Numeracy

August 2023

Linda De Marcellis: Numeracy Coordinator P-6

Nicole Brennan: Numeracy Coordinator 7-12

NSW Department of Education

Acknowledgement of Country

We recognise the Ongoing Custodians of the lands and waterways where we work and live. We pay respect to Elders past and present as ongoing teachers of knowledge, songlines and stories.

We strive to ensure every Aboriginal and Torres Strait Islander learner in NSW achieves their potential through education.

Five ways maths is used in aboriginal cultures: https://education.nsw.gov.au/parents-and-carers/everyday-maths/primary/resources/five-ways-maths-is-used-in-aboriginal-culture#:~:text=Five%20ways%20maths%20is%20used%20in%20Aboriginal%20culture%20from%20counting,symbols%2C%20storytelling%20and%20land%20markers.

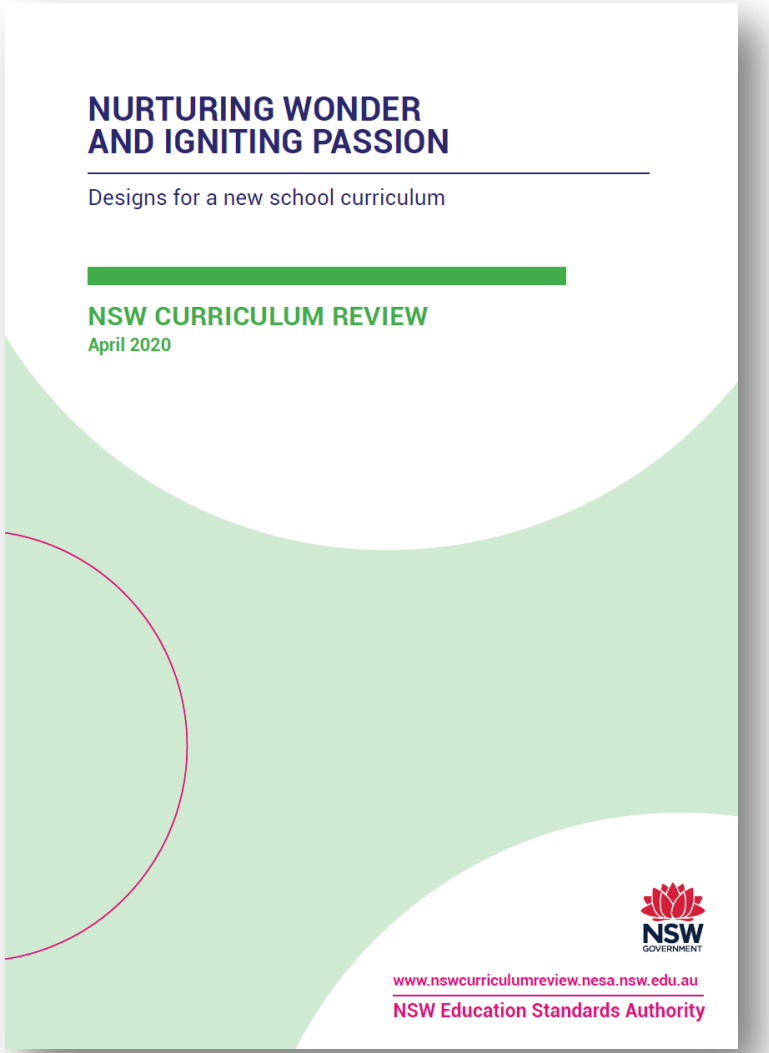
Objectives

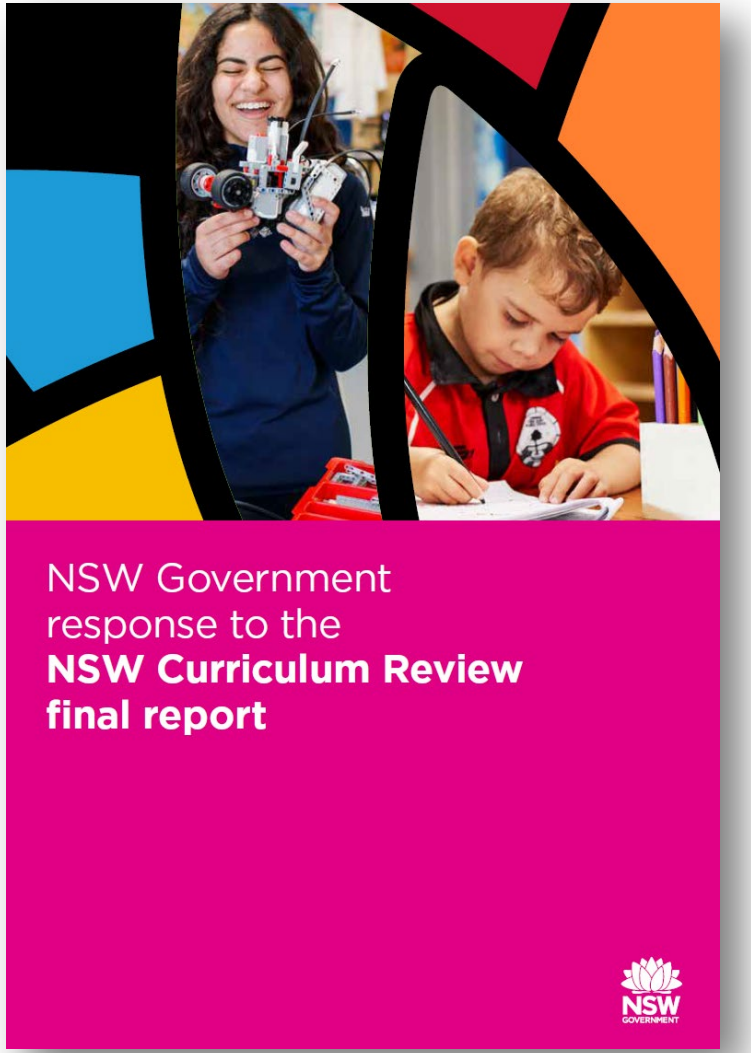
This session intends to support participants to:

