40%, appearing to be the high end.

The two **Australian** states seem to have different approaches to VET. **New South Wales** while allowing vocational subjects as electives, and having the option of a vocationally based mathematics curriculum, does not seem to encourage the VET option, whereas **Queensland** has a much more positive approach to vocational education and qualifications. **Hong Kong** sets up its vocational offer as being aimed at the economic needs of the community, while **Shanghai** has had recent success with the VET pathway in terms of providing students better able to join the workforce.

Overall the jurisdictions are trying to open up vocational pathways, which, while primarily designed to get students into work can also allow progression through to higher education.

Differentiating curriculum in terms of streaming, setting and/or ability grouping of students

Streaming, setting and ability grouping are three of the main methods of differentiating students. Different courses, different pathways, different institutional settings are all on offer somewhere among the 11 jurisdictions under study. In a certain sense, all of the jurisdictions differentiate among some students – for example, there are courses of different demand in mathematics; all students do not do pre-calculus and/or calculus in their final years of secondary study, but in all jurisdictions, some do, for example Advanced Placement mathematics in the US. Ability grouping allows students to remain in heterogeneous classrooms, for example, through reading groups in primary education; setting means that a combination of heterogeneous and homogenous classrooms can be found in the same school, for example, ability groups in science but mixed ability groups in social studies; streaming is the most differentiated, when groups of students study with peers of their own ability group.

There is certainly disagreement about whether or not to group students by ability. Those who argue for it believe that all students will be taught at the right level and have access to textbooks and resources that reflect their ability. These students will be able to operate at their own speed and higher achievers get more demanding work. For teachers, ability grouping is argued to be easier to prepare for, teach and assess; in mixed groups, the argument runs that teachers teach to the middle, leaving lower ability students behind and higher ability students frustrated.

In the negative column, proponents of mixed ability classes/schools argue that all children working together allows for the highest performance for all, where students can help each other out and higher achievers get challenged through aiding students who might not have grasped a concept as quickly as they. There is a social based argument for mixed groups, since ethnic minority and impoverished students tend to be over-represented in lower ability groupings.

Ireson and Hallam (2001), in a systematic review of differentiation, found that the evidence at which they looked suggested that selection of students does not have a powerful impact, but note their use of the concept “powerful”. More recent studies (Hanushek & Woessmann 2005; Boaler 2008; Hattie 2009; Steenbergen-Hu & Moon 2011; Higgins et al 2014) suggest that setting (tracking) can benefit high attainers but detracts from the learning of middle and lower achievers, particularly in mathematics at upper primary and lower secondary. Wiliam questions whether these effects are necessarily features of ability grouping, proposing that if the best teachers taught the lowest achieving students the effect might be to close the achievement gap and increase average performance (personal correspondence).

The case is by no means closed and the successful jurisdictions we studied vary widely in their approach.

Australia

There is no federal government policy on ability grouping for students in Australia, although Clarke (2014) argues that state systems, schools and teachers group students according to their

perceived ability, exacerbated by pressure to achieve well on high-stakes testing such as NAPLAN¹⁵.

The Australian senior secondary national curriculum does, however, offer differentiated courses in mathematics and English. In mathematics there are four differentiated subjects, each of which focuses on a pathway that meets the learning needs of particular groups: Essential Mathematics is aimed at students preparing for employment and/or further training; General Mathematics is aimed at students who will not proceed to mathematically based study; Mathematical Methods emphasizes calculus and statistical analysis, and so is appropriate for those who are pursuing mathematically related study; Specialist Mathematics extends Mathematical Methods and cannot be taken as a stand-alone course -- it is aimed at the highest achievers. For English there are also four senior secondary subjects aimed at different students. English and English Literature are aimed at the majority of students; Essential English develops literacy skills in a practical way for every-day, community, social and applied learning contexts; English as an Additional Language help students learn Standard Australian English.

New South Wales does not have an overall policy about differentiation among students although it does have policies about teaching gifted and talented students, *New South Wales Policy and implementation strategies for gifted and talented students* and its companion document *Guidelines for the use of strategies to support gifted and talented students*, both put into effect in 2004. Differentiation can take place either at the school or the classroom level. In the former gifted and talented students can get free access to technology and learning spaces, and extra time to pursue tasks or to research a topic of interest independently. They can experience accelerated progression, for example by compacting the curriculum or allowing students to undertake intellectual challenges designed for older students. Classroom based differentiation involves having appropriate challenges for all students through adapted content, process and products.

The last time ability grouping seems to have come up formally in the New South Wales parliament was in 1992, when the minister for school education and youth affairs stated that the evidence for sorting students by ability group was inconclusive, although he stated that ability grouping for intellectually disabled or intellectually gifted students was generally deemed effective. At that time there was some in-class ability grouping in primary classrooms, and in mathematics and science ability grouped classes were used starting in Year 8 (NSW Government 1992).

While **Queensland** has explicit policies around educating students with special educational needs, those who are learning English and those who are gifted and talented in a differentiated manner, its explicit emphasis is on a whole school approach to supporting all students who are working within expectations for their year-level (DETE 2014). It emphasizes a three layered approach: differentiated teaching for all students within classrooms; focused teaching for identified students; and intensive teaching for small numbers of students, judging need through

¹⁵ Please note, however, that not everyone agrees that NAPLAN is high-stakes, for example Ben Jenkins (personal correspondence).

analysis of student data on monitoring of student progress. Responsibility for differentiation is left to teachers. Focused teaching often involves the use of support teachers, both for students achieving below expected standards and those achieving above them. Individual student plans are provided for students working at a lower or higher year-level than their age cohort.

Canada

In line with devolving educational responsibility to the provinces, Canada has no overall policy about differentiation among students. Regarding education for gifted and talented students the government is permissive, which allows decision makers at the school district or school level to determine who, if anyone, will get special provision.

However, in practice, students in primary schools are placed in ability groups within heterogeneous classrooms. Meanwhile, in secondary schools, students can be placed into tracks or streams, based on perceived ability levels, such as: general, advanced, vocational, or university entrance (OECD, 2011). These practices are not part of a distinctive national or provincial policy but rather seem to respond to pedagogical (in primary) and career path (in secondary) options to support high achievement in all students. Similarly, neither **Alberta** nor **Ontario** have legislation that explicitly addresses education for gifted students, although Ontario mandates that they are provided with appropriate resources as part of its special education policy (Kanevsky & Clelland 2013).

Alberta supports differentiated learning within classrooms, complemented by a system of stratified courses at the senior high school level for almost every academic subject. It also has different types of graduation documents – diplomas and certificates – that reflect different levels of learning and courses taken.

Its extensive guidance for teachers, *Making a difference: meeting diverse learning needs with differentiated instruction* (Alberta Education 2010) offers information and strategies for differentiating instruction, including planning, student profiling, assessing student needs, creating differentiated learning experiences, utilizing technology and developing school-wide support. As in other jurisdictions, it explicitly points to the need for differentiating among English as second language learners, students with disabilities and gifted students. There are curriculum specific ideas for English, mathematics, social studies and science. The document takes pains to point out that all students are expected to achieve outcomes from the provincial program of studies – differentiated instruction is expected to strengthen the standardized curriculum, not replace it.

Ontario's attitude to differentiation is similar to Alberta's. It is classroom based and not separate from the curriculum expectations for almost all students. With the exceptions of the modified curriculum offered to students with individual education plans, expectations are held constant for students. Ontario's idea of differentiated instruction is not about individualized instruction; rather it is about providing a balance of modeled, shared, guided and independent instructional strategies.

