Audit of the Content of Early Years and Primary Curricula in Eight Jurisdictions

Desk study for the National Council for Curriculum and Assessment (NCCA)

Key findings synthesis: curriculum breadth, depth and organisation

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1. Introduction

In July 2018, the National Council for Curriculum and Assessment (NCCA) commissioned an audit of early years and primary curriculum content in eight jurisdictions - Finland, France, Ireland, New Zealand, Ontario (Canada), Scotland, Singapore and Wales.[1] The audit included a desk study in response to research questions on:

1. content in the curriculum for 4- to 12-year-olds
2. how curriculum content reflects the aims and purposes of primary education
3. the influence from policy and reform on primary curriculum content
4. overload in the primary curriculum, and
5. curriculum continuity in the design and development of primary curriculum content.

The project also involved a desktop audit of the breadth, depth and organisation of curriculum content in the early, middle and upper primary years.

The suite of project outputs includes:

- a set of detailed tables - one for each of the eight jurisdictions - responding to the five research questions
- a set of tables summarising, for each jurisdiction, the knowledge and skills included in each compulsory curriculum area in the early, middle and upper primary years (the 'breadth and depth' tables)
- two overview reports synthesising the findings from the two sets of tables.

This second of the two reports reflects on the key findings from the desktop audit of the breadth, depth and organisation of curriculum content across the early and primary years. It is intended to inform the development of the primary curriculum in Ireland and, to place it in its full context, is best read alongside the other project outputs.

[1] These jurisdictions were selected to reflect a variety of curricular approaches and stages of curriculum (re)development. They form a subset of those jurisdictions included in recent early years and primary education international desk studies completed for the NCCA. In this way, the audit enables the NCCA to more easily view the outputs from this research in their contextual framework, and recognises the contextual disparity of approach inherent in international comparisons. Ireland is included to facilitate comparison in the project outputs.

2. Curriculum organisers

Across the eight jurisdictions, the curriculum for the age range 4-12+, which may encompass separate curricula for the early years, primary and lower secondary phases, is variously organised by learning areas, curriculum areas, themes, strands, domains, subjects, or subject disciplines. These are then set out in the curriculum documents in a range of ways, for example, as compulsory subject key content areas with objectives of instruction for 7- to 13-year-olds in Finland; as subjects and sub-topics with end-of-cycle learning objectives for 6-to 15-year-olds in France; as subject strands and strand units with content objectives in the majority of curriculum areas in Ireland; as learning area strands and sub-strands with achievement objectives in New Zealand; as subject strands with overall expectations and specific expectations in Ontario; and as curriculum area 'organisers' in Scotland, expressed as experiences and outcomes for planning learning, teaching and assessment, and benchmarks relating to levels of progress.

In Singapore, the organisation of individual subjects varies and is set out in separate syllabus documents. Outcomes may be expressed as key understandings; knowledge and skills; knowledge, skills and values / dispositions; or as learning outcomes or goals / objectives. Wales is moving from a curriculum organised by areas of learning and learning objectives from age 3-7, and by individual subjects; strands of study; and learning objectives for ages 7-14, to one organised by areas of learning and experience; knowledge, skills and experiences; and achievement outcomes for ages 3-16. In addition, in Ireland, where revised curriculum areas are beginning to be introduced, such as for language for ages 4-8, these are expressed as curriculum strands and elements, with learning outcomes for each element.

The areas of learning and experience (AoLE) in the new Curriculum for Wales (Welsh Government, 2018a) are being co-constructed by individual AoLE groups which include teachers, academics and international experts. Available by Easter 2019 for testing and feedback[2], each AoLE is being designed around a 'model' (Welsh Government, 2018b), which includes a 'what matters' statement, outlining the essential aspects of learning of that AoLE. The 'knowledge, skills and experiences' will provide an indication of the curriculum content that is key to achieving the what matters statement, and an outline of progression across the continuum of learning will be expressed as achievement outcomes.

In Finland, the three national core curricula for early childhood education and care, compulsory pre-primary education and compulsory basic education include a set of transversal competences. Like the domains of the *socle commun* (the common foundation of knowledge, skills and culture) in France, these competences sit alongside the compulsory subjects and form an integral part of the curriculum framework document.

Table 1 summarises the top-level and more detailed curriculum 'organisers' and how these are expressed as learning outcomes for each of the jurisdictions.

[2] It is intended that the new Curriculum for Wales for 3- to 16-year-olds will be available for testing and feedback by Easter 2019, with all schools having access to the final curriculum from 2020. The aim is to ensure that schools are prepared for statutory roll-out in September 2022.

Table 1: Organisation of curriculum

Jurisdiction, framework, age	Top-level organisers	Expressed as:	With learning outcomes defined as:
Finland			
National Core Curriculum for ECEC, 0-6	Learning areas (5) Transversal competences (5)		Objectives and content Learning aims
National Core Curriculum for Pre-Primary Education, 6-7	Common objectives for instruction (5) Competence areas (6)		Learning objectives Learning aims
National Core Curriculum for Basic Education, 7-13*	Compulsory subjects (11) Transversal competence areas (7)	Key content areas	Objectives of instruction Learning aims
France			
Cycle 1 curriculum, 3-6 Cycle 2 curriculum, 6-9 Cycle 3 curriculum, 9-12 Cycle 4 curriculum, 12-15** *Socle commun*, 6-16	Areas of learning (5) Subjects (7) Subjects (8) Subjects (10) Domains (5)	Sub-topics Sub-topics Sub-topics Sub-topics	Learning aims/expectations for learning End-of-cycle learning objectives End-of-cycle learning objectives End-of-cycle learning objectives Key learning objectives Associated knowledge and skills
Ireland			
Aistear, 0-6 Primary Curriculum, 6-12	Themes (4) Curriculum areas/subjects (7)/(12) Revised curriculum areas	Aims (4) Strands and strand units Strands and elements	Learning goals (6) Content objectives Learning outcomes for each element
New Zealand			
Te Whāriki, 0-5/6 New Zealand Curriculum, 5-13***	Strands (5) Learning areas/subjects(disciplines) (8)/(13)	Goals Strands/sub-strands	Learning outcomes Achievement objectives
Ontario			
Kindergarten Program, 4-6 Ontario Curriculum, 6-14	Frames (broad areas of learning) (4) Subjects/disciplines (7+)	Strands	Overall expectations/specific expectations Overall expectations/specific expectations

Jurisdiction, framework, age	Top-level organisers	Expressed as:	
Scotland Curriculum for Excellence, 3-15****	Curriculum areas (8)	Curriculum organisers	Experiences and outcomes Benchmarks
Singapore NEL framework, 4-6 Primary Curriculum, 6-12 Lower secondary curriculum, 12-14+	 Learning areas (6) Subject disciplines***** (9) Subject disciplines (13)	 e.g. areas of learning/ clusters/content or context strands/themes/domains e.g areas of learning/ content strands/themes/ domains/topics/units	 Learning goals e.g. learning outcomes or goals/key understandings/knowledge, skills and values or dispositions/processes e.g. learning outcomes or goals/learning objectives/knowledge, skills and values or dispositions/functional knowledge and skills
Wales Foundation Phase, 3-7 Key Stage 2, 7-11 Key Stage 3, 11-14 New Curriculum for Wales, 3-16	 Areas of learning (7) Subjects (13) Subjects (14) Areas of learning and experience (6)	 Strands of study Strands of study Knowledge, skills and experiences	 Learning objectives Learning objectives Learning objectives Achievement outcomes

*__Finland__: the National Core Curriculum for Basic Education covers Grades 1-9, ages 7-16. The elementary grades are Grades 1-6, ages 7-13.

** __France__: the early years and primary phase curriculum is organised in teaching cycles. Cycle 1 is pre-compulsory nursery education; Cycle 2, the fundamental learning cycle, encompasses the first three years of primary education; Cycle 3, the consolidation cycle, includes the final two years of primary education and the first year of lower secondary education (ages 9-12); Cycle 4, the knowledge expansion cycle, is the final three years of lower secondary education (ages 12-15).

***__New Zealand__: the New Zealand Curriculum framework covers age 5-18. The elementary grades are Grades 1-8, ages 5-13.

**** __Scotland__: There are two stages in the Curriculum for Excellence (CfE) – broad general education from the early years (aged 3 onwards) to the end of Secondary 3 (S3), age 15; and the senior phase (Secondary 4, S4 to Secondary 6, S6, ages 15-18). For children aged 3-15, the curriculum is organised around experiences and outcomes and benchmarks in eight curriculum areas.

***** __Singapore__: subject disciplines are supported by knowledge skills and life skills. The latter include physical education (PE) and character and citizenship education

2.1 The use of 'age and stage'

In the main, across the eight jurisdictions, expectations for learning are expressed in the curriculum documents for a given year or the end of a stage, cycle or phase, i.e. they are age-related. In Finland, for example, they are established for the end of early childhood education and care, age 6; the end of the compulsory pre-primary year, age 7; the end of Grades 1-2, age 9; and the end of Grade 6, age 13. In France, they are end-of-cycle learning objectives for ages 6, 9, 12 and 15 and, in Ireland, the content objectives for each subject are set out as 'should be enabled to' statements of increasing difficulty for each phase of the Primary Curriculum (infants - ages 4-6; first and second class – ages 6-8; third and fourth class – ages 8-10; and fifth and sixth class – ages 10-12).[3]

In Ontario, where the curriculum expectations for each subject are expressed as overall expectations (OEs) and more detailed specific expectations (SEs), the overall expectations describe in general terms the knowledge and skills that students are expected to achieve in all strands, or broad curriculum areas, by the end of each grade (school year). Specific expectations describe the expected knowledge and skills in greater detail for the end of each grade. Since the OEs describe knowledge and skills that are fundamental to the subject as a whole, they sometimes remain the same from grade to grade or are only slightly modified to indicate a higher level of difficulty. The sequential progression from grade to grade is more evident in the SEs.

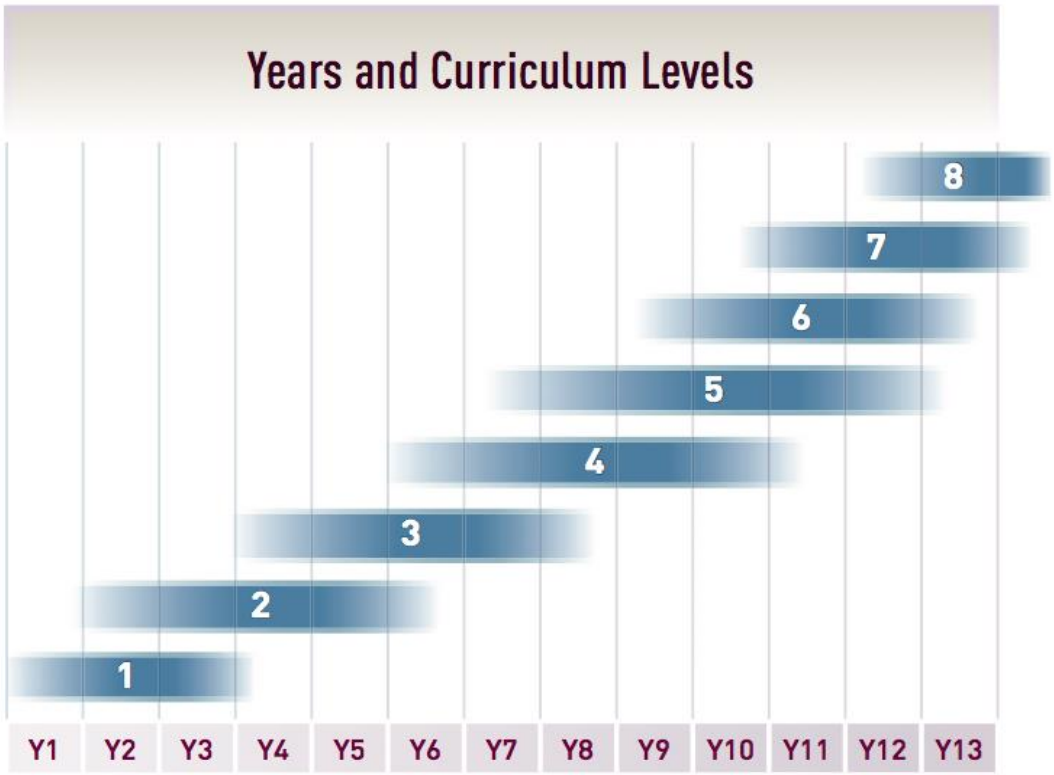
The systems of levels employed to express learning outcomes (or benchmarks) in the New Zealand Curriculum for 5- to 18-year-olds (New Zealand Ministry of Education, 2007) and the Curriculum for Excellence (CfE) for 3- to 18-year-olds in Scotland (Education Scotland, 2018a) are more loosely linked to age. This is intended to enable the curriculum frameworks to 'flex' to respond to individual pupil need and ability. The organisation of the achievement outcomes of the new Curriculum for Wales (Welsh Government, 2018a) is intended to be similar, with outcomes expressed as 'progression steps' on a continuum of learning, relating broadly to expectations at ages 5, 8, 11, 14 and 16, but intended to facilitate learners progressing at their own pace and working through the curriculum experiences and outcomes at the most appropriate level for them.

For each strand of each learning area of the New Zealand Curriculum, achievement objectives determine the progressions through which pupils move as they develop knowledge, skills and understandings related to the strands. The achievement objectives are described by eight levels, where level 6 represents the average performance of a pupil in Year 10 (aged 15). Pupils in primary phase education will usually perform between levels 1 and 4, but some primary pupils may perform at level 5 in some

[3] The learning outcomes in the revised language curriculum describe expected language learning and development in terms of concepts, dispositions and skills at the end of similar two-year periods (age 6, Stage 1, and age 8, Stage 2). When the learning outcomes approach is extended to more subjects and more school years, the intention is that each subject will include clear statements of the skills and competences expected of learners at six points in their development (end of early years/infants – age 6; end of second class – age 8; end of fourth class – age 10; end of primary education, age 12; end of Junior Cycle, age 15; and end of Senior Cycle, age 17/18.

strands of some learning areas. Pupils progress to the next level once they have gained most of the skills, knowledge and understandings of a given level. Figure 1 summarises the curriculum levels by year.

Figure 1: Curriculum levels, New Zealand



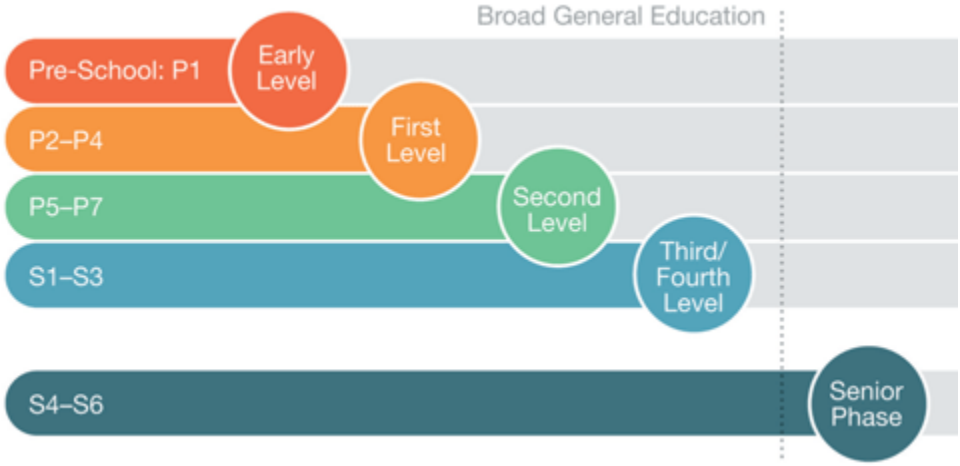
Source: New Zealand Ministry of Education (2007). *The New Zealand Curriculum Online* [online]. Available http://nzcurriculum.tki.org.nz/The-New-Zealand-Curriculum [19 October, 2018].