- engage with definitions of numeracy
- understand the numeracy demands in syllabuses
- consider the numeracy resources and professional learning that pre-service teachers can leverage.

https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy

Curriculum Review





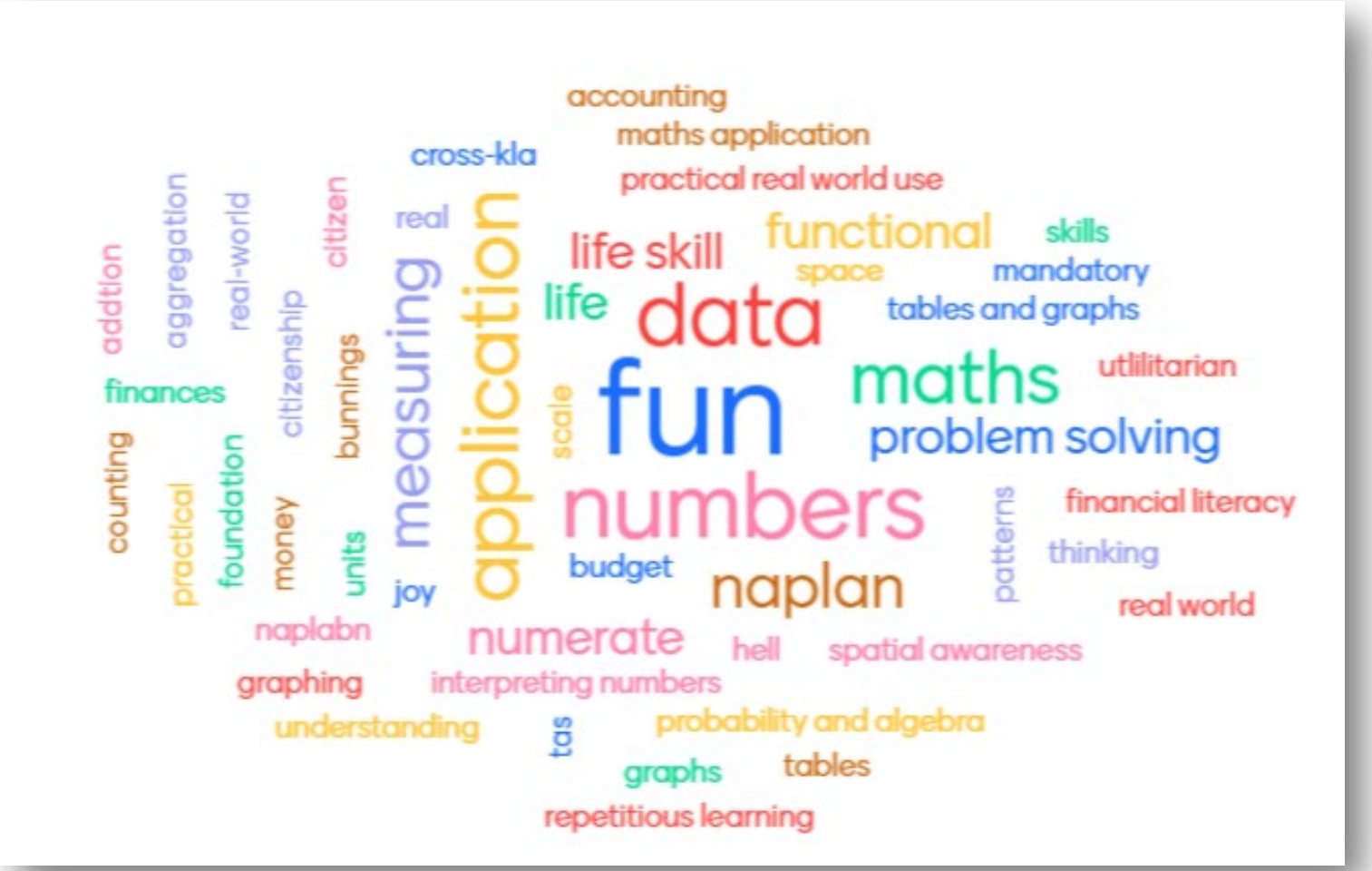
https://nswcurriculumreform.nesa.nsw.edu.au/home/homePageContent/view