As noted in the pathways section below, once students reach Grade 9 the courses that they take are differentiated by level and student aspiration. In Grades 9 and 10 students take academic, applied or open courses, the first of which is university/college facing, the second is more workplace oriented, although students are not expected to make binding decisions about educational or career pathways. Academic and applied courses are available in the disciplines under study here – English, mathematics, science, history, geography.

During the last two years of high school there are five types of courses: college preparation; university preparation; university/college preparation; workplace preparation; and open. Students are supposed to focus increasingly on preparing for postsecondary pathways. Destination related courses in English, mathematics and science are available for all pathways.

The **Hong Kong** curriculum guidelines for all the core subject areas state the importance of all students mastering the basic/core elements of curriculum before progressing onto what is termed extended, enrichment or non-foundation. The same applies to science, which is part of general studies in Primary 1-6 but then appears as a separate subject for Secondary 1-3.

Government guidelines suggest that schools cater for diverse learner abilities at a class or group level. These are appraised through formative and summative assessments in primary and secondary – Basic Competency Assessment (BCA), Student Assessment (SA) and Territory-wide System Assessment (TSA).

Government curriculum guideline documents do not differentiate at primary level in terms of learning objectives or key outcomes for different learner abilities. However, suggestions are given to schools for how they may include enrichment topics for the more able. Teachers are advised to seat low ability students closer to teacher, enabling support; high ability seated further away, fostering independence. Additional provision is available to lower achievers – regular classes plus remedial assistance; intensive remedial teaching programs within schools; resource teaching center service; adjustment programs; school-based remedial support programs.

In lower secondary Foundation and Non-Foundation elements of curriculum are introduced. Strategies include adopting organizational arrangements such as providing additional lessons to certain students and ability grouping strategies such as streaming, split class, withdrawal and cross-level subject setting.

Regardless of the pathway in upper secondary, all students take the core subjects of Chinese, mathematics, English and liberal studies. In the case of mathematics, all students take the compulsory curriculum, but not all take the extended component, which is made up of calculus and statistics, and algebra and calculus. Elective subjects are offered in different levels and classes; and schools are advised to adopt flexible grouping strategies.

The curriculum in **Shanghai** has an emphasis on student-centered learning and it is organized in three components: a basic, compulsory, curriculum; an enriched, mainly elective, curriculum; and an inquiry based, extra-curricular, curriculum (OECD, 2010a). In primary, students in Shanghai

have lessons in eight major domains: language and literature (Chinese and English); mathematics; natural sciences (including nature); social sciences (including conduct and society, geography, history and political thought); arts (including song and dance and art); technology; sports and fitness and integrated practice (including social practice and community service) (Tan, 2013). In lower and upper secondary, meanwhile, students dedicate most of their lesson time to a number of fundamental subjects (encompassing the eight domains from primary school), in addition to a smaller proportion of time dedicated to extended subjects (academic, seminar- or class-based or related to community service activities), and research-based or exploratory subjects.

Although in most parts of China there is competition to get places in schools perceived as better by parents, Shanghai was the first jurisdiction to introduce neighborhood attendance at primary and lower secondary. This means students would attend their local schools and that there are no differentiated tracks in these levels. However, at the end of lower secondary, students need to take the *zhongkao* to attend upper secondary schools of different categories. Based on their performance in *zhongkao* students are allocated either to an academic or a vocational track (OECD 2010a).

According to the OECD (2013), in Shanghai there are a varied number of tracks available for students at the end of lower secondary education (age 15) but these can be summarized in two large strands: general upper secondary and vocational upper secondary; almost 80% of students attend general upper secondary education.

Finland's Basic Education curriculum assumes that almost all students will be able to meet yearly curriculum requirements. There is some leeway for higher and lower achievers. A student may advance in different subjects according to his/her own study plan if the objectives in the class year's syllabi have been achieved. Immigrant students can also be instructed in separate classes in order to prepare them for the expectations of the Basic Education curriculum.

Although there is no streaming during the Basic Education period, there is support available for struggling learners, which can be general support, intensified support or special support. All students are eligible for general support, and such support is quite common (Laukkanen, 2006). At the local level there is autonomy for schools to organize the national curricula to suit their students. This means that although teaching groups are ordinarily composed according to year groups (grades), it is also possible to make different arrangements and there can, for example, be different kinds of combined classes.

The post-compulsory upper secondary level streams students into general or vocational education. Both forms usually take three years and give eligibility for higher education. In 2011 about 50 per cent of basic education school-leavers opted for the general upper secondary school, 41 per cent for vocational upper secondary education and 9 per cent did not continue immediately to secondary level (Statistics Finland, 2011). The government believes that tailoring individual study paths for each student supports learning and that it is especially important to provide individual study paths to students with special needs, immigrants, athletes and the gifted.

Traditionally, education in **Japan** promoted a homogenous curriculum for all students in compulsory education. But since the 2002 *yutori* reform, that introduced “relaxed learning” through more flexibility and choice in the curriculum, certain forms of ability grouping (*shujyukudo*) expanded in primary and secondary schools (Park, 2013). Nevertheless, in recent years, there has been something of a return to traditional education with MEXT encouraging schools to concentrate on essential subjects, namely Japanese, mathematics, science, social studies and a foreign language (usually, English), although some commentators claim that MEXT still promotes differentiated learning and curricula for students with different abilities (DeCocker and Bjork, 2013).

According to Mellanby and Theobald (2014) in Japanese classrooms, it is common for students of varying ability to work together and assist each other. Japanese educators believe that everyone in a class should proceed together on common materials. If students finish ahead of their peers on a task, they can then circulate alongside the teacher, helping others out. They cite evidence that this whole class approach encourages lower achievers. The class moves ahead only after everyone has mastered the task, concept etc. Lower achievers realize that they can understand the same concepts as their peers. This way of working reinforces the Japanese notion that hard work is more important than innate ability.

In terms of the progression through the school system, students attend nine years of compulsory education (six for primary and three for lower secondary). Generally, there is some level of differentiation in primary and secondary schools in the terms explained above, but most students study similar courses. Once students reach the age of 15, they move onto upper secondary education, choosing between senior high schools, colleges of technology or special training colleges. A small proportion of students choose the last two, while most students continue their upper secondary in senior high schools.

To apply and access a senior high school, students must take a number of entrance examinations determined by these schools. Also, they can be placed into general, specialized or integrated curricular programs. This choice depends on the school students wish to apply and the completion of entrance examinations requested by these schools. Generalized courses differ from specialized in that the former offer a curriculum that will equip them to continue to higher education, while the latter prepares students for a range of vocational areas. Integrated courses, on the other hand, allow students to choose courses from both general and specialized tracks.

Among the jurisdictions studied, **Singapore** groups student by ability the earliest. School-based examinations take place at the end of Primary 4, the results of which determine what subject combinations students study at Foundation or Standard level in Primary 5 and 6 for English, mathematics, science and mother tongue language (also available at a Higher level). There is some fluidity of movement between Foundation and Standard level courses should students either be pulling ahead or falling behind. Students who are intellectually gifted are placed in centrally run Gifted Education Program (GEP) classes at the primary level.