In Scotland, similarly, the experiences and outcomes (Education Scotland, 2018b), which describe pupils' learning and progression in each curriculum area, are described in relation to six levels of progress. Benchmarks for each curriculum area (Education Scotland, 2018c) supplement the experiences and outcomes by providing statements about what children and young people need to learn to achieve each of the six levels.

Primary schools and early learning and care (ELC) settings typically focus on the first three of the six levels ('early', 'first' and 'second'), depicted in Figure 2. As in New Zealand, the levels are intended to provide a general guide, with learners progressing at their own pace through them. The aim is not to have artificial ceilings which might limit expectations of what children can achieve, and to space the

levels so that they are not regarded as hurdles to get over as quickly as possible, but rather as staging posts in a curriculum experience which offers depth, enrichment and consolidation of learning.

Figure 2: Curriculum for Excellence (CfE) levels, Scotland



Shows the CfE levels with progression to the senior phase (Secondary 4 to Secondary 6, S4-S6, ages 15-18). Early level includes pre-school and Primary 1 (P1) (ages 3 to 5-6); first level includes P2-P4 (ages 6-9); second level includes P5-P7 (ages 9-12); and third/fourth level includes Secondary 1 to Secondary 3 (S1-S3, ages 12-15).
Source: Education Scotland (2018d). *Curriculum Levels* [online]. Available: https://education.gov.scot/parentzone/learning-in-scotland/Curriculum%20levels [19 October, 2018]

Concluding remarks

The curriculum 'organisers' for early years and primary level curricula vary across the eight jurisdictions. In general, the early years curriculum is organised by learning area (areas of learning) (also described as early years 'themes', 'strands' and 'frames'), while subjects / subject disciplines become more common in the primary years. Learning outcomes usually relate to expectations by age, although the systems of levels used in New Zealand and Scotland aim to provide a more general guide with a view to enabling learners to more easily progress at their own pace. In Finland and France, a set of competences / essential knowledge and skills to be developed form an integral part of the curriculum framework documents. These are discussed further in Section 3.2.

3. Curriculum content

The desktop audit tables outlining curriculum content across the eight jurisdictions enable analysis of curriculum content by phase of education, age range or year group, and by individual subjects / learning areas. This key findings synthesis highlights some key aspects of the breadth, depth and organisation of curriculum content, but readers may be interested to look in depth at particular curriculum areas or year groups in the detailed tables.

3.1 Curriculum content: early years

Set out, at the top-level, as broad themes or areas of learning (Table 2), the detailed early years curriculum content for young children aged up to 6, which is usually expressed as learning aims / goals / objectives or outcomes in the curriculum frameworks for the phase (Table 1), emphasises the breadth of experience and development which the curricula at this level are intended to ensure. While the frameworks include a focus on developing young children's communication skills and early literacy and mathematical behaviours, along with their thinking and creative skills and their physical and motor skills, there is also explicit emphasis on children's personal, social and emotional development (their well-being); on the development of their self-management and self-regulation skills; and on developing their understanding of the world and their place in it.

In Wales, for example, the Foundation Phase Framework for 3- to 7-year-olds (Welsh Government, 2015) places 'personal and social development, well-being and cultural diversity' at the heart of the curriculum for this phase, and expects children's skills in this area of learning to be integrated in and developed across the six other areas of learning. Through personal and social development, well-being and cultural diversity, young children in Wales are expected, among others, to be given opportunities to value and contribute to their own well-being and to the well-being of others; to develop an understanding that exercise and hygiene and the right types of food and drink are important for healthy bodies; and to consider the consequences of words and actions for themselves and others. Early level 'health and well-being' in the Curriculum for Excellence (CfE) in Scotland (Education Scotland, 2018a) sets similar expectations that children become aware of how cleanliness, hygiene and safety can affect health and well-being; and of their own and other's needs and feelings, e.g. when taking turns and sharing resources. Overall expectations (OEs) in the Kindergarten Program for 4- to 6-year-olds in Ontario (Ontario Ministry of Education, 2016) focus on young children demonstrating independence and self-regulation; on them identifying and using social skills; and on them demonstrating an awareness of their own health and well-being, while the well-being strand in the *Te Whāriki* Early Childhood Curriculum (New Zealand Ministry of Education, 2017) establishes the learning outcomes that, over time and with guidance and encouragement, children aged 0-5/6 in New Zealand will become increasingly capable of keeping themselves healthy and caring for themselves; managing themselves and expressing their feelings and needs; and keeping themselves and others safe from harm. At the heart of the social and emotional development learning area in the Nurturing Early Learners (NEL) curriculum framework in Singapore (Singapore Ministry of Education, 2012a) is the development of self-awareness, self-management, social awareness, relationship management, and responsible decision-making.

Table 2: Early years learning areas

Finland	NCC, ECEC, 0-6 Learning areas	NCC, ECEC, 0-6 Transversal competences	NCC, Pre-Primary, 6-7 Common objectives for instruction	NCC, Pre-Primary, 6-7 Competence areas
	• Rich world of languages • Diverse forms of expression • Me and our community • Exploring and interacting with my environment • I grow, move and develop	• Thinking and learning • Cultural competence, interaction and self-expression • Taking care of oneself and everyday skills • Multiliteracy and competence in ICT • Participation and involvement	• Rich world of languages • Diverse forms of expression • Me and our community • Exploring and interacting with my environment • I grow and develop	• Thinking and learning • Cultural competence, interaction and self-expression • Taking care of oneself and everyday skills • Multiliteracy • Competence in ICT • Participation and involvement
France	Cycle 1 curriculum, 3-6 Areas of learning			
	• Using language in a multitude of different ways • Acting, expressing oneself and understanding through physical activity • Acting, expressing oneself and understanding through the arts • Creating the first tools for organising one's thoughts • Exploring the world			
Ireland	*Aistear*, 0-6 Themes			
	• Well-being • Identity and belonging • Communicating • Exploring and thinking			

New Zealand	Te Whāriki, 0-5/6 Strands
	• Well-being • Belonging • Contribution • Communication • Exploration
Ontario	Kindergarten Program, 4-6 Frames
	• Belonging and contributing • Self-regulation and well-being • Demonstrating literacy and mathematics behaviours • Problem-solving and innovating
Scotland	Curriculum for Excellence, 3-15 Curriculum areas
	• Expressive arts (includes art and design, dance, drama, and music) • Health and well-being (includes food and health, personal and social education, and physical education) • Languages (includes literacy, English, Gaelic and modern / foreign languages) • Mathematics, including numeracy • Religious and moral education • Sciences • Social studies • Technologies

Singapore	Nurturing Early Learners framework, 4-6 Learning areas
	• Aesthetics and creative expression • Discovery of the world • Language and literacy • Motor skills development • Numeracy • Social and emotional development
Wales	Foundation Phase framework, 3-7 Areas of learning
	• Personal and social development, well-being and cultural diversity • Language, literacy and communication skills • Mathematical development • Welsh language development • Knowledge and understanding of the World • Physical development • Creative development

The acquisition of communication skills - both verbal and non-verbal - is a key strand running through the early years curriculum frameworks in all eight jurisdictions. In some, in addition, there is particular emphasis on developing reading and writing skills, although where frameworks begin from birth (e.g. in Ireland and New Zealand), requirements are less explicit, highlighting, for example, the role of developing children's interest in print and other media (including ICT), and in mark-making in an enjoyable and meaningful way (*Aistear*; NCCA, 2009). In Finland similarly, requirements relating to reading and writing are not explicit in the National Core Curriculum for Early Childhood Education and Care (0- to 6-year-olds) (Finnish National Agency for Education, 2017), but the National Core Curriculum for Pre-Primary Education (6- to 7-year-olds) (Finnish National Agency for Education, 2016a) sets the expectation that children will be encouraged to recognise and produce letters, words and texts; given opportunities to experiment with the production of their own texts by using ICT; and be guided to use an appropriate pencil grip and keyboard skills. In France, by the end of Cycle 1 (nursery education, age 6) children are expected to be able to begin to produce written language; understand how the alphabet works; and start to write independently (e.g. writing their first name by using cursive writing, without copying from a model). By the end of kindergarten in Ontario (age 6), children are expected to be able to use reading behaviours to make sense of familiar and unfamiliar texts in print; and to write simple messages using a combination of pictures and symbols, while in Singapore, 6-year-olds should be able to read with understanding and for enjoyment; to recognise and write their own name; and to form upper- and lowercase letters of the alphabet. Explicit early level reading and writing outcomes in Scotland include that young children will be able to use knowledge of sounds, letters and patterns to read words; will form most lowercase letters legibly; use a pencil with increasing control and confidence; write words from left to right; and make an attempt to use a capital letter and a full stop in at least one sentence.

As with the development of early literacy skills, curriculum content relating to the development of mathematical skills in the early years is less explicit in those jurisdictions with frameworks that begin from birth, but particularly explicit in others, such as France, where the expectation is that 6-year-olds will be able to count aloud to 30 by the end of pre-primary education and read numbers to 10. In Singapore, the Nurturing Early Learners (NEL) curriculum framework (Singapore Ministry of Education, 2012a) includes the learning outcome that 6-year-olds should be able to recognise the numbers 1 to 10 in numerals and in words, and form the numbers 1 to 10 in numerals, while 6-year-olds in Wales are expected to be able to count reliably up to 20 objects; recite numbers up to 100, forwards and backwards and from different starting points; and to read and write numbers to at least 20 forming and orientating them correctly. These compare with the *Te Whāriki* Early Childhood Curriculum requirement (0- to 5/6-year-olds) (New Zealand Ministry of Education, 2017) for children to be able to recognise mathematical symbols and concepts and use them with enjoyment, meaning and purpose.

3.2 Curriculum content: primary level

Table 3 summarises the top-level curriculum content in primary phase education across the jurisdictions.

Table 3: Primary curriculum learning areas

Finland	Compulsory subjects	Transversal competence areas
National Core Curriculum (NCC) for Basic Education, Grades 1-6, ages 7-13	• Mother tongue and literature (Finnish or Swedish) • Second national language (Swedish or Finnish) • Foreign languages (must be taught from Grade 5, age 11+, but individual schools / localities may introduce earlier) • Mathematics • Environmental studies (includes elements of biology, geography, physics, chemistry, and health education) • Religion/ethics • History and social studies (must be taught from Grade 4, age 10+, but individual schools / localities may introduce earlier) • Music • Visual arts • Crafts • Physical education	• Thinking and learning to learn (T1) • Cultural competence, interaction and self-expression (T2) • Taking care of oneself and managing daily life (T3) • Multiliteracy (T4) • ICT competence (T5) • Skills for working life and entrepreneurship (T6) • Participation, involvement and building a sustainable future (T7)
France	Subjects	Domains of the socle commun, 6-16
Cycle 2 curriculum, ages 6-9	• French • Mathematics • Foreign (or regional) language • Physical education • Art education (art and music) • Questioning the world • Moral and civic education	• Languages for thinking and communicating • Methods and tools for learning • Forming one's identity and becoming a citizen • Natural systems and technical systems • Representations of the world and human activity
Cycle 3 curriculum, ages 9-11	• French • Mathematics • Foreign language	

	• Physical education • Art education (art, music, history of art) • Science and technology • History and geography • Moral and civic education	
Cycle 3 curriculum, ages 11-12*	• French • Mathematics • Foreign language • Physical education • Art education (art, music, history of art) • Science and technology (includes physics and chemistry) • History and geography • Moral and civic education • Optional subjects	
Ireland	Curriculum areas / subjects	

Primary Curriculum, ages 4+-12	• Arts education – broken down into:
	  ◦ Music, Drama, Visual arts
	• Language:
	  ◦ Irish, English
	• Mathematics
	• Social environmental and scientific education (SESE) – broken down into:
	  ◦ History, Geography, Science
	• Physical education
	• Social, personal and health education (SPHE)
	• Religious education	

New Zealand	Learning areas
New Zealand Curriculum Years 1-8, ages 5-13	• English • The arts – dance, drama, music (sound arts), and visual arts • Health and physical education – health education, physical education, and home economics • Languages** • Mathematics and statistics • Science • Social sciences • Technology
Ontario	Subjects / disciplines
Ontario Curriculum Grades 1-8, ages 6-14	• The arts (includes the strands of dance, drama, music, and visual arts) • French as a second language • Health and physical education • English language • Mathematics • Science and technology • Social studies (Grades 1-6, ages 6-12) (history and geography in Grades 7-8, ages 12-14) • Native languages (where relevant)
Scotland	Curriculum areas
Curriculum for Excellence, ages 3-15***	• Expressive arts (includes art and design, dance, drama, and music) • Health and well-being (includes food and health, personal and social education, and physical education) • Languages (includes literacy, English, Gaelic and modern/foreign languages) • Mathematics, including numeracy • Religious and moral education • Sciences • Social studies • **T**echnologies

Singapore	Subject disciplines	21st century competencies
Primary Curriculum Years 1-2, ages 6-8	• English language • Mother tongue language (Chinese, Malay, or Tamil) • Social studies • Art • Music • Mathematics • Physical education (PE) (includes dance) **** • Character and citizenship education****	Core values • Respect • Responsibility • Integrity • Care • Resilience • Harmony Social and emotional competencies • Self-awareness • Self-management • Social awareness • Relationship management • Responsible decision-making Emerging 21st century competencies • Civic literacy, global awareness and cross-cultural skills • Critical and inventive thinking • Communication, collaboration and information skills
Primary Curriculum Years 3-4, ages 8-10	• English language • Mother tongue language (Chinese, Malay, or Tamil) • Social studies • Art • Music • Mathematics • Science • Physical education (PE) (includes dance) • Character and citizenship education	
Primary Curriculum Years 5-6, ages 10-12*****	• English language (foundation or standard level) • Mother tongue language (Chinese, Malay, or Tamil) (foundation, standard or higher level) • Social studies • Art • Music • Mathematics (foundation or standard level) • Science (foundation or standard level) • Physical education (PE) (includes dance) • Character and citizenship education	

Wales	Subjects
Key Stage 2 curriculum, ages 7-11	• English • Welsh first language • Mathematics • Science • Design and technology • Information and communication technology (ICT) • History • Geography • Art and design • Music • Physical education (PE) • Welsh second language (compulsory if the pupil is not studying Welsh first language) • Religious education • Personal and social education (PSE)
Key Stage 3 curriculum, ages 11-14	• English • Welsh first language • Mathematics • Science • Design and technology • Information and communication technology (ICT) • History • Geography • Art and design • Music • Physical education (PE) • Welsh second language (compulsory if the pupil is not studying Welsh first language) • Modern foreign language • Religious education

	• Personal and social education (PSE) (including a programme of sex and relationships education) • An introduction to careers and the world of work
New Curriculum for Wales	Areas of learning and experience (AoLE)
Ages 3-16	• Expressive arts (will include the disciplines of music, dance, drama, art, film, and digital media) • Health and well-being • Humanities (to include history, geography, RE, business, and social studies) • Languages, literacy and communication (including Welsh, English, other languages, and digital media) • Mathematics and numeracy • Science and technology (will include elements of biology, chemistry, physics, engineering, design technology [including food technology, textiles and product design], computer science and IT)

***France:** Pupils in Cycle 4, ages 12-15, usually study French, foreign or regional language, fine art, music, history of art, moral and civic education, PE, history and geography, physics and chemistry, biology, technology, and mathematics.