In lower secondary students are streamed into Express, Normal (Academic) and Normal (Technical) courses. The first leads to the most challenging O level examinations, the second to N level examinations (with an opportunity to take O levels) and the third to N(T) level examinations. Again, while there is some movement between the streams, most students remain in their stream through to examinations at around age 16. Students who are intellectually gifted can attend integrated program schools with School-Based Gifted Education (SBGE) programs. Students' placement on one of the above courses depends largely on their results on the Primary School Leaving Examination. Post-16/17 students attend Junior Colleges if they are university bound or polytechnics or an Institute of Technical Education (ITE) if they are more technically or vocationally oriented. Polytechnic and ITE students can go on to university as well.

Comparative analysis

Every jurisdiction studied differentiates between students in different ways and at different ages. Most, **Canada, China, Finland** and **Japan**, have clear policies encouraging classes to remain together and to cover the same material. There may be explicit enhanced programs for the gifted and talented, or extra support, possibly extra tuition or students withdrawn to small groups, for those who are struggling. However, this differentiation is almost always within the class and at the teacher's discretion.

In general across these jurisdictions, this approach ends at upper secondary level. In **China** and **Japan** different school cater for students with different progression routes in mind and in general will be available only after examination. In **Canada** there are alternative pathways leading to different outcomes for students, and in **Finland** students enter general or vocational pathways. The **Australian** states have no explicit policies on setting or streaming, but devolve this to school or classroom level. There are policies about extra provision for gifted and talented, however.

Singapore is the obvious outlier. Students are assigned different pathways from a much earlier age than in other jurisdictions, the basis being examination in Primary 4. While students can and do change pathways thereafter, for the majority their future is to some extent mapped out at an early age.

Pathways, gateways and qualifications

All of the jurisdictions studied have some sort of pathway for upper secondary students, even if it simply consists of increasing the range of vocational courses. One of the elements that sets some systems apart from others is the availability of separate subject/sector qualifications that have been externally assessed, most notably in Singapore, as opposed to general high school leaving certificates such as the high school diplomas in the US and the Canadian provinces. And while compulsory leaving age varies among the jurisdictions, this is not really an indication of who might stay on – Japan has a low leaving age, but the vast majority of its students stay on through some form of post or upper secondary education.

Australia

At age 15-16, students may choose whether to continue in secondary school or to enter a range of technical or vocational courses at colleges of technical and further education, senior colleges or rural training schools. At post-compulsory levels, students generally have more scope to specialize and a range of elective studies is usually provided. Although there are no compulsory subjects as such, the vast majority of senior level students study English and mathematics throughout their senior secondary course. Post compulsory education also takes place at Technical and Further Education (TAFE) institutions, providing a range of vocational tertiary education courses, qualifying under the National Training System, Australian Qualifications Framework and Australian Quality Training Framework, as noted above in the section on differentiation. Fields covered include business, finance, hospitality, tourism, construction, engineering, visual arts, information technology and community work. Approximately 40% of students follow some sort of VET pathway.

All states and territories have some form of external certification system in Year 12 for students completing their final year of school education. This has the double purpose of certifying compulsory and post-compulsory school completion, and through the Australian Tertiary Admission Rank (ATAR) ranks students for entry to tertiary institutions, except in Queensland, which does not use ATAR. Students who either fail to achieve an ATAR or get a low score must find an alternative pathway to enter university (Universities Admission Centre 2014).

Students in **New South Wales** are given a Record of School Achievement (RoSA). RoSA is cumulative, centered on school-based assessment, allows comparison between students across New South Wales, and gives students the option of taking on-line literacy and numeracy tests and records extra-curricular achievements. Those students choosing to leave school without pursuing the Higher School Certificate (HSC) will have RoSA as a formal credential for applying for jobs, further education or training.

In Years 11 and 12 most students take courses that lead to a Higher School Certificate (HSC). Board developed courses are externally examined and contribute to the calculation of the Australian Tertiary Admission Rank (ATAR). Board endorsed courses are mainly vocational and lead to qualifications on the Australian Qualifications Framework (AQF), with Registered Training Organizations (RTOs) delivering the courses, some of which include a work placement.

The **Queensland** Certificate of Education (QCE) is awarded to eligible Year 12 students. It is flexible regarding curriculum and institution at which that curriculum is delivered. Learning options include senior school subjects, vocational education and training and workplace and community learning. Each student gets a learning account that records details of learning and results of completed studies.

Alberta's senior high school students have quite a bit of choice in their last three years of school. All of their academic courses can be taken on different levels, for example the sciences, where in order to graduate students must take a 20 level course, but it can be general science (either 20 or 24), biology, chemistry or physics. Career and life management courses are compulsory and electives are both academic and vocational. For those unable to obtain a diploma, a certificate of achievement is available, for which students have to amass fewer credits and those credits can be at a lower (10) level. The certificate has mandatory vocational requirement.

In **Ontario**, once students reach Grade 9 there are three types of courses offered, each of which runs through Grades 9 and 10: academic courses; applied courses; and open courses. Students can select an appropriate combination of courses from these pathways and are not expected to make binding decisions about a particular educational or career pathway at this stage.

There are a further five pathways open for students to follow in Grades 11 and 12: college preparation; university preparation; university/college preparation; workplace preparation; and open courses. Students focus increasingly on their individual interests and identify and prepare for their postsecondary pathways. They work towards graduation by obtaining the Ontario Secondary School Diploma (OSSD). The OSSD requires students to obtain 30 credits (18 compulsory and 12 elective), meet the provincial literacy requirements in a test in Grade 10 (Ontario Secondary School Literacy Test (OSSLT)) and complete 40 hours of community involvement activities. Students can apply for the *Ontario Youth Apprenticeship Program* (OYAP) after they have reached age 16 and completed a cooperative education program in apprenticeship. Those students who turn 18 and have obtained fewer than 14 credits can obtain a *Certificate of Accomplishment*.

The **Hong Kong** Diploma of Secondary Education (HKDSE) was implemented for the first time in 2012. 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. All students have an opportunity to pursue six years of secondary education, and in the last three years, the subjects that students take vary according to the students' interests and future plans. The Youth Council offers programs for both Secondary 3 and Secondary 6 school leavers called the Diploma in Vocational Education. This program prepares students either for employment or for further education. In 2012-2013 the Vocational Training Council 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 Technological and Higher Education Institute (THEi).

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.

Hong Kong has 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. 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.

In **Shanghai** children are required to attend six years of primary school and three years of lower secondary school. At age 15, students have the option of either leaving school or entering upper secondary programs. In order to gain a place at upper secondary, students must take a locally administered entrance exam known as *zhongkao*. Based on *zhongkao* results students enter either an academic or a vocational upper secondary school.

In upper secondary school, students take three years of classes in core and elective subjects in preparation for the nationally based university entrance exam, known as *gaokao*. Vocational schools offer coursework for two to four years in a number of occupational areas, including skills for managerial and technical personnel as well as in more traditional vocations such as agriculture.

After three years of senior high school students take the *gaokao*, or university entrance examination. In Shanghai the municipal education commission writes the examinations for those students who have a Shanghai *hukou* (right of residency). About 80% senior high school graduates go on to some form of tertiary education (Sharma 2011). Like the *zhongkao*, *gaokao* results determine a student's future; in this case what caliber of university he or she will attend.