****New Zealand**: Pupils in New Zealand aged 5 to 11 (Years 1-6) receive teaching in at least seven of the eight learning areas; learning languages is the exception. Schools with pupils in Years 7 to 10 (ages 11/12-14/15) are expected to be working towards offering students opportunities for learning a second or subsequent language.

*****Scotland**: There are two stages in the Curriculum for Excellence (CfE) – broad general education from the early years (aged 3 onwards) to the end of Secondary 3 (S3), age 15; and the senior phase (Secondary 4, S4 to Secondary 6, S6, ages 15-18).

******Singapore**: PE and character and citizenship education are part of the life skills strand of the curriculum.

*******Singapore**: Pupils in lower secondary education, aged 12+ follow one of three tracks - express, normal (academic) or normal (technical). In the normal (academic) track, in the lower secondary years (ages 12-14), they usually study English language, mother tongue language, mathematics, science, art, music, geography, history, English literature, food and consumer education, PE, and character and citizenship education.

Competences in the curriculum

As in the national core curricula for early childhood education and care and pre-primary education in Finland, the National Core Curriculum for Basic Education for 7- to 16-year-olds (Finnish National Agency for Education, 2016b) includes a set of transversal competences. Like the *socle commun* (the common foundation of knowledge, skills and culture) in France, these competences sit alongside the compulsory subjects and form an integral part of the curriculum framework document.

The National Core Curriculum for Basic Education sets out each compulsory subject in terms of objectives of instruction (learning objectives) and key content related to the objectives. It links each objective of instruction to the key content, and the objectives of instruction and key content to the transversal competences. To aid this linking, each objective of instruction is numbered (O1, O2 etc.), as is each key content area (C1, C2…), and each transversal competence (T1, T2 etc. as in Table 3). The short example in Figure 3 explains.

Figure 3: Linking the transversal competences in the National Core Curriculum for Basic Education (Finland)

Finnish language and literature in Grades 1 and 2, ages 7-9, includes:

Key content area (C1): 'acting in interactive situations', which has four objectives of instruction
Objective of instruction O4 is: 'to guide the pupil to build a self-image as a communicator and to understand that people communicate in various ways'
Objective of instruction O4 links to the transversal competences thinking and learning to learn (T1); cultural competence, interaction and self-expression (T2), and participation, involvement and building a sustainable future (T7)
This is expressed in the National Core Curriculum document in the following way:

Objectives of instruction	Content areas related to the objectives	Transversal competences
Acting in interactive situations		
O1: to guide the pupil to improve his or her skills in acting in different interactive situations	C1	T1, T2, T3
O2: to guide the pupil to develop his or her language and imagination as well as interaction and team work skills by offering opportunities to participate in different group communication situations and become familiar with the related practices	C1	T1, T2, T7
O3: to support the pupil in expressing himself or herself more confidently and to guide the pupil to all-round self-expression, also by the means of drama	C1	T1, T2, T7
O4: to guide the pupil to build a self-image as a communicator and to understand that people communicate in various ways	C1	T1, T2, T7

In a similar way in France, the five domains of the *socle commun*, which outlines the fundamental knowledge and skills that pupils will acquire during compulsory education (ages 6-16), are numbered and linked to the individual subject requirements. Figure 4, which is a translated extract from the curriculum document (Ministère de l'Éducation Nationale, 2015), placed in table format by the author of this report, summarises how this works for music in Cycle 2, ages 6-9.

Figure 4: Linking the *socle commun* to the subjects of the curriculum in France

Art education: music, Cycle 2

Skills and knowledge to be developed and links to the domains of the *socle commun*	End-of-cycle learning objectives
Singing • Singing a simple melody with the correct intonation; singing a rhyme or song through imitation • Interpreting a song with expression Domains: 1.4, 5	• Experimenting with the voice through speaking and singing • Understanding and reproducing the conditions for attentive listening • Imagining simple organising principles for sounds; creating sounds and ordering them • Expressing sensitivity and exercising critical analysis skills while respecting the views of others
Listening and comparing • Describing and comparing sound elements • Comparing music and identifying resemblances and differences Domains: 1.1, 1.4, 3, 5	
Exploring and imagining • Representing music through drawing or the body • Organising elements of sound Domains: 1.4, 5	
Exchanging and sharing • Expressing one's emotions, feelings and preferences • Listening and respecting others' opinions and their sensitivity Domains: 1.1, 3, 5	
Socle commun domains Domain 1: Languages for thinking and communicating (further broken down into 1.1 understanding and expressing oneself in oral and written French; 1.2 understanding and expressing oneself in a foreign (or regional) language; 1.3 understanding and expressing oneself in mathematical, scientific and technological language; 1.4 understanding and expressing oneself in the language of art and the body) Domain 2: Methods and tools for learning Domain 3: Forming one's identity and becoming a citizen Domain 4: Natural systems and technical systems Domain 5: Representations of the world and human activity	

Note: In September 2018, the expectations for French, mathematics, and moral and civic education in the Cycle 2, 3 and 4 curriculum in France were simplified and clarified slightly. The changes introduced made the terminology clearer and subject content more explicit. The revised curriculum was not available at the time of the data collection for the desktop audit tables but is now available online.

The individual subject syllabuses in Singapore similarly incorporate the 21st Century Competencies and Student Outcomes (Singapore Ministry of Education, 2015), which include core values (e.g. respect, resilience); social and emotional competencies (e.g. self-management); and emerging 21st century competencies (e.g. critical and inventive thinking). Figure 5 is extracted from the syllabus for physical education (PE) (Singapore Ministry of Education, 2016) to provide an example of how the competencies are incorporated as learning outcomes for the end of Primary 3 (P3, age 9) and P6 (age 12) PE.

Figure 5: The 21st century competencies in PE in Singapore

Core value: respect

What it means	A person demonstrates respect when he/she believes in his/her own self-worth and the intrinsic worth of all people
Exemplars of what respect looks like during PE	In PE, the student consistently behaves in a respectful manner. He/she puts in maximum effort in all tasks. He/she shows respect towards him/herself, his/her teachers and classmates. He/she values contributions made by others. He/she abides by the rules of the game.

Levels	**Learning outcomes**				
	Social and emotional competencies			Emerging 21st century competencies	
	Self-awareness & self-management	Social awareness & relationship management	Responsible decision-making	Critical and inventive thinking	Communication, collaboration and information skills
By end of P3	The student recognises that everyone is unique in his/her own way. He/she is also able to identify his/her ability.	The student is aware of his/her classmates' social cues during group activities, and responds appropriately.	The student is aware of the decisions he/she makes and the reasons for them.		The student works with others in his/her group.
By end of P6	The student recognises that everyone is unique in his/her own way. He/she is also able to identify his/her ability.	The student shares ideas and equipment with group members, and puts others first.	The student recognises and reflects on the impact and consequences of his/her decisions on self and others.	The student accepts different perspectives, solutions and/or methods, in an uncertain situation.	The student works with others in his/her group to meet the group's goals.

Revisions of curriculum content

In France, the subject content summarised in Figure 4 above is extracted from the 2015 curriculum document which covers all subjects for Cycles 2, 3 and 4 (ages 6-15); in Finland also, the information in Figure 3 comes from the overarching document which covers all subjects for pupils aged 7 to 16. In these jurisdictions, all subjects for a particular phase or cycle are often reviewed at the same time, although in France in September 2018, there were some minor changes to the specifications for Cycles 2, 3 and 4 French, mathematics, and moral and civic education, simplifying and clarifying these slightly and making terminology clearer and subject content more explicit.

In Ontario and Singapore, there is no overarching curriculum document covering all of the compulsory subjects in primary phase education, instead there are separate subject specifications or syllabuses for the individual curriculum subjects, which are each reviewed at different times. In Singapore also, these syllabus documents may cover more than one phase. As a result, in Ontario, the mathematics curriculum for the elementary grades (Grades 1-8, ages 6-14) currently dates from 2005 (Ontario Ministry of Education, 2005); the curriculum for the arts from 2009 (Ontario Ministry of Education, 2009); and the social studies curriculum from 2018 (Ontario Ministry of Education, 2018), when it was revised with the specific objective of strengthening pupils' knowledge and understanding of indigenous history and culture.[4] In Singapore, the curriculum for art, which covers primary and lower secondary education, dates from 2008 (Singapore Ministry of Education, 2008), while the syllabuses for mathematics and social studies both cover the primary phase and date from 2012 and 2011 respectively (Singapore Ministry of Education 2012b; 2011).

In Wales, although the majority of the programmes of study for the current curriculum date from its introduction in 2008, those for English, Welsh and mathematics were revised in 2015 to reflect the introduction of the National Literacy and Numeracy Framework (LNF) (Welsh Government, 2014). The situation is similar in New Zealand, where the majority of the curriculum subject documents date from 2007 when the curriculum framework was published.[5] The technology curriculum, however, was revised in 2017, with the aim of strengthening the position of digital technologies and so better preparing pupils for the future. The revisions placed a greater focus on students building their skills as *creators* of digital solutions, moving beyond being solely users and consumers of digital technologies.

As in Wales, where the final version of the new Curriculum for Wales will be published in 2020 to allow schools the time to adapt to its requirements and begin to formally implement it from September 2022; and in Scotland, where schools have until August 2021 to introduce new requirements to ensure that all children can study a first foreign language (or Gaelic) from the start of primary education (age 5), and a second language (or Gaelic) from age 9; schools in New Zealand have some time to fully integrate the revised technology learning area into their curriculum, being required to do this by the start of the 2020 school year (February 2020).

[4] The mandatory study of indigenous history and culture was introduced to the social studies curriculum in 2018 as a response to the work of the Truth and Reconciliation Commission of Canada.
[5] The subject documents were published online in 2014.

3.3 Curriculum content: language and mathematics in the primary curriculum

A brief analysis of the strands included in the primary language learning and primary mathematics curricula (Tables 4 and 5 below) highlights the similarity in content, at this macro level, across the eight jurisdictions.

Unsurprisingly, the language curriculum centres on the three strands of oracy, reading and writing, albeit with the addition of grammar and vocabulary as a specific strand in France and Singapore; and with literature and culture featuring in Finland and in the later primary years in France (from age 9, the start of Cycle 3). In New Zealand, although the three areas of oracy, reading and writing are core to the curriculum for English, they are presented as two strands: one on making meaning from information received - that of 'listening, reading and viewing'; the other on creating meaning - 'speaking, writing and presenting'.

As highlighted in Table 4, media literacy also features as a strand of the English language curriculum in Ontario. In France, teachers in all subjects in Cycles 2, 3 and 4 (pupils ages 6-15) are required to integrate 'information and media' in their teaching, while in Finland, media literacy features in the transversal competences and, in Scotland, in the curriculum area of health and well-being. In Wales, the detailed learning objectives of the current English and Welsh language programmes of study include media literacy, while digital media will feature in the languages, literacy and communication area of learning and experience (AoLE) in the new Curriculum for Wales.

In mathematics, at the top level, number; measuring; geometry; algebra; and data handling / statistics are common strands of the primary level curriculum across the jurisdictions and, in the majority, these strands are the same throughout the primary years. In Finland, however, algebra is not introduced until Grade 3, age 9, and data manipulation (the 'organisation and management of results and functions' and 'algorithms and programming') does not form a strand of the mathematics curriculum in France until pupils are aged 12 (the beginning of Cycle 4). At the more micro-level, money is a particular feature of the mathematics curriculum frameworks in Ireland, Ontario, Scotland, Singapore and Wales; time, 2-D and 3-D shapes, fractions, and the learning of the essential numerical operations feature in all.

The tables from the desktop audit provide the detail for more specific analysis across these and the complete range of curriculum subjects.

Table 4: content areas, primary language learning

Finland Mother tongue language, 7-13	Acting in interactive situations	Interpreting texts	Producing texts	Understanding language, literature and culture
France French, 6-9 French, 9-12 French, 12-15	Oral language Oral language Oral language	Reading and understanding written texts Reading and written comprehension Reading comprehension and visual comprehension	Writing Writing Writing	Study of language (grammar, spelling and vocabulary) Study of language (grammar, spelling and vocabulary) Literary and artistic culture Grammar, spelling and vocabulary Literary and artistic culture
Ireland Language 4+-12	Oral language	Reading	Writing	
New Zealand English, 5-13	Listening, reading and viewing (making meaning from information received)		Speaking, writing and presenting (creating meaning)	
Ontario (English) language, 6-14	Oral communication	Reading	Writing	Media literacy
Scotland Literacy and English, 3-12+	Listening and talking	Reading	Writing	
Singapore English language, 6-12 English language, 12-14	Listening and viewing Speaking and representing Listening and viewing Speaking and representing	Reading and viewing Reading and viewing	Writing and representing Writing and representing	Grammar Vocabulary Grammar Vocabulary
Wales English, 7-14	Oracy	Reading	Writing	

Table 5: content areas, mathematics

Finland Mathematics, 7-9 Mathematics, 9-12	Thinking skills Thinking skills	Numbers and operations Numbers and operations	Algebra	Geometry and measuring Geometry and measuring	Data processing and statistics Data processing and software, statistics and probability
France Mathematics, 6-9 Mathematics, 9-12 Mathematics 12-15		Number and calculation Number and calculation Number and calculation		Size and measurement Space and geometry Size and measurement Geometry Size and measurement Space and geometry	 Organisation and management of results and functions Algorithms and programming
Ireland Mathematics, 4+-6 Mathematics, 6-12	Early mathematical activities	Number Number	Algebra Algebra	Shape and space Measures Shape and space Measures	Data Data
New Zealand Mathematics and statistics, 5-13		Number and algebra		Geometry and measurement	Statistics
Ontario Mathematics, 6-14		Number sense and numeration	Patterning and algebra	Measurement Geometry and spatial sense	Data management and probability

Scotland Numeracy and mathematics, 3-12+		Number, money and measure		Shape, position and movement	Information handling
Singapore Mathematics, 6-12 Mathematics, 12-14		Number and algebra Number and algebra		Measurement and geometry Measurement and geometry	Statistics Statistics and probability
Wales Mathematics, 7-14	Numerical reasoning	Using number skills	Using algebra skills	Using measuring skills Using geometry skills	Using data skills

Concluding remarks

Curriculum content in the early years has a clear focus on the breadth of the learning experience for young children. In addition to the development of their communication and early literacy and mathematical skills, it emphasises the development of their personal, social, emotional and locomotor skills alongside their understanding of their place in the world.

Where the development of transversal competences sits alongside the areas of learning and subject disciplines in early years and primary education, and forms an integral part of the curriculum framework documents, this is intended to facilitate their incorporation in the daily classroom experience.