Students in **Finland** generally apply for either upper secondary general education or upper secondary vocational education and training at the age of 16, both of which lead to further tertiary studies should students want to stay on education. Upper secondary is optional, but approximately 95% of students stay on. This is a selective level, and students are selected on basis of their previous study record. The upper secondary syllabus is designed to last for three years but students may complete it in two to four years. In their last year, students participate in

the Matriculation Examination, which is required for graduation. Completion of upper secondary (either general or vocational) gives students eligibility to apply for higher education at universities and polytechnics. There are no test-based standards until the end of upper secondary schooling. Instead, teachers' judgments are relied upon, gathered through continuous, formative, classroom assessment. Decisions on how students will progress through basic education and to upper secondary education are made by the class teacher, or jointly when a student is taught by several teachers, with parents and the students (who are encouraged to self-assess) also involved. Provision for applied and specialist learning is decided by schools.

Students are expected to include compulsory and elective courses in their individual study plans and they must complete a minimum of 75 courses for upper secondary. The students are assessed for compulsory and elective studies and once they have obtained acceptable grades for their courses they can complete general upper secondary education. They then receive a general upper secondary school certificate, and typically sit for the Matriculation Examination that includes the entire secondary school program. Following this, they receive a separate certificate that show details of the examinations passed and levels and grades achieved. Hence, in Finland, there is only one high-stake school leaving examination at the age of 18 or 19. On completion of either general or vocational secondary education, students have the option of progressing to higher education by attending universities or polytechnics.

Upper secondary schools in **Japan** offer general, specialized or integrated curricula. The general course provides the necessary background for those who want to proceed to higher education as well as to those wishing to transition to work but do not have a specific vocational area they want to pursue. Specialized courses are mainly intended to provide vocational or other specialized education for those students who have chosen a particular vocational area. Integrated courses were introduced in 1994 and offer a wide variety of subject areas and subjects from both the general and the specialized courses, in order to satisfy adequately students' diverse interests, abilities and aptitudes and future career plans.

In addition Japan also has specialized training colleges and "miscellaneous schools," which offer a variety of practical vocational and technical education programs in response to diverse demands of people in a changing society. The great majority of these schools are privately controlled. Courses provided in specialized training colleges may be classified into three categories: upper secondary, postsecondary and general courses.

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

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

Singapore probably has the most stratified progression routes of all the jurisdictions studied, starting at Primary 5, although students can shift from one route to another. Students take school-based examinations in English, mother tongue, mathematics and science at the end of Primary 4 (age 10). On the basis of their performance in these exams, they go on to study these subjects at either Standard or Foundation level (or Higher Level for mother tongue). At the end of Primary 6, the school decides at which level to enter the child in each subject in the Primary School Leaving Examination (PSLE), which is a national test that assesses a student's achievements at primary school and determines access to secondary education. In 2013 over 43,000 students took PSLE examinations and 97.5% of them were deemed to be ready for secondary education, 66.7% in the Express track, 19.9% in the Normal (Academic) track and 10.9% in the Normal (Technical) track (see below).

The same secondary school generally will offer Express, Normal (Academic) and Normal (Technical) streams in lower and upper secondary. Students in the Express stream follow a four-year program culminating in the General Certificate of Education (GCE) O level exam. Students in the Normal (Academic) stream follow a four year course leading to the GCE N (Normal) Level, or sit for the O levels in the fifth year. Normal (Academic) students can bypass the N levels and go straight to O levels, or take a number of subjects at O levels alongside N levels. After N levels, Normal (Academic) students may opt to proceed to polytechnics or be admitted to the Institute of Technical Education (ITE) through a direct entry scheme. They can also be transferred laterally to the Express stream if they are deemed suitable. The Normal (Technical) program prepares students for technical higher education, jobs, or the postsecondary Institute of Technical Education (ITE), after a four year program leading to the GCE N Levels. They are able to take a few subjects at Normal (Academic) level or be laterally transferred to a Normal (Academic) course.

Within the three track secondary system multiple pathways are now a key feature. The MOE takes a total system approach, and uses the phrase “bridges and ladders” both to signal porosity within tracks and between schools and post-secondary institutions.

Students who are of university caliber may study in Integrated Program (IP) schools where they can bypass the O levels and go straight onto A Levels at age 17/18. The rationale behind this program is to encourage them to participate in broader learning experiences that develop their leadership abilities and critical and creative thinking. Once students finish secondary school, they can go on to post-secondary programs of one to three years' duration. There are four different types: junior colleges; polytechnics; ITE; and the Millennia Institute. Many polytechnic graduates who have done well go on to university. Students with O or N levels can take skill-based

certificates in technical or vocational subjects at the Institute of Technical Education (ITE). Outstanding ITE graduates can also go on to polytechnics or universities. Currently 26% of the cohort attends university; the government plans to increase that to 30% by 2015.

In **Florida**, each student's progression from one grade to another partially depends on his/her proficiency in reading, writing, science and mathematics. The school district is responsible for progression planning, including specific levels of performance in the subjects above, as well as in FCATs. If the student is deemed to be below the progression cut off then that student must receive remedial education or be retained (held back) and put into a special program.

In order to graduate from high school, a student must successfully complete a minimum of 24 credits, an IB or an Advanced International Certificate of Education curriculum. At least one of the 24 credits must be acquired through on-line learning, which can take place during normal school hours. For courses that require state tests, a minimum of 30% of the student's end of course grade will reflect the results. Certificates of completion are available to students who obtain the 24 credits but are unable to pass the FCATs or other end of course tests.

The **Massachusetts** Comprehensive Assessment System (MCAS) was designed to support and assess the curriculum standards. Students in Grades 3 through 8 are tested annually in English and mathematics and in science in Grades 4 and 8. Students in Grade 10 must pass tests in English, mathematics and science in order to graduate from high school. There are three types of public schools in Massachusetts (Local Schools, Regional Schools and Vocational Technical Schools) in addition to two types of Charter Schools (Commonwealth Charter Schools and Horace Mann Charter Schools) that students can attend under a school choice scheme.

All these schools types provide education for early childhood, primary and secondary. In the case of vocational/technical education, post-secondary levels of education beyond Grade 12 are available, although compulsory education is defined as between the ages of 6 and 16.

The Massachusetts High School Program of Studies (MassCore) is the recommended high school course of study. MassCore is intended to help the state's high school graduates arrive at college or the workplace well prepared (and reduce the number of students taking remedial courses in college.) The recommended program of studies includes: four years of English, four years of math, three years of a lab-based science, three years of social studies, two years of the same foreign language, one year of an arts program and five additional "core" courses such as business education, health, and/or technology.

Comparative analysis

As we have seen in the previous section, all jurisdictions offer some alternative pathways for those in upper secondary, and there is clearly widespread recognition of the need to provide a modern and relevant vocational route. **Singapore** is clearly the most complex system with multiple pathways operating from an early age, leading to different N, O and A level qualifications, but both **Alberta** and **Ontario** have multiple pathways for upper secondary, leading to a range of certification. The **Australian** states have Year 12 exams which feed into their inter-state

university selection process, ATAR. Similar processes work in **Finland**, where the end of school test is the only formal external exam, **Japan** (Certificate of Upper Secondary), **Massachusetts** (MassCore) and **Hong Kong** (HKDSE). **Shanghai** has the two traditional high stakes Chinese tests, the *zhongkao* and *gaokao*. In **Florida** students need to attain a number of credits to achieve their school diploma, but must also reach certain attainment levels at the end of each year to progress through the system without further support and tuition.

Assessment

Wynne Harlen (1994) defined assessment as the process of firstly gathering evidence, and secondly interpreting that evidence in the light of some defined criterion in order to form a judgment. This definition covers both the summative (assessment of learning) and formative (assessment for learning) aspects of assessment that the jurisdictions studied use in order to ascertain if students have been successful at obtaining the knowledge, skills and understandings that define the curriculum. Summative assessment is a success measure of the outcomes of the end of a unit, program, year's study, qualification or educational experience, for example school leaving examinations and certificates. It is almost always a formal process and can include teacher judgment as well as testing. Formative assessment is the process of seeking and interpreting evidence for use by students and their teachers to decide where the students are in their learning, where they need to go and how best to get there (ARG 2002). One of its key elements is feedback as part of the learning process.

All of the jurisdictions prescribe a combination of the two types of assessment, but the emphasis is different, from the school-based, largely formative assessment found in **Finland** and **Japan** to the high stakes testing in **Singapore** and the **US**. **Queensland** introduces another variable – 'assessment as learning', which sets in policy terms students' active participation in the assessment process. This section concentrates on governments' involvement in creating assessments that all children take, when children take them and whether those assessments are high stakes, although it also covers jurisdictions' formative assessment policies.

Australia

Assessment for Learning (AfL) is featured in the Australian national curriculum.

National testing, ostensibly low stakes for children but intended to be higher stakes for schools and teachers through accountability regimes, is centered on NAPLAN. Children in Years 3, 5, 7 and 9 of compulsory education in Australia are tested against agreed national literacy and numeracy benchmarks. This mandatory testing program reports student outcomes against the benchmarks and collects data for reporting to parents/caregivers and schools, and for systemic reporting through the *MySchool* websites. Almost all children in both government and non-government schools participate in this testing. NAPLAN has been conducted annually since 2008 and tests the sorts of skills essential for children to progress through school and life including reading, writing, language conventions and numeracy. ACARA develops and marks the tests; many of the answers are multiple choice so can be machine read.

Nonetheless, in international terms, it is not clear that NAPLAN is as high stakes for schools as in some other jurisdictions. As Ben Jensen points out, the *MySchool* website is the only accountability instrument introduced for schools and there are no repercussions for teachers on their careers or promotion or any link to pay. Recent evidence from Western Australia, where NAPLAN was made explicitly more important for schools, saw a rise students' achievement level.

The NAPLAN reading tests are almost exclusively multiple choice, with one question asking the test takers to write items in order, introduced in Year 5 and one open-ended question, introduced in Year 7. Language convention tests are a combination of multiple choice items and one word write-in items giving the correct spelling of given words. Until this year, the writing tests interestingly used the same prompt or stimulus across all of the grades, for example, “it is cruel to keep animals in cages,” and were scored using the same rubric. Students in the higher grades are expected to answer with increasing sophistication. Numeracy tests are a combination of multiple choice questions and write-in one word/number questions; in Years 7 and 9 there are both calculator and non-calculator tests (ACARA 2014).

Aside from national testing, **New South Wales** has a number of assessment initiatives in place. Judgments about students’ progress depend as much on teacher assessment as they do on external assessment. For Kindergarten children *Best Start Kindergarten* assessment is a diagnostic assessment of children’s literacy and numeracy skills at the start of the year. It is comprised of one-to-one tasks, marked by the teacher.

During Kindergarten through Year 6, children’s achievements and progress are teacher assessed, using a variety of continuous assessment techniques including direct observation. Twice a year teachers make more formal judgments against each key learning area on a five point (A – E or Outstanding, High, Sound, Limited and Basic) achievement scale. School-based assessment for older children follows a similar pattern to the younger ones, with progress reports home to parents twice a year. Judgments of progress are made against key learning area expectations using a five point scale.

New South Wales emphasizes assessment for learning (AfL) throughout schooling. The syllabuses incorporate AfL on the theory that it has had world-wide success in enhancing teaching and improving student learning. Teachers decide how and when to assess student achievement, since they plan the work students will do, and use a range of appropriate assessment strategies including self-assessment and peer assessment. Teachers are expected to incorporate AfL activities into their units of work through:

- identifying the unit’s outcomes
- deciding on the subject matter or focus of the unit
- deciding on the required evidence of learning and how students will show their learning and how evidence will be gathered and recorded
- selecting relevant syllabus content for the outcomes
- planning the learning experiences and instruction and identifying the AfL strategies that will provide evidence
- ensuring a range of assessment strategies are used and that meaningful feedback is given
- providing opportunities to reflect on student progress and modify future learning experiences accordingly.

NAPLAN results show that overall the scores across all four grades and all five tests were not statistically significantly different for **New South Wales** and Australia as a whole. Between 2008 when the tests were first given and 2013, literacy and numeracy scores have been relatively stable, although fewer Year 9 students have reached the national minimum standards in numeracy. There were troubling gaps between non-Indigenous and Indigenous test takers and between test takers from the highest and lowest socio-economic groups.

Before the latest changes brought about by the national curriculum, schools in **Queensland** had to report about student progress through five interrelated components: essential learnings; standards; an assessment bank; Queensland Comparable Assessment Tasks (QCATs); and *Guidelines for Reporting*. The QCATs (phased out in 2012) were an interesting standards-based assessment tool in English, mathematics and science that was introduced in 2009. Based on performance-based assessment notions of authentic assessment and higher-order thinking skills, they were primarily diagnostic (given early in Year 4 and 6 to ascertain end of Year 3 and 5 achievement, respectively, and at the end of Year 9 to assess the learning of that year). Schools received a design brief that detailed the essential learning to be assessed and they were teacher marked, school moderated and low-stakes. They were used to report to parent and students about strengths and weaknesses, but not to measure teacher or school effectiveness (Stanley et al 2009).

Schools have the responsibility of providing classroom assessments that align with the curriculum – both the Queensland curriculum and more recently the national curriculum. They must administer NAPLAN standardized assessments in literacy and numeracy to all students in Years 3, 5, 7 and 9 and the sample assessments in science, civics and citizenship and ICT in Years 6 and 10. For students in Years 11 and 12 schools must meet the assessment requirements specified in the senior syllabuses and administer the Queensland Core Skills Test to eligible Year 12 students.

Queensland's assessment policy stresses that assessment's primary purpose is to improve student learning. Assessment for learning, assessment as learning and assessment of learning are all used for support, self-reflection and evidence gathering. The first two are supported by Queensland's reliance on school-based assessment. In the former, teachers continually monitor student learning through diagnostic and formative assessment and provide timely feedback that enables students to reflect and monitor their own progress (self-assessment). Summative assessment, again, mostly based on teacher judgment, is used to report progress to parents and students as well as for certification in upper secondary. National curriculum general capabilities and cross-curriculum priorities are not assessed separately; instead they are embedded in the learning area content. Assessment planning must take place at whole-school and year level, the latter goes as far as to spell out the range and balance of assessment types and modes.

At the upper secondary stage there are two assessment regimes for students aged 16 to 18 years. One is a system of internal, continuous, school-based, subject-specific assessment, moderated across the state by the work of review panels. The other is an external cross-curriculum test, the Queensland Core Skills Test (QCS Test). This scaling test assesses students'

capabilities in relation to the more demanding aspects of the curriculum and, according to Lingard (2010) it is unusual in that its effects on pedagogy have been positive – stretching teaching, curricula and students rather than pandering to the lowest common denominator. Lingard argues that the Queensland upper secondary assessment system has resulted in teachers who are highly assessment literate and that the moderation of assessment is a beneficial form of ongoing teacher professional development and learning. He did, however, find that teachers of lower grades were less assessment literate than their upper secondary peers.