Overarching curriculum frameworks tying together the whole of a phase - with component 'subject contributors' lying beneath - is the most common model of organisation, although in Ontario and Singapore, individual subject specifications or syllabuses form the primary curriculum. These are reviewed at different times and can consequently date from a wide range of years. Across the jurisdictions, when curriculum revisions are introduced, implementation is often gradual to allow time for schools to adapt.

4. Presentation of curriculum content

In addition to outlining subject content and learning objectives, the curriculum documents across the eight jurisdictions generally include additional matter. For Finland, France, Ireland, New Zealand, Ontario, Scotland and Singapore, this includes sections providing the context for the subject, i.e. outlining the aims for and importance of the subject and its place and role in the wider curriculum. In all eight jurisdictions, the curriculum framework documents also include guidance on planning pupil teaching and learning experiences, and on assessment and, in France, Ireland, Ontario and Scotland, they incorporate sections on the links between a particular subject area and others in the curriculum.[6]

With the exception of Finland, the curriculum documents for the jurisdictions are readily accessible online. The screenshot figures in the remainder of this section of the report give an impression of how they are presented for mathematics in France (Figures 6 and 7)[7]; Ireland (Figures 8 and 9); New Zealand (Figures 10 and 11), Ontario (Figures 12 and 13), Scotland (Figure 14), Singapore (Figure 15) and Wales (Figures 16 and 17). They provide a visual snapshot of how the curriculum documents are organised and presented across the jurisdictions, and highlight the variety in this organisation and in the terminology used to describe the subject content, subject strands and sub-strands, and learning outcomes.

The figures emphasise, for France, how the presentation of the skills and knowledge to be developed links to the domains of the *socle commun*, and how each curriculum sub-topic (strand), such as number and calculation, is expressed as a series of end-of-cycle achievement statements. For Ireland, they summarise how the subject strands and strand units are expressed as content objectives in the form of 'should be enabled to' statements. Figures 10 and 11 for New Zealand show how the New Zealand Curriculum Online presents the aims for the subject of mathematics and statistics, i.e. 'What is mathematics and statistics?' and 'Why study mathematics and statistics'; explains the structure of the learning area, i.e. the strands that make it up; and then outlines the achievement objectives by level (and strand). For Ontario, Figures 12 and 13 show how the overall and specific expectations for mathematics are set out by strand, and complemented by an 'achievement chart', which identifies four levels of achievement across four categories of knowledge and skills (knowledge and understanding; thinking; communication; and application) to be developed across the expectations. Figure 14 for Scotland highlights how the Curriculum Benchmarks (Education Scotland, 2018c) present the experiences and outcomes (for planning learning, teaching and assessment) and the benchmarks (to support practitioners' professional judgement of achievement of a level) by curriculum level, curriculum area, and curriculum organisers (strands and sub-strands).

[6] Note: in Singapore, the organisation of the syllabus documents varies considerably between subjects.

[7] These figures are extracted from the refreshed, September 2018 Cycle 2 curriculum framework document. In September 2018, the expectations for French, mathematics, and moral and civic education in the Cycle 2, 3 and 4 curriculum were simplified and clarified slightly. The changes introduced made the terminology clearer and subject content more explicit. With the exception of these figures, the content of this desktop audit, collected before these revisions were published, is based on the original, 2015 curriculum document.

While the Figure 15 extract from the Singapore mathematics syllabus (Singapore Ministry of Education, 2012b) summarises how mathematics subject content is organised by strand and sub-strand, with learning outcomes expressed as 'learning experiences' in the form of 'should have opportunities to' statements, it is important to note that the syllabuses in Singapore vary considerably by subject. The syllabus for PE (Singapore Ministry of Education, 2016), by contrast, presents subject strands as learning areas, and identifies goals and learning outcomes for each learning area, while the primary social studies syllabus (Singapore Ministry of Education, 2011) organises the subject by three broad clusters, each of which is associated with two years of primary education. Each cluster is expressed as one theme for each year of the cluster, and each theme is described by a level descriptor set out as an inquiry focus; key understandings; knowledge outcomes; skills outcomes; values outcomes; and key concepts.

The final figures, for Wales, show the subject strands and elements (sub-strands) of the programme for study for the current Key Stage 2 mathematics curriculum (ages 7-11), with outcomes expressed as 'learners are able to' statements for the end of each year. These are supported by a range of level descriptions (Figure 17), which describe the types and range of performance that pupils working at a particular level characteristically demonstrate. By the end of Key Stage 2 (age 11), the performance of the great majority of learners is expected to be within the range of Levels 3 to 6, and by the end of Key Stage 3 (age 14) within the range 4 to 7.

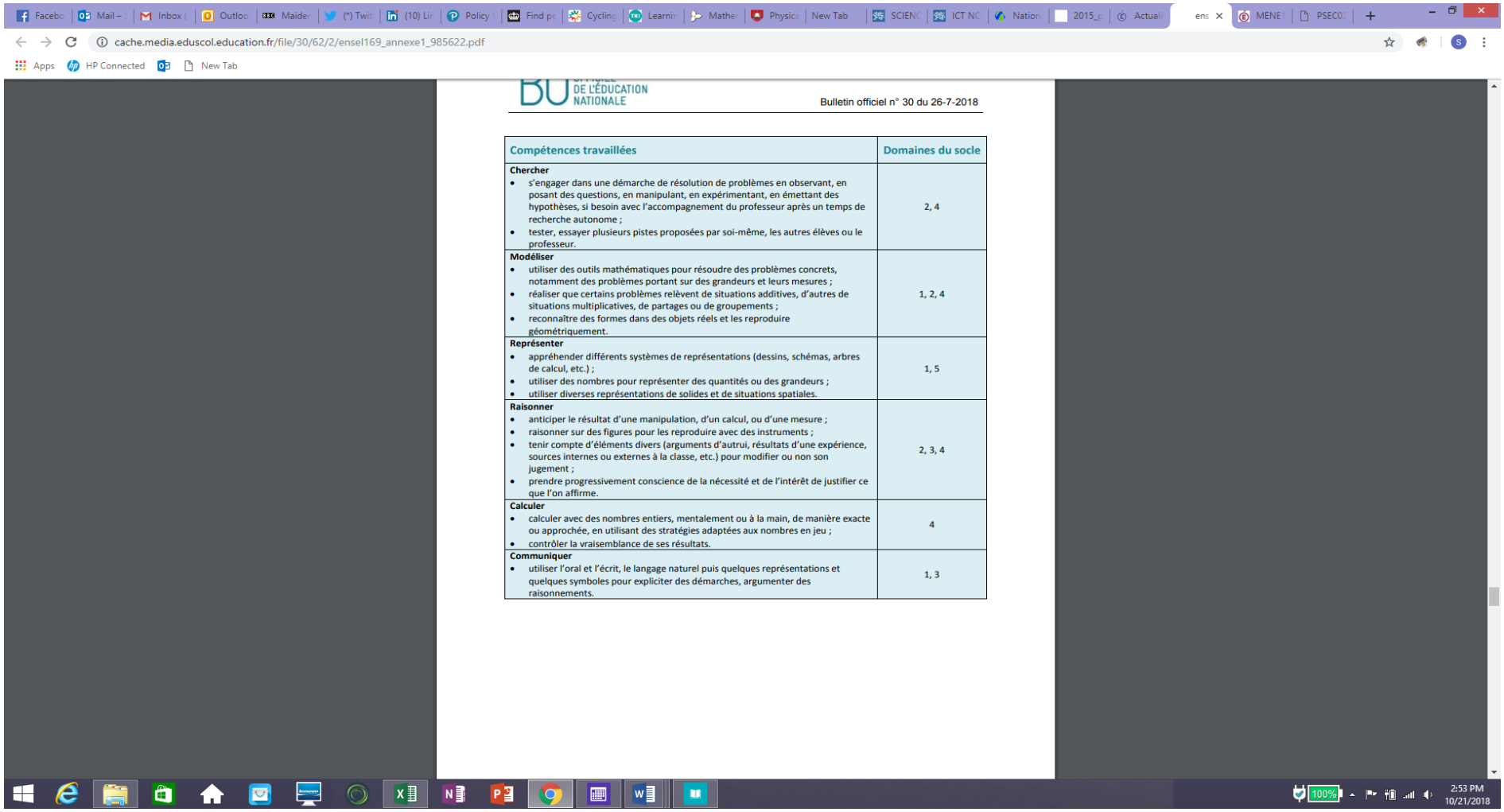
Concluding remarks

The organisation, presentation and accessibility of primary level curriculum content varies across the jurisdictions but, in all, with the exception of Singapore, the model of presentation is generally consistent across subjects.

In their 'additional matter', curriculum documents in some of the jurisdictions explicitly reference links across subjects and year groups / phases of education to aid curriculum continuity and coherence. All include guidance on planning teaching and learning experiences and assessment.

Figure 6: France - extract from the revised 2018 curriculum document

The presentation of the skills and knowledge to be developed in Cycle 2 mathematics (ages 6-9) and the links to the *socle commun*

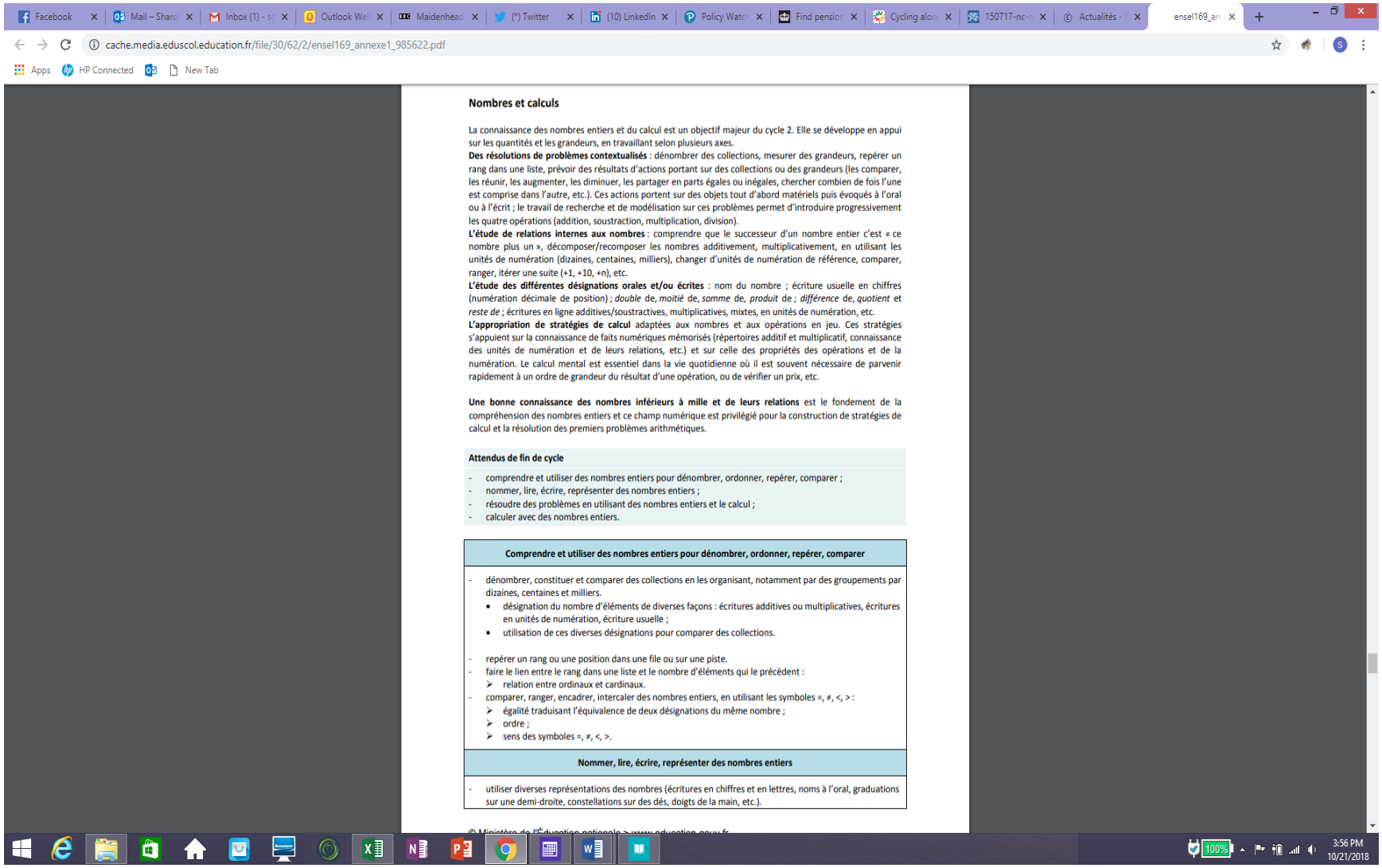


BULLETIN OFFICIEL DE L'ÉDUCATION NATIONALE

Bulletin officiel n° 30 du 26-7-2018

Compétences travaillées	Domaines du socle
Chercher • s'engager dans une démarche de résolution de problèmes en observant, en posant des questions, en manipulant, en expérimentant, en émettant des hypothèses, si besoin avec l'accompagnement du professeur après un temps de recherche autonome ; • tester, essayer plusieurs pistes proposées par soi-même, les autres élèves ou le professeur.	2, 4
Modéliser • utiliser des outils mathématiques pour résoudre des problèmes concrets, notamment des problèmes portant sur des grandeurs et leurs mesures ; • réaliser que certains problèmes relèvent de situations additives, d'autres de situations multiplicatives, de partages ou de groupements ; • reconnaître des formes dans des objets réels et les reproduire géométriquement.	1, 2, 4
Représenter • appréhender différents systèmes de représentations (dessins, schémas, arbres de calcul, etc.) ; • utiliser des nombres pour représenter des quantités ou des grandeurs ; • utiliser diverses représentations de solides et de situations spatiales.	1, 5
Raisonner • anticiper le résultat d'une manipulation, d'un calcul, ou d'une mesure ; • raisonner sur des figures pour les reproduire avec des instruments ; • tenir compte d'éléments divers (arguments d'autrui, résultats d'une expérience, sources internes ou externes à la classe, etc.) pour modifier ou non son jugement ; • prendre progressivement conscience de la nécessité et de l'intérêt de justifier ce que l'on affirme.	2, 3, 4
Calculer • calculer avec des nombres entiers, mentalement ou à la main, de manière exacte ou approchée, en utilisant des stratégies adaptées aux nombres en jeu ; • contrôler la vraisemblance de ses résultats.	4
Communiquer • utiliser l'oral et l'écrit, le langage naturel puis quelques représentations et quelques symboles pour expliciter des démarches, argumenter des raisonnements.	1, 3

Figure 7: France - end-of-cycle learning objectives for number and calculation (in the pale shaded box)



Nombres et calculs

La connaissance des nombres entiers et du calcul est un objectif majeur du cycle 2. Elle se développe en appui sur les quantités et les grandeurs, en travaillant selon plusieurs axes.

Des résolutions de problèmes contextualisés : dénombrer des collections, mesurer des grandeurs, repérer un rang dans une liste, prévoir des résultats d'actions portant sur des collections ou des grandeurs (les comparer, les réunir, les augmenter, les diminuer, les partager en parts égales ou inégales, chercher combien de fois l'une est comprise dans l'autre, etc.). Ces actions portent sur des objets tout d'abord matériels puis évoqués à l'oral ou à l'écrit ; le travail de recherche et de modélisation sur ces problèmes permet d'introduire progressivement les quatre opérations (addition, soustraction, multiplication, division).

L'étude de relations internes aux nombres : comprendre que le successeur d'un nombre entier c'est « ce nombre plus un », décomposer/recomposer les nombres additivement, multiplicativement, en utilisant les unités de numération (dizaines, centaines, milliers), changer d'unités de numération de référence, comparer, ranger, itérer une suite (+1, +10, +n), etc.

L'étude des différentes désignations orales et/ou écrites : nom du nombre ; écriture usuelle en chiffres (numération décimale de position) ; *double* de, *moitié* de, *somme* de, *produit* de ; *différence* de, *quotient* et *reste de* ; écritures en ligne additives/soustractives, multiplicatives, mixtes, en unités de numération, etc.

L'appropriation de stratégies de calcul adaptées aux nombres et aux opérations en jeu. Ces stratégies s'appuient sur la connaissance de faits numériques mémorisés (répertoires additif et multiplicatif, connaissance des unités de numération et de leurs relations, etc.) et sur celle des propriétés des opérations et de la numération. Le calcul mental est essentiel dans la vie quotidienne où il est souvent nécessaire de parvenir rapidement à un ordre de grandeur du résultat d'une opération, ou de vérifier un prix, etc.

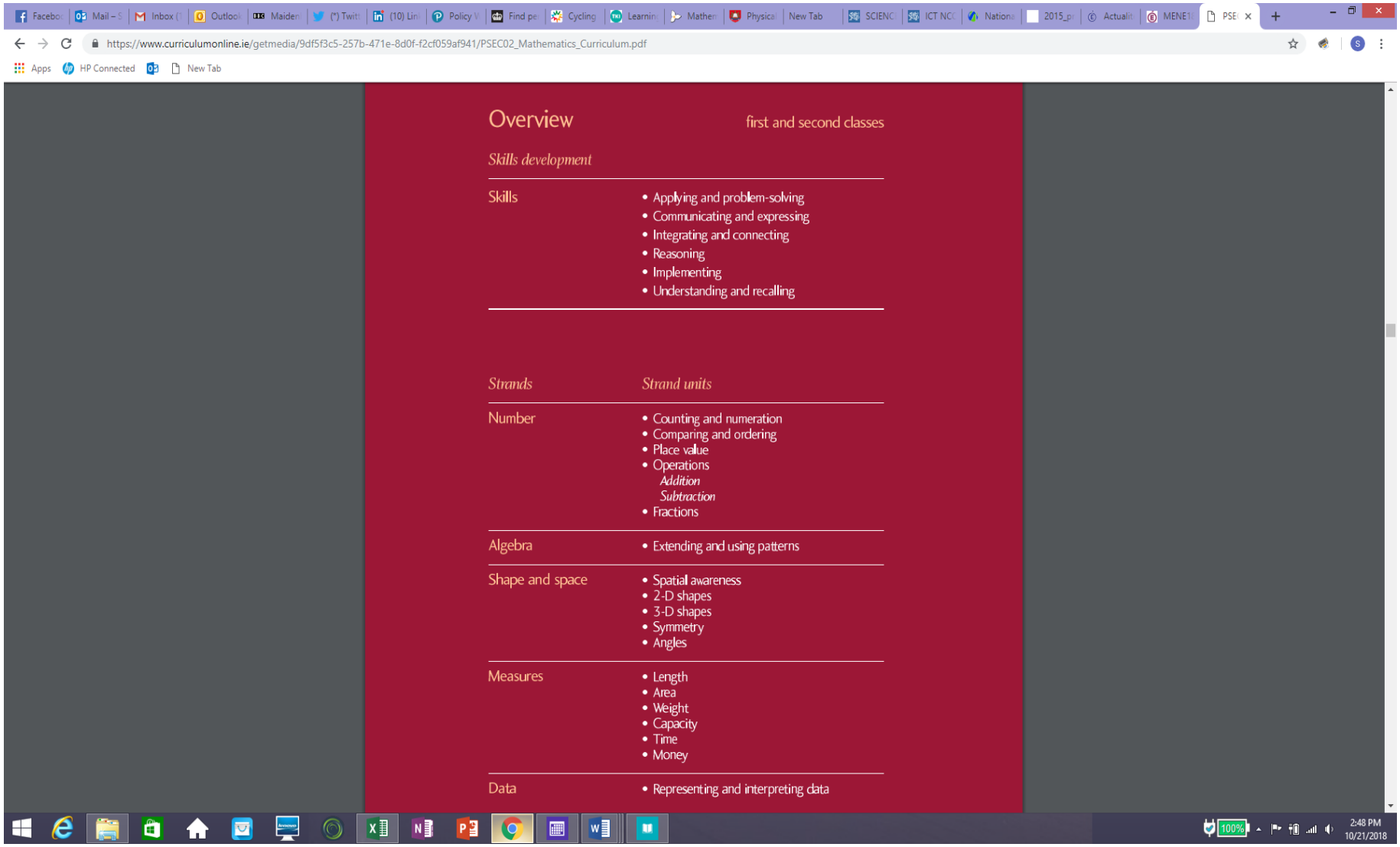
Une bonne connaissance des nombres inférieurs à mille et de leurs relations est le fondement de la compréhension des nombres entiers et ce champ numérique est privilégié pour la construction de stratégies de calcul et la résolution des premiers problèmes arithmétiques.

Attendus de fin de cycle

- comprendre et utiliser des nombres entiers pour dénombrer, ordonner, repérer, comparer ;
- nommer, lire, écrire, représenter des nombres entiers ;
- résoudre des problèmes en utilisant des nombres entiers et le calcul ;
- calculer avec des nombres entiers.

Comprendre et utiliser des nombres entiers pour dénombrer, ordonner, repérer, comparer
- dénombrer, constituer et comparer des collections en les organisant, notamment par des groupements par dizaines, centaines et milliers. • désignation du nombre d'éléments de diverses façons : écritures additives ou multiplicatives, écritures en unités de numération, écriture usuelle ; • utilisation de ces diverses désignations pour comparer des collections. - repérer un rang ou une position dans une file ou sur une piste. - faire le lien entre le rang dans une liste et le nombre d'éléments qui le précèdent : ➢ relation entre ordinaux et cardinaux. - comparer, ranger, encadrer, intercaler des nombres entiers, en utilisant les symboles =, ≠, <, > : ➢ égalité traduisant l'équivalence de deux désignations du même nombre ; ➢ ordre ; ➢ sens des symboles =, ≠, <, >.
Nommer, lire, écrire, représenter des nombres entiers
- utiliser diverses représentations des nombres (écritures en chiffres et en lettres, noms à l'oral, graduations sur une demi-droite, constellations sur des dés, doigts de la main, etc.).

Figure 8: Ireland - skills, strands and strand units for mathematics, ages 6-8



https://www.curriculumonline.ie/getmedia/9df5f3c5-257b-471e-8d0f-f2cf059af941/PSEC02_Mathematics_Curriculum.pdf

Overview

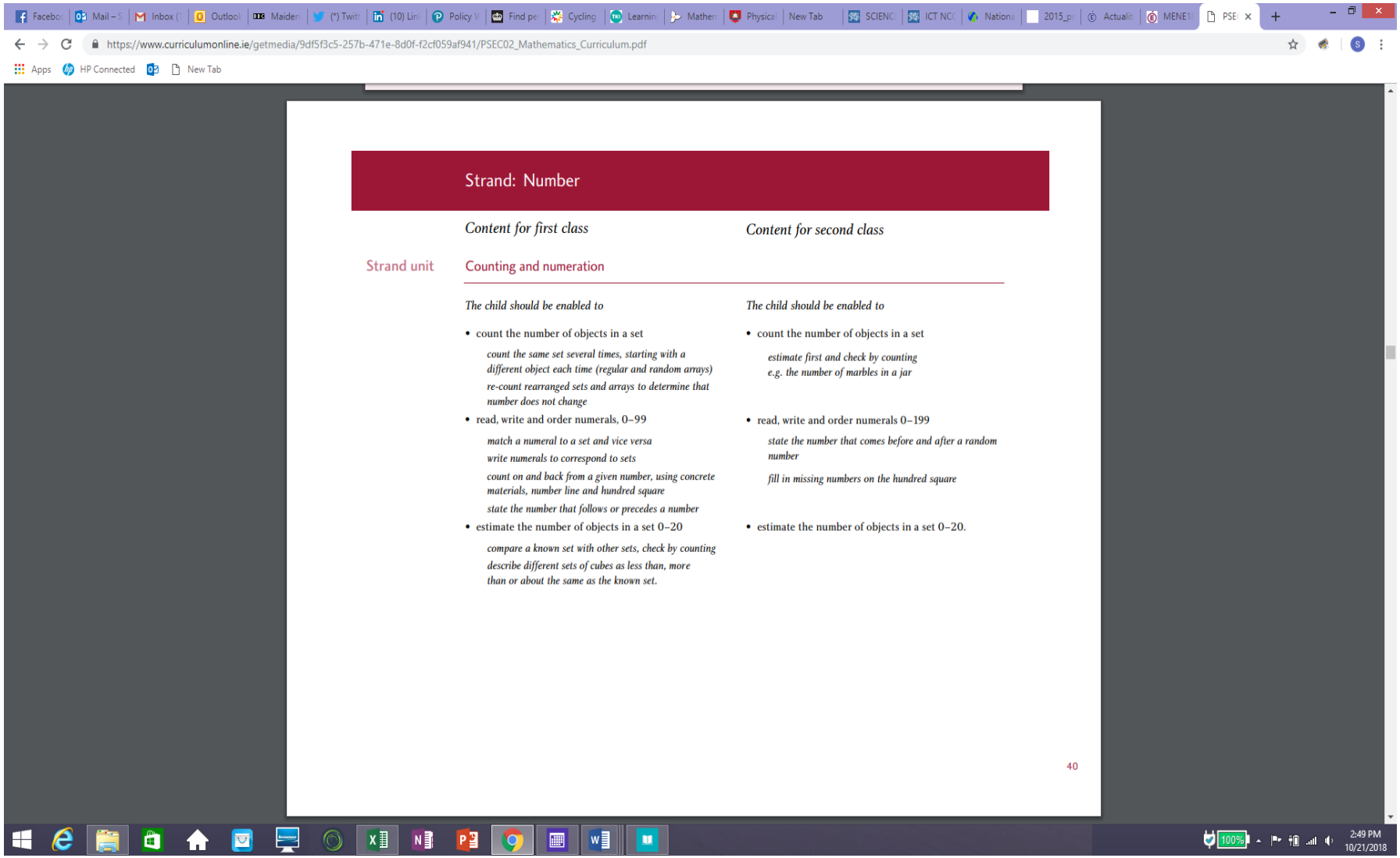
first and second classes

Skills development

Skills	• Applying and problem-solving • Communicating and expressing • Integrating and connecting • Reasoning • Implementing • Understanding and recalling

Strands	*Strand units*
Number	• Counting and numeration • Comparing and ordering • Place value • Operations *Addition* *Subtraction* • Fractions
Algebra	• Extending and using patterns
Shape and space	• Spatial awareness • 2-D shapes • 3-D shapes • Symmetry • Angles
Measures	• Length • Area • Weight • Capacity • Time • Money
Data	• Representing and interpreting data

Figure 9: Ireland - content objectives: mathematics counting and numeration strand unit, ages 6-8



Strand: Number

	Content for first class	Content for second class
Strand unit	Counting and numeration	
	The child should be enabled to	*The child should be enabled to*
	• count the number of objects in a set	• count the number of objects in a set
	count the same set several times, starting with a different object each time (regular and random arrays)	*estimate first and check by counting e.g. the number of marbles in a jar*
	re-count rearranged sets and arrays to determine that number does not change	
	• read, write and order numerals, 0–99	• read, write and order numerals 0–199
	match a numeral to a set and vice versa	*state the number that comes before and after a random number*
	write numerals to correspond to sets	*fill in missing numbers on the hundred square*
	count on and back from a given number, using concrete materials, number line and hundred square	
	state the number that follows or precedes a number	
	• estimate the number of objects in a set 0–20	• estimate the number of objects in a set 0–20.
	compare a known set with other sets, check by counting	
	describe different sets of cubes as less than, more than or about the same as the known set.	

40

Figure 10: New Zealand - learning area structure (strands) for mathematics and statistics