In order to ensure consistency of teacher judgment of summative tasks, the state provides marking guides within syllabuses that identify knowledge, understanding and skills to be assessed using a five-point scale. Moderation for upper secondary is in place to ensure common understanding among all teachers about assessment development, making judgments and determining overall achievement levels. Portfolios are maintained to compile representative student work for each learning area or subject. Under these strong quality assurance guidelines, schools and teachers can devise and implement syllabus-based assessments that are tailored to local needs (Maxwell & Cumming 2011).

Canada

Since 1993, **Alberta** and **Ontario** have participated in tests conducted across Canada by the Council of Education Ministers Canada (CMEC), the Pan-Canadian Assessment Program (PCAP), which assesses Grade 8 (age 14) students. The purpose of PCAP is to give provinces and territories an insight into their curricula and to compare student achievement across Canada. PCAP complements provincial assessments; the tests were developed by teachers working with CMEC. Results are available at provincial/territorial level only – students, schools and district information is not available, so the tests are low stakes.

PCAP includes mathematics, reading, and science in each assessment, one being the major area and the other two being the minor areas to be assessed (as in PISA). The first PCAP assessment was administered in 2007 with a focus on reading. The second PCAP was administered in spring 2010 with a focus on mathematics.

In 2010 **Alberta** had results that were not statistically different from Canada as a whole. Ontario had results above the Canadian average in mathematics, science, and reading. The Ontario average in reading was higher than those for all other jurisdictions. Ontario was the only province with results above the Canadian average in all three subjects.

Alberta Education considers the assessment of student progress in relation to the outcomes outlined in programs of study to be important for the following reasons:

- the information on student progress is essential so that teachers can change or refine instructional plans to ensure learning activities are appropriate for all students
- the information is required for reporting student progress clearly to students and parents
- the information is used in making decisions regarding student placement

- the information is required for the evaluation of program effectiveness and for the revision of programs to improve student learning.

Assessment information is collected in a variety of ways to provide feedback that is useful to student and teacher alike.

The AISI initiative, which ended in 2012, included AfL. It emphasized clear, shared understanding between teachers and students of learning outcomes and success criteria, student self-assessment and the continuous, timely exchange between teachers and students about student progress. The AISI initiative seemed to be quite successful in promoting these learning strategies. In its third cycle (2006- 2009), over 51% of AISI projects identified assessment for learning as a central theme and in the fourth (2009-2012) over 35% of projects did so, with over 60% of projects incorporating AfL instructional strategies in their projects.

The current provincial assessment system, Provincial Assessment Tests (PAT), tests children at the end of Grade 3 in English language and mathematics and Grades 6 and 9 in English, mathematics, science, social studies and French. They are curriculum-based achievement tests that provide information on how well individual students are achieving on the provincial programs of study as well as whole class and whole school information. The PATs use multiple-choice, numerical- and written-response items. Feedback to parents and students is in the form of a numeric score and the standard (Acceptable Standard, Standard of Excellence, Below Acceptable Standard) achieved.

Teachers are supposed to use the outcomes in instructional planning and delivery. They can be used to compare results throughout the province. School administrators are supposed to take the results into account when reporting out the school's annual progress and also to set goals, priorities and targets as part of the school's education plan. System-wide the results can be used to monitor student learning and to inform curriculum redesign. Results are reported out publicly and in that sense can be perceived as instruments of accountability. However, teacher evaluations are not tied to test outcomes and Alberta Education states that the tests only assess part of the learning programs and should be interpreted in the context of local programs (Alberta Education 2013; Andrews et al 2007).

Alberta Education is in the process of replacing the PATs with new Student Learning Assessments (SLAs). These will provide students, teachers, and parents with information at the beginning of the school year to plan for learning. The ministry sees SLAs as "readiness" assessments to be used to determine the programing needs and support more personalized learning. They are computer-based and interactive and will concentrate on literacy and numeracy. Unlike the curriculum based PATs, the SLAs are meant to assess problem solving, critical thinking and creativity, all of which feature as 21st century skills. The main purposes of the tests are to improve student learning and enhance instruction. They are meant to complement teachers' continuous assessment in the classroom, and, as with the PATs, teachers will be involved in blueprinting, item development, field-testing, test validation, French translation

validation, standards setting and results interpreting. Alberta Education states that district superintendents may use the tests' outcomes to allocate resources appropriately.

For older students, the Diploma Examinations Program consists of course-specific examinations based on the senior high school programs of study. Students enrolled in mainstream courses in the sciences, ELA, French, mathematics and social studies must take diploma examinations.

The final mark for diploma examination courses is determined by blending the diploma examination mark with the school-based mark. To obtain credit in a diploma examination course, students must take the appropriate diploma examination and obtain a final mark in the course of 50% or higher. The tests outcomes are clearly high stakes for students.

The **Ontario** Ministry of Education's policy document *Growing Success: Assessment, Evaluation, and Reporting in Ontario Schools* (Ontario MOE 2010), focuses on three types of assessment: assessment for learning, which is designed to give teachers information to modify and differentiate teaching and learning activities; assessment as learning, which is a process of developing and supporting metacognition for students; and assessment of learning, which is summative in nature and is used to confirm what students know and can do, to demonstrate whether they have achieved the curriculum outcomes, and, occasionally, to show how they are placed in relation to others.

Province-wide standardized testing began in 1996 in several grades and in a range of subjects, with both a summative and formative purpose (Andrews et al 2007). The literacy tests – the OSSLT – are developed according to frameworks that are benchmarked both nationally and internationally. As with PISA, TIMSS and PIRLS assessment, the provincial assessments are accompanied by student, teacher and principal questionnaires that are intended to improve practice (EQAO 2011).

Currently the following tests developed by the EQAO are given to all students in Ontario:

- assessment of reading, writing and mathematics (Grades 1-6): three test booklets, two for English and one for mathematics that are six hours long
- Grade 9 assessment of mathematics: two test booklets of 60 minutes' duration each
- Ontario Secondary School Literacy Test (OSSLT) (Grade 10): two test booklets of 75 minutes duration each.

The tests contain both multiple choice and open ended items, including essays. Results are reported as overall achievement levels, from 1 to 4 with Level 1 being the lowest and Level 4 the highest. Sublevels are also reported so that end users can determine where a student's performance sits within the achievement level. Such fine grained data are supposed to be used by schools to make decisions about placement, intervention programs, school organization and program planning. Students are reported as either "successful" or "unsuccessful" in the OSSLT.

A central plank in the 2001 learning to learn program in **Hong Kong** is assessment for learning (AfL). The CDC (2001) recommended ways of carrying out AfL in schools that included reducing tests and examinations. 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) did find that some successful formative assessment could be carried out, if it did not conflict with the emphasis on summative assessment. School-based assessment (SBA) is being introduced in Hong Kong to serve two purposes – assessment and reviewing. Teacher assessment now carries 20% of overall marks for each subject in senior secondary programs in almost all subjects.

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. Also, surveyed teachers were suspicious that final marks for senior secondary might be adjusted when SBA results were aggregated with external assessment,

Hong Kong has 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. Candidates may, if they choose, take up to eight examinations in addition to the compulsory ones. 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.

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).

For primary a sample of students in Primary 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. The stakes are low for individual students, with reports generated at the school level. All schools participate. The tests' purpose is to assess basic competency in critical curriculum areas. 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).

Keen to stress that these tests are for internal use only the HKEAA makes 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.