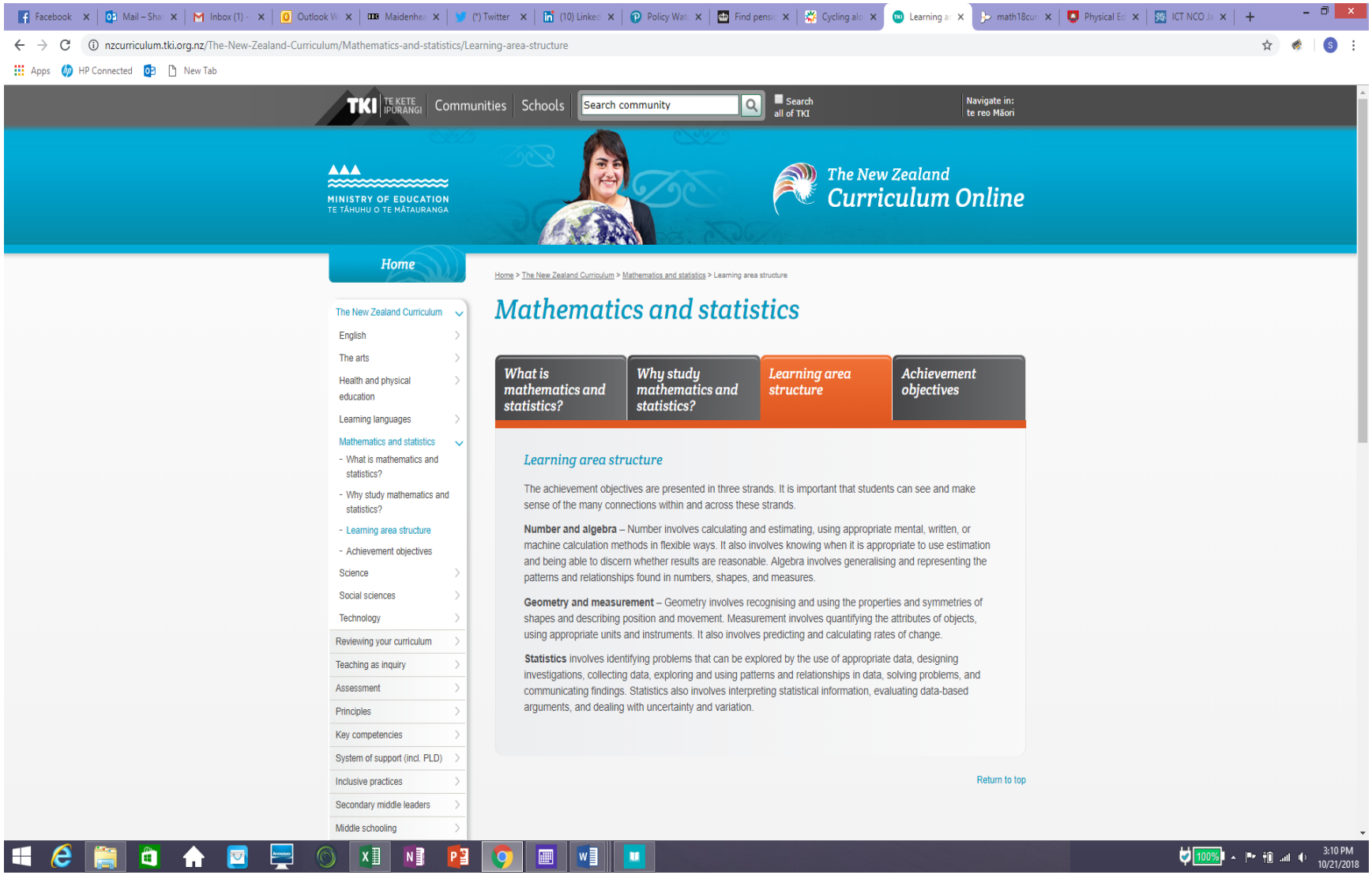


Figure 11: New Zealand - achievement objectives for mathematics and statistics

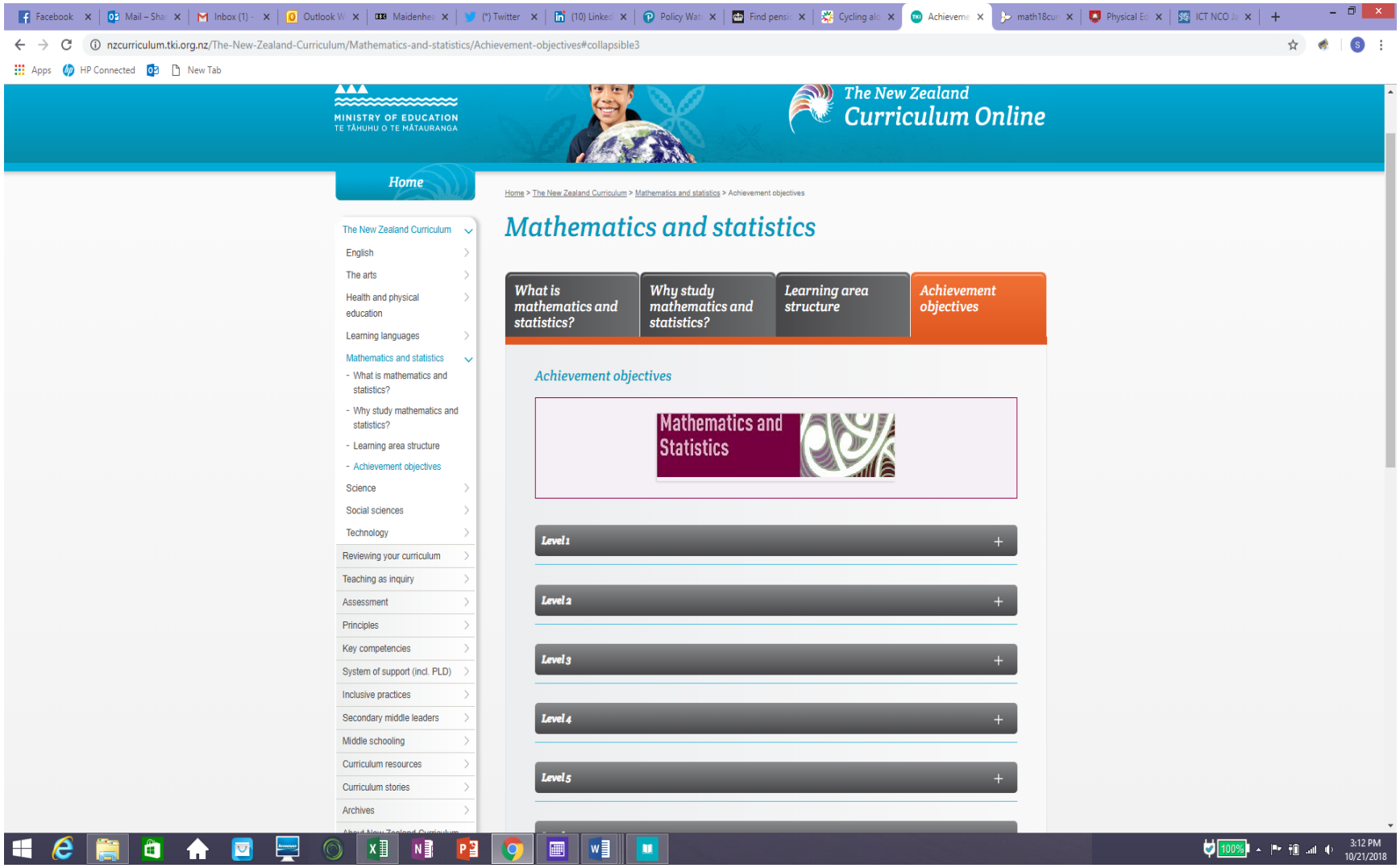
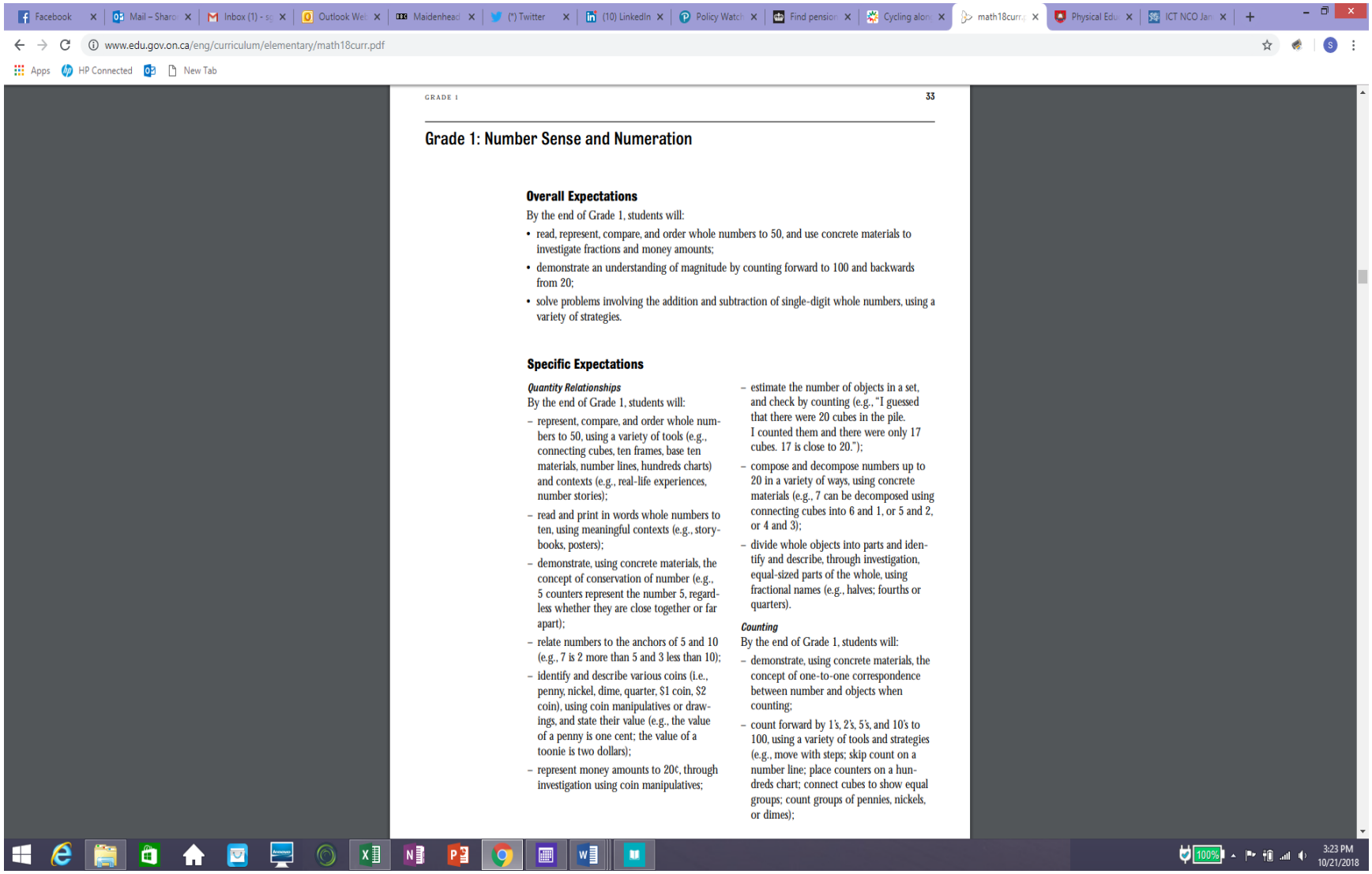


Figure 12: Ontario - expectations for Grade 1 number sense and numeration strand



GRADE 1 33

Grade 1: Number Sense and Numeration

Overall Expectations

By the end of Grade 1, students will:

- read, represent, compare, and order whole numbers to 50, and use concrete materials to investigate fractions and money amounts;
- demonstrate an understanding of magnitude by counting forward to 100 and backwards from 20;
- solve problems involving the addition and subtraction of single-digit whole numbers, using a variety of strategies.

Specific Expectations

Quantity Relationships

By the end of Grade 1, students will:

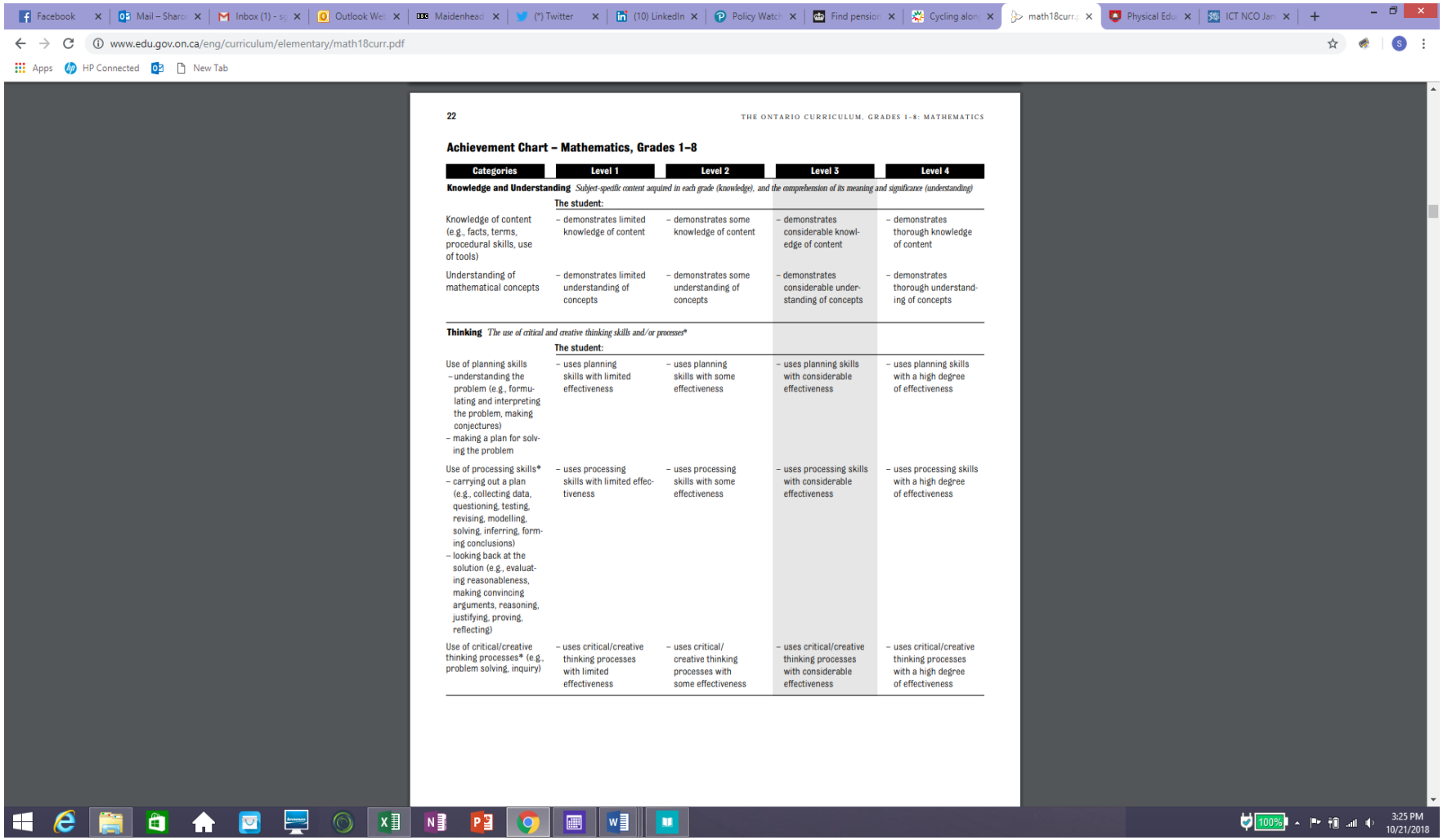
- represent, compare, and order whole numbers to 50, using a variety of tools (e.g., connecting cubes, ten frames, base ten materials, number lines, hundreds charts) and contexts (e.g., real-life experiences, number stories);
- read and print in words whole numbers to ten, using meaningful contexts (e.g., storybooks, posters);
- demonstrate, using concrete materials, the concept of conservation of number (e.g., 5 counters represent the number 5, regardless whether they are close together or far apart);
- relate numbers to the anchors of 5 and 10 (e.g., 7 is 2 more than 5 and 3 less than 10);
- identify and describe various coins (i.e., penny, nickel, dime, quarter, $1 coin, $2 coin), using coin manipulatives or drawings, and state their value (e.g., the value of a penny is one cent; the value of a toonie is two dollars);
- represent money amounts to 20¢, through investigation using coin manipulatives;
- estimate the number of objects in a set, and check by counting (e.g., "I guessed that there were 20 cubes in the pile. I counted them and there were only 17 cubes. 17 is close to 20.");
- compose and decompose numbers up to 20 in a variety of ways, using concrete materials (e.g., 7 can be decomposed using connecting cubes into 6 and 1, or 5 and 2, or 4 and 3);
- divide whole objects into parts and identify and describe, through investigation, equal-sized parts of the whole, using fractional names (e.g., halves; fourths or quarters).