China, in general, and **Shanghai** in particular, has moved to adopt more learner-centered curricula and assessments. Assessment for learning has been introduced in order to aid students' understanding of the world around them. Passive knowledge, memorization and mechanical drilling are all discouraged and assessment is being used to foster student developments. Teachers are reminded to look beyond students' examination preparation to develop moral qualities, citizenship, learning to learn, social interaction and cooperation as well as participation in sport, health and aesthetics (Tan 2012). However, on the whole, the preferred method of assessment in China is summative rather than formative, pencil and paper rather than performance tasks (Tan 2013). Standardized assessment is seen as fairer and more objective than other assessments.

There are two national entrance examinations for Chinese students called *zhongkao* and *gaokao*, each of which is high stakes for students. At the end of Grade 9, all students take the *zhongkao*, which is a summative assessment of the previous nine years of education, as well as an entrance examination into senior high school. Assessing students in six domains – Chinese, mathematics, English, combined physics and chemistry and physical fitness, the *zhongkao* determines whether a student will attend a selective senior high school or upper secondary program or if s/he will go on to an ordinary high school or a vocational program.

And after three years of senior high school students take the *gaokao*, or university entrance examination. In Shanghai the municipal education commission writes the examinations for those students who have a Shanghai *hukou* (right of residency), consisting of Chinese, mathematics and English plus one subject of the student's choice including physics, chemistry, biology, politics, history or geography. Like the *zhongkao*, *gaokao* results determine a student's future, in this case what caliber of university he or she will attend. Students must also take the School Standard Examination, at upper secondary, which consists of examinations in 10 subjects taken over a three year period including Chinese, mathematics, English, physics, chemistry, life sciences, IT, geography, history and ideology and politics. These are primarily paper and pencil tests, except IT which is an on-line assessment. English language includes a listening and speaking element and the sciences include an applied element. Unlike the *zhongkao* and *gaokao*, standard examinations are graded and norm-referenced (Tan 2013). While it sometimes happens that students who have not attended highly selective lower secondary schools go on to selective upper secondary schools, this is unusual, so a child's fate is decided fairly early on (Tan 2013).

In addition to these national examinations, students in Shanghai take local examinations at primary, lower and upper secondary school. Each district sets its own papers; there are also tests that are based on sampling of about 30% of students that are aimed to assess teaching quality in which neither the subject nor the sample is known beforehand. Interestingly, these tests also ask about students' sleeping and reading habits, whether or not they have additional tutoring, which are their favorite subjects, etc. in order to get the message across to schools that they are educating the whole child, not just offering examination preparation (Tan 2013).

Despite reform efforts, teaching and learning, especially in secondary schools, are predominantly determined by the examination syllabi, and school activities are very much oriented towards exam preparation. As the time gets closer to examinations, non-examined subjects such as music, art and physical education are removed from the timetable. Additional examination preparation classes are laid on and students study for many hours each day, including weekends.

The Ministry of Education issued a major policy document in 2001 that called for de-emphasizing the screening and selective functions of assessments and instead to emphasize their formative and constructive functions. Shanghai has opted to modify the mode and contents of examinations so they serve the purpose of curriculum and pedagogy reform. Since 1985 Shanghai has had the responsibility of overseeing the university entrance examinations within its jurisdiction. It has put a great deal of effort into modifying the examinations so that they complement curricular and pedagogical changes. The examinations follow a three + X pattern of

the three core subjects (Chinese, English and mathematics) plus the X of any other subject(s), depending on the receiving institution. That component can be a paper and pencil test, an oral examination or a practical skills test and may test one or more subjects. The OECD gives the example of interdisciplinary papers that test students' ability to solve real-life problems as well as questions that require students to show knowledge, understanding and skills not on the examination syllabus. There are no longer multiple choice questions in Shanghai's public examinations (OECD 2010a).

Finland's National Core Curriculum for Basic Education (2004) sets out guidance and arrangements for both formative (in course) assessment and final assessment at the end of a phase of education. The National Curriculum also provides overall objectives for assessment associated with each phase. The local curriculum provides local guidance on criteria and practices regarding progression each year from one grade to another.

The importance of formative assessment is highlighted. Approaches advocated are aligned with the curriculum in their emphasis on assessment of work skills alongside assessment of subject matter, and on the use of a variety of approaches in assessment including the importance of self-assessment and feedback to students. Summative assessment at the end of each school year provides feedback to students and their parents about progress and areas for improvement. There are no high stakes assessments for Grades 1-4. The final assessment of Basic Education takes place at the end of Grade 9 and is based on teacher assessment of samples of work over the preceding two years. Notable features of the Finnish system are the lack of high stakes assessment and the status given to teacher assessment.

There is no cohort-wide testing in Finland until students reach upper secondary education. Instead, students are continuously assessed by their teachers. Schools generally will have data on testing that is developed and implemented by teachers, but those data are not publicly available and the testing is not high-stakes (Sahlberg 2013). Each year students' progress is reported either in the form of a written description or a grade at the end of the year and on one occasion before that (Galloway 2008). The grading scale is from 4 to 10, where 4 denotes a fail, 5 pass, 6 and 7 satisfactory, 8 good, 9 very good and 10 excellent.

Upon successful completion of basic education, students are awarded a school leaving certificate that allows them to progress to upper secondary education. Students who achieve the highest grades and marks are eligible to attend general upper secondary education, while others attend the vocational school (Hendrickson 2012). "Teachers are never evaluated by the rise or fall of their students' test scores. There is no value-added assessment in Finland (Ravitch 2013).

In upper secondary students are given assessment feedback on a frequent basis for every course, based on their achievement of course objectives and their overall progress in each subject. The grading scale is that same as that for basic education. Students who fail their assessments are given an opportunity to take a separate examination to complete the course. Students are expected to include compulsory and elective courses in their individual study plans and, according to the Government Decree N 955 (2002) they must complete a minimum of 75 courses

for upper secondary. The students are assessed for compulsory and elective studies and once they have obtained acceptable grades for their courses they can complete general upper secondary education. They then receive a general upper secondary school certificate, and typically sit for an external Matriculation Examination that includes the entire secondary school program. Following this, they receive a separate certificate that shows details of the examinations passed and levels and grades achieved. Hence, in Finland, there is only one high-stake school leaving examination at the age of 18 or 19 (Sahlberg 2013).

The Matriculation Examination is offered in spring and in autumn to those studying in Grade 12. A Matriculation Examination Board administers the examination and provides guidelines on the contents of, and arrangement for, the examination. Passing the examination makes the students eligible for tertiary education. However, admission to a university and polytechnics could require students to go through an additional entrance examination in some fields of study (Galloway 2008).

The Matriculation Examination comprises of at least four tests: a test in the candidate's mother tongue — compulsory for all candidates; three tests from the following four categories: second national language; foreign language; mathematics; and one test in the general studies battery (sciences and humanities). Students may opt to take more than these four tests.

In addition to the school-based assessment of learning that schools carry out, national assessments of learning outcomes are done regularly. There is a test nearly every year either in mother tongue and literature or mathematics. Other subjects are assessed according to the evaluation plan of the Ministry of Education and Culture. Not only are academic subjects assessed but cross-curricular themes are as well. The assessments are not cohort wide, they are sample-based. The main aim of the national assessments is to follow at a national level how well the core curriculum's objectives have been reached.

National assessments are most commonly carried out in Grades 6 and 9 and their main aim is to ensure equality and equity across regions and for students from different language groups, social backgrounds and gender. The government stresses that these assessments are meant to develop and steer, not to control. Outcomes are not used to rank schools and are not made available publicly, despite pressure from the media. Participating schools receive their own results, which are compared with national outcomes. These data are meant to be used developmentally by the schools. Nationally, the results are used to aid in policy decisions (NBE 2006).