Counting

By the end of Grade 1, students will:

- demonstrate, using concrete materials, the concept of one-to-one correspondence between number and objects when counting;
- count forward by 1's, 2's, 5's, and 10's to 100, using a variety of tools and strategies (e.g., move with steps; skip count on a number line; place counters on a hundreds chart; connect cubes to show equal groups; count groups of pennies, nickels, or dimes);

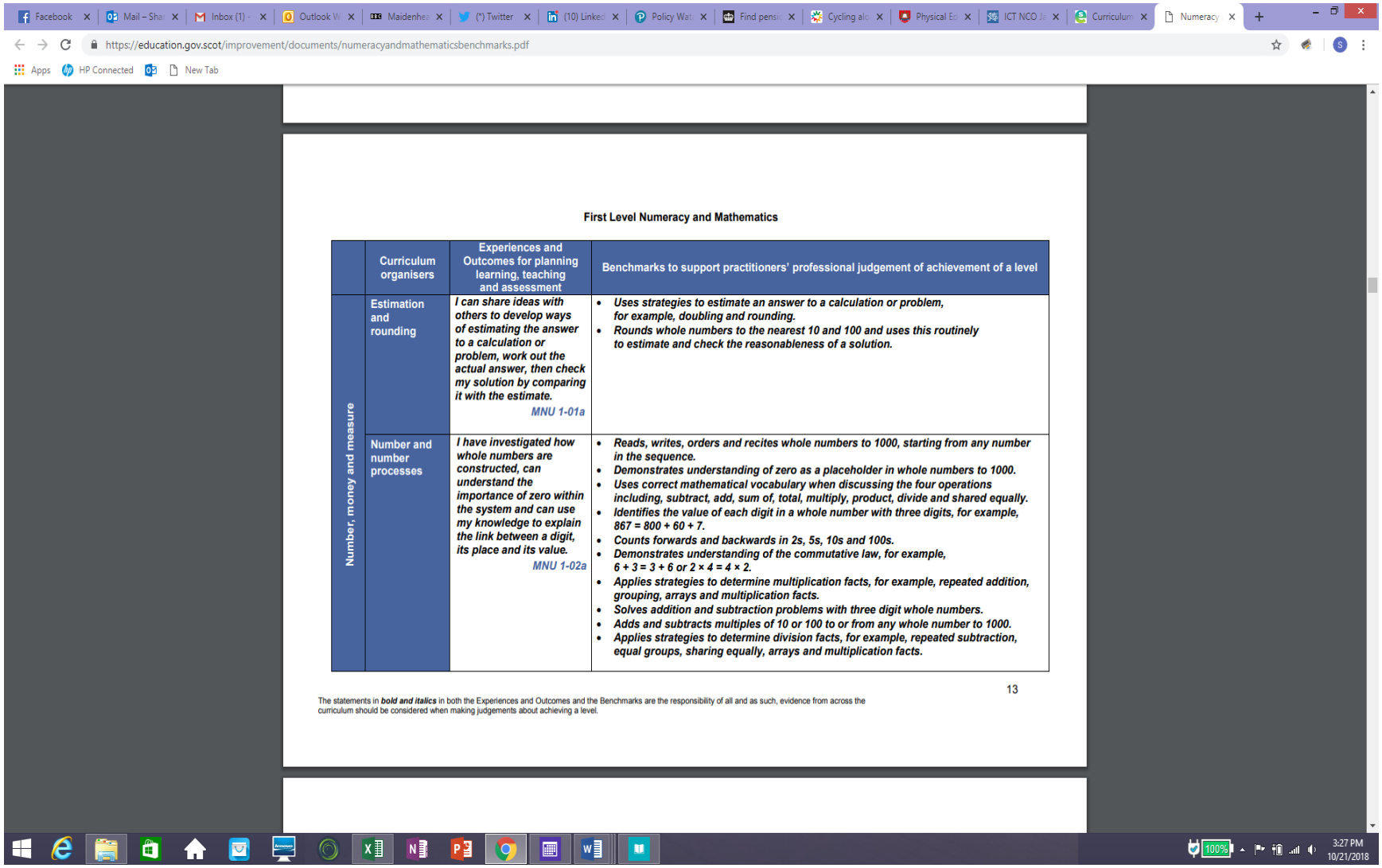
Figure 13: Ontario, - achievement chart for mathematics, Grades 1-8



Achievement Chart – Mathematics, Grades 1–8

Categories	Level 1	Level 2	Level 3	Level 4
Knowledge and Understanding *Subject-specific content acquired in each grade (knowledge), and the comprehension of its meaning and significance (understanding)*				
	The student:			
Knowledge of content (e.g., facts, terms, procedural skills, use of tools)	– demonstrates limited knowledge of content	– demonstrates some knowledge of content	– demonstrates considerable knowledge of content	– demonstrates thorough knowledge of content
Understanding of mathematical concepts	– demonstrates limited understanding of concepts	– demonstrates some understanding of concepts	– demonstrates considerable understanding of concepts	– demonstrates thorough understanding of concepts
Thinking *The use of critical and creative thinking skills and/or processes**				
	The student:			
Use of planning skills – understanding the problem (e.g., formulating and interpreting the problem, making conjectures) – making a plan for solving the problem	– uses planning skills with limited effectiveness	– uses planning skills with some effectiveness	– uses planning skills with considerable effectiveness	– uses planning skills with a high degree of effectiveness
Use of processing skills* – carrying out a plan (e.g., collecting data, questioning, testing, revising, modelling, solving, inferring, forming conclusions) – looking back at the solution (e.g., evaluating reasonableness, making convincing arguments, reasoning, justifying, proving, reflecting)	– uses processing skills with limited effectiveness	– uses processing skills with some effectiveness	– uses processing skills with considerable effectiveness	– uses processing skills with a high degree of effectiveness
Use of critical/creative thinking processes* (e.g., problem solving, inquiry)	– uses critical/creative thinking processes with limited effectiveness	– uses critical/creative thinking processes with some effectiveness	– uses critical/creative thinking processes with considerable effectiveness	– uses critical/creative thinking processes with a high degree of effectiveness

Figure 14: Scotland - experiences and outcomes and benchmarks for first level number, money and measure



First Level Numeracy and Mathematics

	Curriculum organisers	Experiences and Outcomes for planning learning, teaching and assessment	Benchmarks to support practitioners' professional judgement of achievement of a level
Number, money and measure	Estimation and rounding	*I can share ideas with others to develop ways of estimating the answer to a calculation or problem, work out the actual answer, then check my solution by comparing it with the estimate.* *MNU 1-01a*	• *Uses strategies to estimate an answer to a calculation or problem, for example, doubling and rounding.* • *Rounds whole numbers to the nearest 10 and 100 and uses this routinely to estimate and check the reasonableness of a solution.*
	Number and number processes	*I have investigated how whole numbers are constructed, can understand the importance of zero within the system and can use my knowledge to explain the link between a digit, its place and its value.* *MNU 1-02a*	• *Reads, writes, orders and recites whole numbers to 1000, starting from any number in the sequence.* • *Demonstrates understanding of zero as a placeholder in whole numbers to 1000.* • *Uses correct mathematical vocabulary when discussing the four operations including, subtract, add, sum of, total, multiply, product, divide and shared equally.* • *Identifies the value of each digit in a whole number with three digits, for example, 867 = 800 + 60 + 7.* • *Counts forwards and backwards in 2s, 5s, 10s and 100s.* • *Demonstrates understanding of the commutative law, for example, 6 + 3 = 3 + 6 or 2 × 4 = 4 × 2.* • *Applies strategies to determine multiplication facts, for example, repeated addition, grouping, arrays and multiplication facts.* • *Solves addition and subtraction problems with three digit whole numbers.* • *Adds and subtracts multiples of 10 or 100 to or from any whole number to 1000.* • *Applies strategies to determine division facts, for example, repeated subtraction, equal groups, sharing equally, arrays and multiplication facts.*

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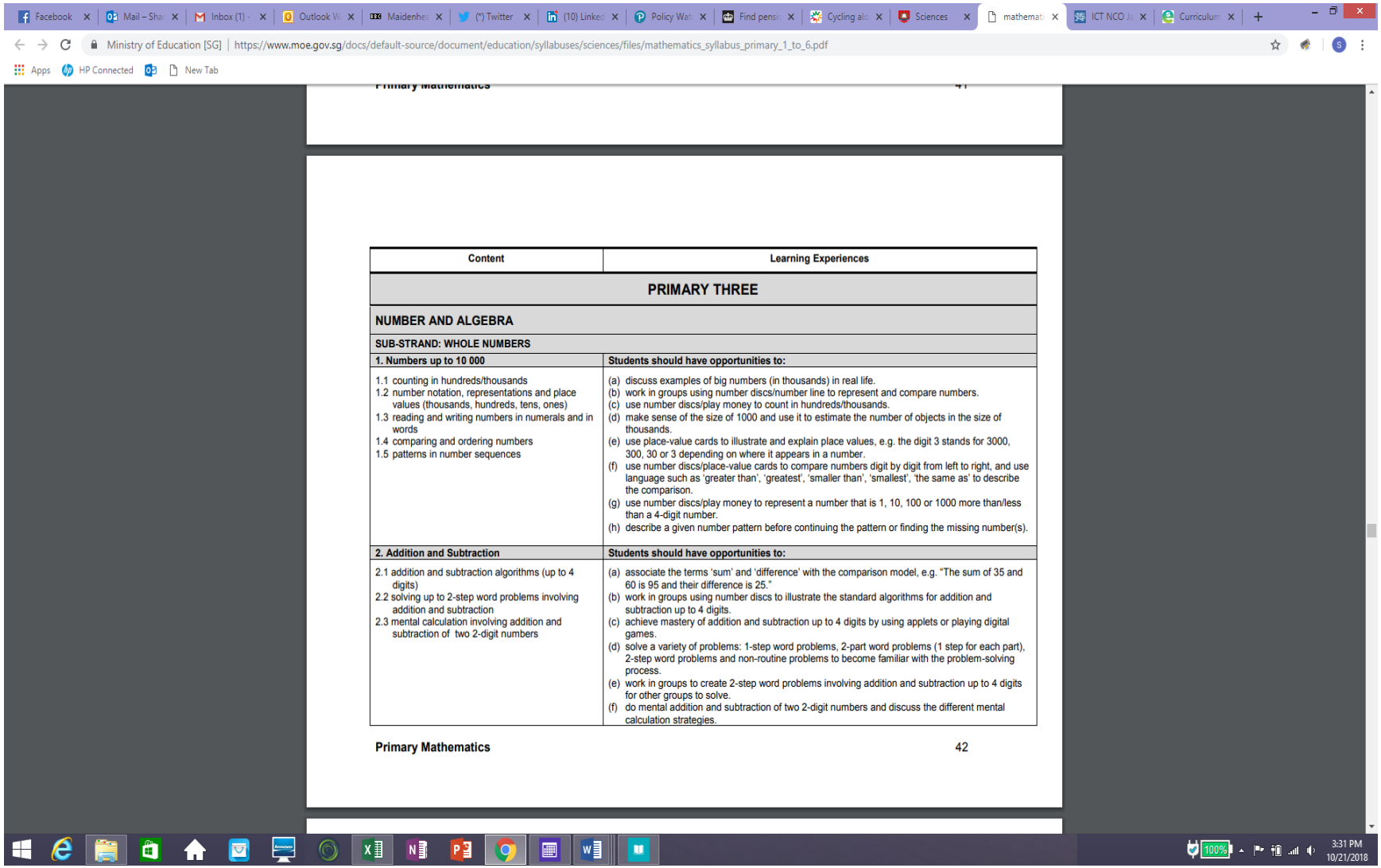
The statements in ***bold and italics*** in both the Experiences and Outcomes and the Benchmarks are the responsibility of all and as such, evidence from across the curriculum should be considered when making judgements about achieving a level.

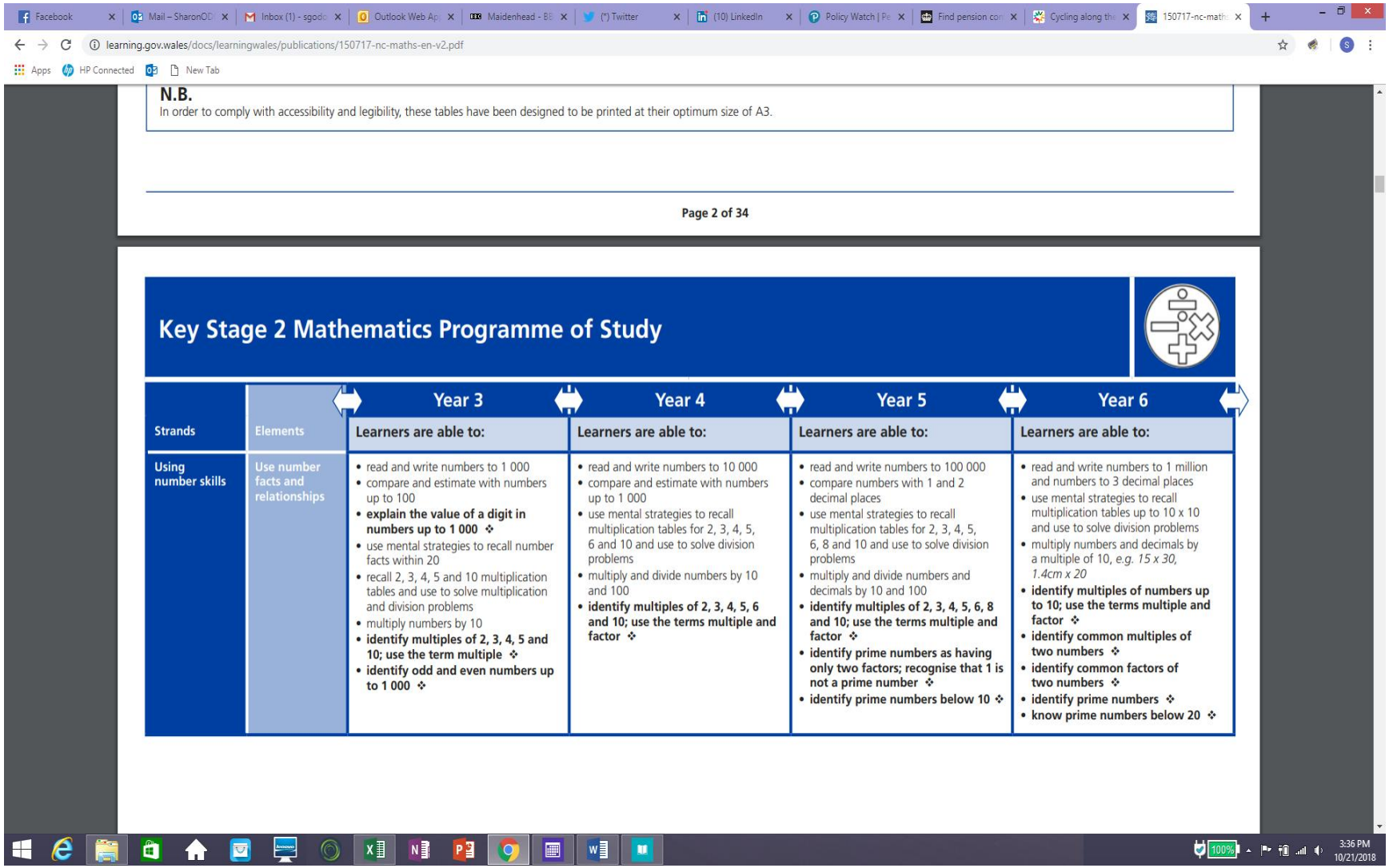
Figure 15: Singapore - content and learning experiences for Primary 3 number and algebra (ages 8-9)



Content	Learning Experiences
PRIMARY THREE	
NUMBER AND ALGEBRA	
SUB-STRAND: WHOLE NUMBERS	
1. Numbers up to 10 000	**Students should have opportunities to:**
1.1 counting in hundreds/thousands 1.2 number notation, representations and place values (thousands, hundreds, tens, ones) 1.3 reading and writing numbers in numerals and in words 1.4 comparing and ordering numbers 1.5 patterns in number sequences	(a) discuss examples of big numbers (in thousands) in real life. (b) work in groups using number discs/number line to represent and compare numbers. (c) use number discs/play money to count in hundreds/thousands. (d) make sense of the size of 1000 and use it to estimate the number of objects in the size of thousands. (e) use place-value cards to illustrate and explain place values, e.g. the digit 3 stands for 3000, 300, 30 or 3 depending on where it appears in a number. (f) use number discs/place-value cards to compare numbers digit by digit from left to right, and use language such as 'greater than', 'greatest', 'smaller than', 'smallest', 'the same as' to describe the comparison. (g) use number discs/play money to represent a number that is 1, 10, 100 or 1000 more than/less than a 4-digit number. (h) describe a given number pattern before continuing the pattern or finding the missing number(s).
2. Addition and Subtraction	**Students should have opportunities to:**
2.1 addition and subtraction algorithms (up to 4 digits) 2.2 solving up to 2-step word problems involving addition and subtraction 2.3 mental calculation involving addition and subtraction of two 2-digit numbers	(a) associate the terms 'sum' and 'difference' with the comparison model, e.g. "The sum of 35 and 60 is 95 and their difference is 25." (b) work in groups using number discs to illustrate the standard algorithms for addition and subtraction up to 4 digits. (c) achieve mastery of addition and subtraction up to 4 digits by using applets or playing digital games. (d) solve a variety of problems: 1-step word problems, 2-part word problems (1 step for each part), 2-step word problems and non-routine problems to become familiar with the problem-solving process. (e) work in groups to create 2-step word problems involving addition and subtraction up to 4 digits for other groups to solve. (f) do mental addition and subtraction of two 2-digit numbers and discuss the different mental calculation strategies.

Primary Mathematics 42

Figure 16: Wales - mathematics, ages 7-11



N.B.
In order to comply with accessibility and legibility, these tables have been designed to be printed at their optimum size of A3.

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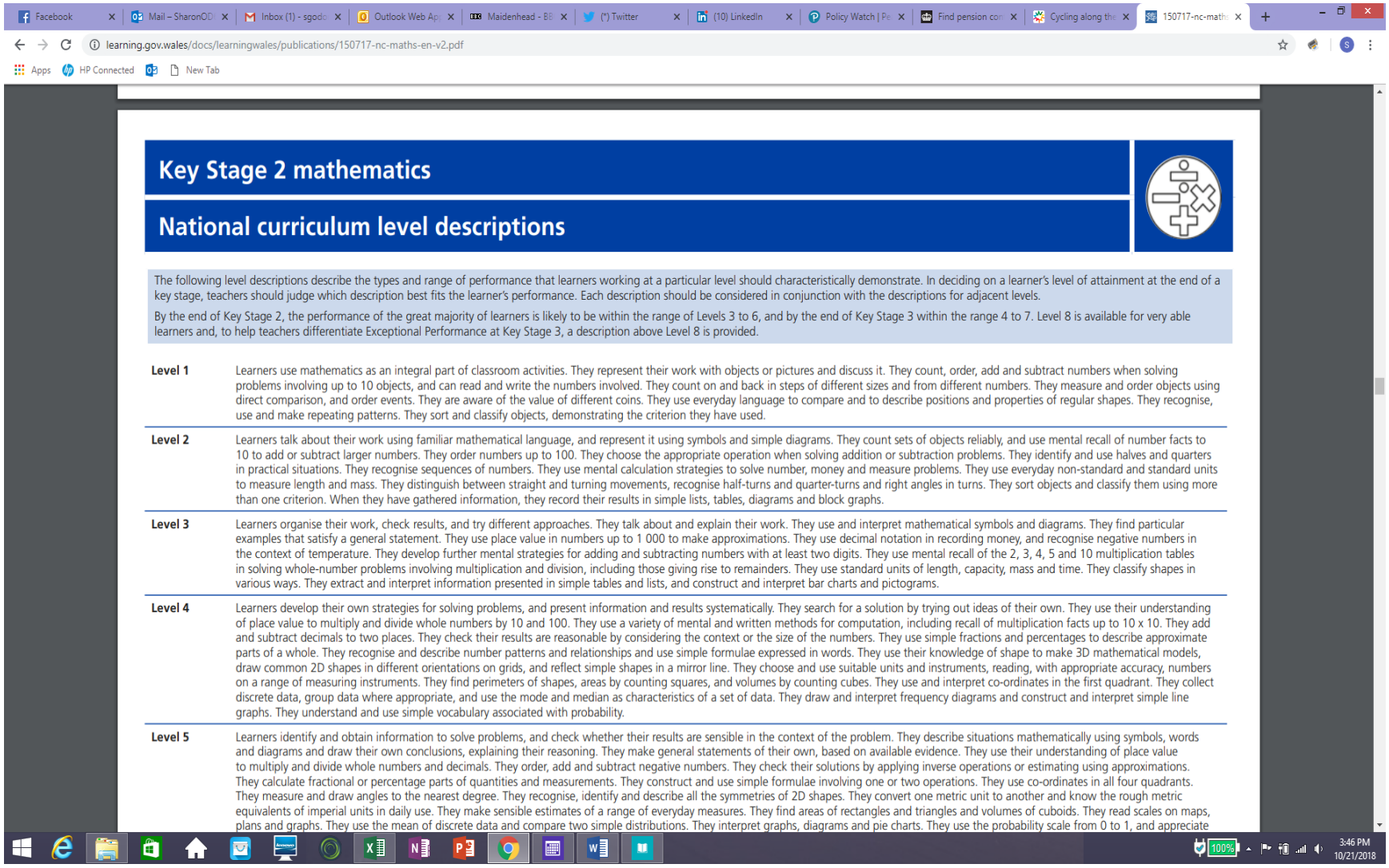
Key Stage 2 Mathematics Programme of Study

Strands	Elements	Year 3 Learners are able to:	Year 4 Learners are able to:	Year 5 Learners are able to:	Year 6 Learners are able to:
Using number skills	Use number facts and relationships	• read and write numbers to 1 000 • compare and estimate with numbers up to 100 • **explain the value of a digit in numbers up to 1 000** ❖ • use mental strategies to recall number facts within 20 • recall 2, 3, 4, 5 and 10 multiplication tables and use to solve multiplication and division problems • multiply numbers by 10 • **identify multiples of 2, 3, 4, 5 and 10; use the term multiple** ❖ • **identify odd and even numbers up to 1 000** ❖	• read and write numbers to 10 000 • compare and estimate with numbers up to 1 000 • use mental strategies to recall multiplication tables for 2, 3, 4, 5, 6 and 10 and use to solve division problems • multiply and divide numbers by 10 and 100 • **identify multiples of 2, 3, 4, 5, 6 and 10; use the terms multiple and factor** ❖	• read and write numbers to 100 000 • compare numbers with 1 and 2 decimal places • use mental strategies to recall multiplication tables for 2, 3, 4, 5, 6, 8 and 10 and use to solve division problems • multiply and divide numbers and decimals by 10 and 100 • **identify multiples of 2, 3, 4, 5, 6, 8 and 10; use the terms multiple and factor** ❖ • **identify prime numbers as having only two factors; recognise that 1 is not a prime number** ❖ • **identify prime numbers below 10** ❖	• read and write numbers to 1 million and numbers to 3 decimal places • use mental strategies to recall multiplication tables up to 10 x 10 and use to solve division problems • multiply numbers and decimals by a multiple of 10, *e.g. 15 x 30, 1.4cm x 20* • **identify multiples of numbers up to 10; use the terms multiple and factor** ❖ • **identify common multiples of two numbers** ❖ • **identify common factors of two numbers** ❖ • **identify prime numbers** ❖ • **know prime numbers below 20** ❖

Figure 17: Wales - mathematics level descriptions



learning.gov.wales/docs/learningwales/publications/150717-nc-maths-en-v2.pdf

Key Stage 2 mathematics

National curriculum level descriptions

The following level descriptions describe the types and range of performance that learners working at a particular level should characteristically demonstrate. In deciding on a learner's level of attainment at the end of a key stage, teachers should judge which description best fits the learner's performance. Each description should be considered in conjunction with the descriptions for adjacent levels.

By the end of Key Stage 2, the performance of the great majority of learners is likely to be within the range of Levels 3 to 6, and by the end of Key Stage 3 within the range 4 to 7. Level 8 is available for very able learners and, to help teachers differentiate Exceptional Performance at Key Stage 3, a description above Level 8 is provided.

Level 1	Learners use mathematics as an integral part of classroom activities. They represent their work with objects or pictures and discuss it. They count, order, add and subtract numbers when solving problems involving up to 10 objects, and can read and write the numbers involved. They count on and back in steps of different sizes and from different numbers. They measure and order objects using direct comparison, and order events. They are aware of the value of different coins. They use everyday language to compare and to describe positions and properties of regular shapes. They recognise, use and make repeating patterns. They sort and classify objects, demonstrating the criterion they have used.
Level 2	Learners talk about their work using familiar mathematical language, and represent it using symbols and simple diagrams. They count sets of objects reliably, and use mental recall of number facts to 10 to add or subtract larger numbers. They order numbers up to 100. They choose the appropriate operation when solving addition or subtraction problems. They identify and use halves and quarters in practical situations. They recognise sequences of numbers. They use mental calculation strategies to solve number, money and measure problems. They use everyday non-standard and standard units to measure length and mass. They distinguish between straight and turning movements, recognise half-turns and quarter-turns and right angles in turns. They sort objects and classify them using more than one criterion. When they have gathered information, they record their results in simple lists, tables, diagrams and block graphs.
Level 3	Learners organise their work, check results, and try different approaches. They talk about and explain their work. They use and interpret mathematical symbols and diagrams. They find particular examples that satisfy a general statement. They use place value in numbers up to 1 000 to make approximations. They use decimal notation in recording money, and recognise negative numbers in the context of temperature. They develop further mental strategies for adding and subtracting numbers with at least two digits. They use mental recall of the 2, 3, 4, 5 and 10 multiplication tables in solving whole-number problems involving multiplication and division, including those giving rise to remainders. They use standard units of length, capacity, mass and time. They classify shapes in various ways. They extract and interpret information presented in simple tables and lists, and construct and interpret bar charts and pictograms.
Level 4	Learners develop their own strategies for solving problems, and present information and results systematically. They search for a solution by trying out ideas of their own. They use their understanding of place value to multiply and divide whole numbers by 10 and 100. They use a variety of mental and written methods for computation, including recall of multiplication facts up to 10 x 10. They add and subtract decimals to two places. They check their results are reasonable by considering the context or the size of the numbers. They use simple fractions and percentages to describe approximate parts of a whole. They recognise and describe number patterns and relationships and use simple formulae expressed in words. They use their knowledge of shape to make 3D mathematical models, draw common 2D shapes in different orientations on grids, and reflect simple shapes in a mirror line. They choose and use suitable units and instruments, reading, with appropriate accuracy, numbers on a range of measuring instruments. They find perimeters of shapes, areas by counting squares, and volumes by counting cubes. They use and interpret co-ordinates in the first quadrant. They collect discrete data, group data where appropriate, and use the mode and median as characteristics of a set of data. They draw and interpret frequency diagrams and construct and interpret simple line graphs. They understand and use simple vocabulary associated with probability.
Level 5	Learners identify and obtain information to solve problems, and check whether their results are sensible in the context of the problem. They describe situations mathematically using symbols, words and diagrams and draw their own conclusions, explaining their reasoning. They make general statements of their own, based on available evidence. They use their understanding of place value to multiply and divide whole numbers and decimals. They order, add and subtract negative numbers. They check their solutions by applying inverse operations or estimating using approximations. They calculate fractional or percentage parts of quantities and measurements. They construct and use simple formulae involving one or two operations. They use co-ordinates in all four quadrants. They measure and draw angles to the nearest degree. They recognise, identify and describe all the symmetries of 2D shapes. They convert one metric unit to another and know the rough metric equivalents of imperial units in daily use. They make sensible estimates of a range of everyday measures. They find areas of rectangles and triangles and volumes of cuboids. They read scales on maps, plans and graphs. They use the mean of discrete data and compare two simple distributions. They interpret graphs, diagrams and pie charts. They use the probability scale from 0 to 1, and appreciate

5. Primary curriculum breadth and depth: concluding considerations for NCCA

This key findings synthesis and the detailed tables underpinning it provide an insight into the organisation and content of the early years and primary curriculum in Finland, France, Ireland, New Zealand, Ontario, Scotland, Singapore and Wales.

In addition to providing a rich resource for ongoing study and analysis as the primary level curriculum in Ireland is reviewed and reformed, they hopefully reflect, to some small extent, the volume of curriculum content and requirements with which practitioners have to contend.

Where models of organisation are consistent across primary level subjects, and where this also includes the early years (e.g in the new Curriculum for Wales, in the Curriculum for Excellence in Scotland, and in the overall expectations and specific expectations requirements in Ontario), this may help accessibility, enabling teachers to more easily digest and 'translate' the requirements across the landscape of subjects they have to teach.

'At a glance' depictions, for each curriculum area, of the models of organisation:

- incorporating clear visual summaries of content requirements and learning outcomes
- including clear links to any cross-curricular requirements such as the teaching of any transversal competences
- displayed by year group, phase or level
- reflecting the continuum of learning progression, and
- enabling ready access to more detailed guidance or resources

may help ensure that curriculum documents are accessible, comprehensible and practical for teachers.

Such 'living' documents, which teachers can use, develop and adapt to suit the needs of the individual learners they encounter in their classrooms every day may not only help teachers to help all learners achieve their full potential, but also prevent perceptions of overload.

Glossary of terms and abbreviations

Aistear	The Early Childhood Curriculum Framework (Ireland)
AoLE	Areas of learning and experience - the learning areas of the new Curriculum for Wales, which will be introduced in all schools in Wales from September 2022 (and available for first feedback in April 2019)
CfE	Curriculum for Excellence (Scotland)
ECCE	Early childhood care and education (Ireland)
ECEC	Early childhood education and care (Finland, New Zealand)
ELC	Early learning and care (Scotland)
Foundation Phase	The phase of education for children aged 3-7 in Wales, which straddles both pre-school (ages 3-4/5) and primary education (ages 4/5-7)
Foundation Phase framework	The statutory curriculum covering early education and the first two years of primary education (ages 3-7) in Wales
ICT	Information and communication(s) technology
IT	Information technology
Junior Cycle	The lower secondary phase in Ireland (for pupils in the age range 12+-15+)
KS2	Key Stage 2 (Wales), pupils in upper primary education, ages 7-11
KS3	Key Stage 3 (Wales), pupils in lower secondary education, ages 11-14
LNF	(National) Literacy and Numeracy Framework (Wales)
NCC	National Core Curriculum (Finland)
NEL framework	Nurturing Early Learners framework (Singapore), the non-statutory curriculum framework for 4- to 6-year-olds
OEs	The overall expectations in the Ontario Curriculum, which describe in general terms the knowledge and skills that students are expected to demonstrate by the end of a grade (school year)
PE	Physical education
PSE	Personal and social education (Wales)
RE	Religious education
Senior Cycle	The upper secondary phase in Ireland (for pupils in the age range 15+-17/18)
SEs	The specific expectations in the Ontario curriculum, which describe the detailed knowledge and skills that students are expected to demonstrate by the end of a grade (school year)
SESE	Social, environmental and scientific education (Ireland)
socle commun	In France, the 'common foundation of knowledge, skills and culture' – the core knowledge and skills which compulsory education guarantees for all pupils between the ages of 6 and 16
SPHE	Social, personal and health education (Ireland)
Te Whāriki	The Early Childhood Curriculum Framework (New Zealand)

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Sharon O'Donnell, October 2018

The views expressed in this report are those of the authors and do not necessarily reflect the views or policy of the National Council for Curriculum and Assessment