Japan relies heavily on teacher-based assessment, both formative and summative. National assessments were introduced in 2007, known as the national academic achievement tests. They assess students in 6th and 9th Grade in mathematics, literacy and science. While schools' participation in these tests was voluntary, almost 99% of schools participated in the first year. The test shifted from whole-cohort to sampling (30%) in 2010 on the theory that this would both save money and provide sufficient data necessary for student achievement monitoring. Starting in 2013, the testing became mandatory again, as MEXT believed that the outcomes could be linked

with schools' planning cycles. There has been debate about whether to make the test results public or not. Currently prefectures have been told not to publish results, even though some wanted to do so in the name of public accountability (Takayama 2013).

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

The assessment for Grade 6 students includes the following:

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

The assessment for Grade 9 includes the following:

- 45 minute test on Japanese knowledge
- 45 minute test on Japanese usage
- 45 minute test of mathematics knowledge
- 45 minute test of mathematics application
- 45 minute science test. This test measures both knowledge and application integrally (only in 2012).

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

There are no formal Assessment for Learning policies. There are entrance examinations that students must pass in order to get into upper secondary programs and universities; individual institutions design and write these tests. For upper secondary schools, there are two types of entrance processes, general entrance exams and admission on recommendation. In general entrance exams, those who establish and manage a school devise a common academic entrance examination. For example, Prefecture Boards of Education offer a common entrance exam to

applicants to their schools, so many Grade 9 students who want to go to public upper secondary schools in Tokyo take an entrance exam offered by Tokyo Board of Education. However, some (competitive) state schools can offer their own (more challenging) exams to recruit excellent students. Each state upper secondary school decides who can enter their school based on academic examinations and other elements.

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

Recently a government panel has been convened to make recommendations about reforming the university entrance system; any reforms are due to be put in place by 2018. At the moment the panel is considering replacing the standardized test with one that better reflects achievement and that can be available a number of times each year. The panel also is interested in the universities themselves reforming their individual entrance examinations to de-emphasize recall of factual information. It also is looking into the possibility of expanding the elements that comprise the decision making to include things such as interviews, debates and short essays as well as extra-curricular activities undertaken by upper secondary school students (Osaki 2013).

In **Singapore**, apart from national examinations, student assessment is school-based, on which the MOE provides guidelines. Continuous, formative assessment forms an integral part of the teaching-learning process, and has been encouraged through various policy initiatives. School-based mid- and end-of-year examinations provide summative evaluation. The outcomes of these assessments are aggregated to provide a profile of the student's progress. They are the basis on which critical decisions about a student's future are made, such as placements and at what levels subjects are to be studied.

Students take school-based examinations in English, mother tongue, mathematics and science at the end of Primary 4. On the basis of their performance in these exams, they go on to study these subjects at either Standard or Foundation level (or Higher Level for mother tongue). At the end of Primary 6, the school decides at which level to enter the child in each subject in the Primary School Leaving Examination (PSLE), which is a national test that assesses a student's achievements at primary school and determines access to secondary education. It is conducted annually by the Singapore Examinations and Assessment Board (SEAB). Students' performance in the PSLE is also one of the factors used to measure the performance of the school.

PSLE English consists of four papers: writing (27.5% weighting); language use and comprehension (47.5% weighting); listening comprehension (10% weighting); and oral

communication (15% weighting). The writing paper is 1 hour 10 minutes long and consists of open-ended essay questions; the language use paper is 1 hour 50 minutes long and is a combination of open-ended and multiple choice items; listening comprehension is about 35 minutes long and contains multiple choice items; and oral communication is about 11 minutes long and is open-ended. Foundation English follows the same format, but it is slightly shorter and more heavily weighted toward oral communication (20%) and less toward language use and comprehension (40%).

PSLE mathematics consists of two papers, one of 50 minutes (40% weighting) and the second 1 hour 40 minutes (60% weighting). The former contains a combination of multiple choice and short answer items; the latter consists of short answer and structured long answer questions. The foundation mathematics test, while following the same format, is shorter, at 2 hours 15 minutes, with more multiple-choice items and fewer structured ones.

PSLE science is a 1 hour 45 minute test comprised of multiple choice (60% weighting) and open-ended (40% weighting) items. Foundation science is 1 hour 15 minutes long and consists of multiple-choice (46% weighting), structured (20% weighting) and open-ended (34% weighting) items.

Upon completion of secondary students take Normal (N) levels or General Certificate of Education Ordinary (O) levels. N levels can be either technical (NT) or academic (NA). Results determine what, if any, post-secondary track students embark on. NA levels are graded 1 to 5, with a U for ungraded; NT levels are graded A to D, with a U for ungraded. Two thirds of Singapore secondary students undertake O level examinations. O levels are graded A to F.

Students with good O level passes are normally admitted to junior college, where they complete the A levels in two years, or to a centralized institute to complete A levels in three years. A revised A Level curriculum took effect from 2006; candidates now select subjects from three levels of study -- Higher 1 (H1), which contains about 50% of the content of a Higher 2 (H2) and is the same level of demand, H2 which is the full two-year course and Higher 3 (H3), which is a special paper for the most able students. H1 and H2 papers are graded A to E; H3 is graded pass, merit or distinction. Students can select any combination and number of H1 and H2 subjects but they must take either the H1 General Paper or H2 Knowledge and Inquiry paper.

Florida has been assessing its students state-wide since 1976; it had the first high school graduation test in the US. Currently Florida is in transition from FCAT to FCAT 2.0 and Florida End-of-Course (EOC) Assessments. The FCAT 2.0 is criterion-referenced and measures student achievement of the Next Generation Sunshine State Standards in reading, mathematics, science, and writing. FCAT 2.0 in reading (Grades 3-10) and mathematics (Grades 3-8) were first offered in the spring of 2011; FCAT 2.0 science (Grades 5 and 8) was offered in the spring of 2012; FCAT 2.0 writing (Grades 4, 8 and 10) in the spring of 2013. The tests are almost exclusively multiple-choice except for the 4th, 8th and 10th Grade writing tests (FDOE 2013). High school seniors who have not passed the 10th Grade FCAT in reading are given multiple opportunities to re-take the test, can use SAT or ACT scores in lieu of a passing score, or can pursue a General

Education Diploma (GED). While students are allowed to enroll in a community college with only a Certificate of Completion they may continue to retake the FCAT 2.0 reading test in order to obtain a high school diploma.

The FCAT 2.0 assessments are complemented by Florida End-of-Course (EOC) Assessments, which measure student achievement of the NGSSS for specific courses. The first of these assessments was of Algebra I and took place in 2011. Biology I and Geometry tests took place in 2012; US History in 2013, Civics in 2014.

The **Massachusetts** Comprehensive Assessment System (MCAS) is the state's compulsory assessment system for 3rd through 8th Grade and 10th Grade students. MCAS measures student performance based on the Massachusetts curriculum framework learning standards, and provides a means of reporting on the performance of individual students, schools, and districts. MCAS is applied to all students in reading; English Language Arts; science, technology/engineering and mathematics; history and social sciences.

MCAS serves as a basis of accountability for students, schools, and districts by: informing curriculum and instruction; evaluating student, school, and district performance according to Curriculum Framework content standards and MCAS performance standards; and determining eligibility for high school Competency Determination of students.

Comparative analysis

The table below shows a summary of the different assessment regimes in the jurisdictions studied.