The literacy and numeracy five priorities

1. There is a whole school and system approach to literacy and numeracy achievement from preschool to Year 12
2. School leadership is focussed on improving student literacy and numeracy
3. All teachers use effective practices to improve student literacy and numeracy outcomes through curriculum
4. Schools and systems use data to inform literacy and numeracy improvement
5. Families are supported as partners in their children's literacy and numeracy development

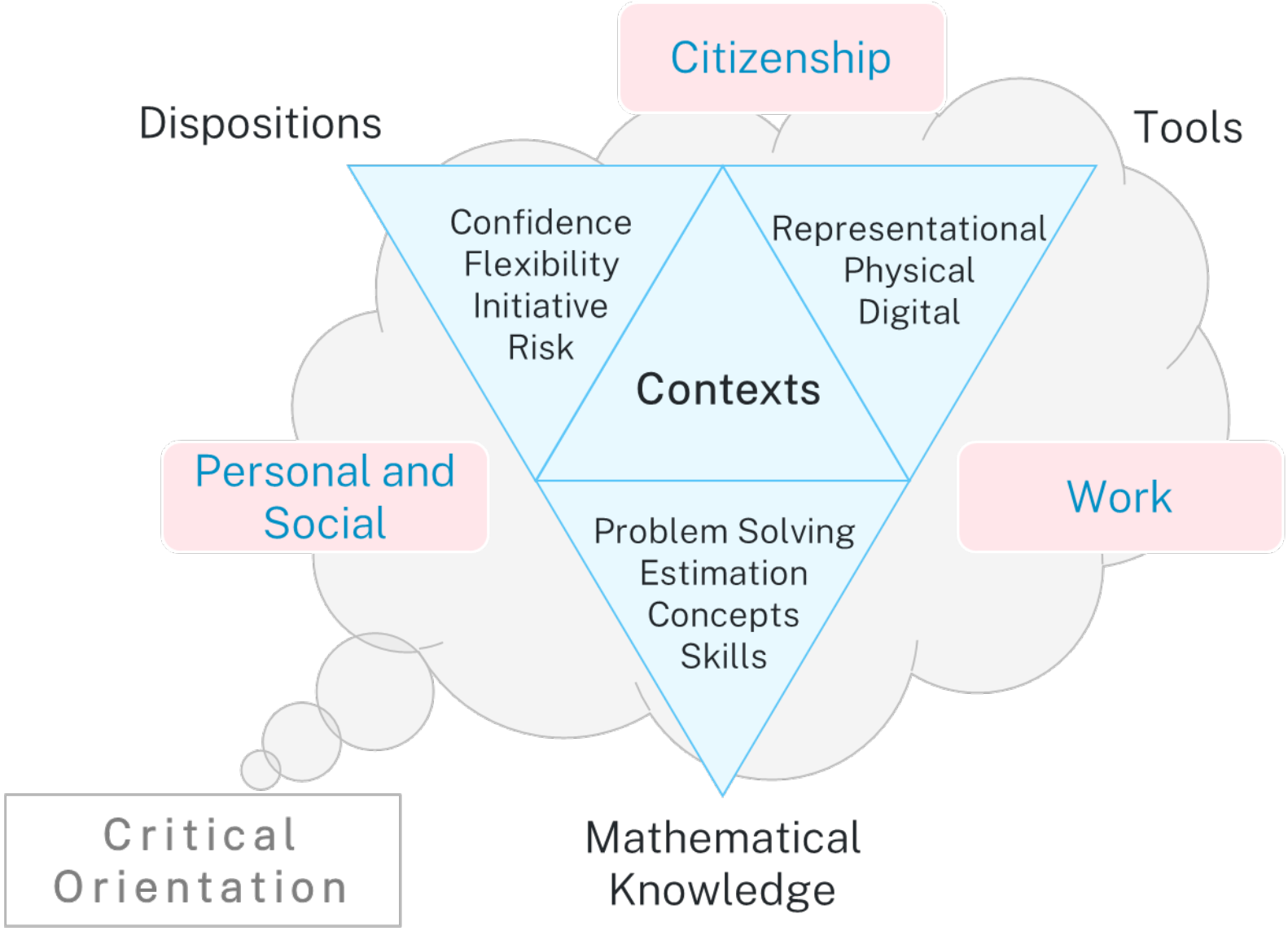
https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/priorities

What words do you associate with numeracy?

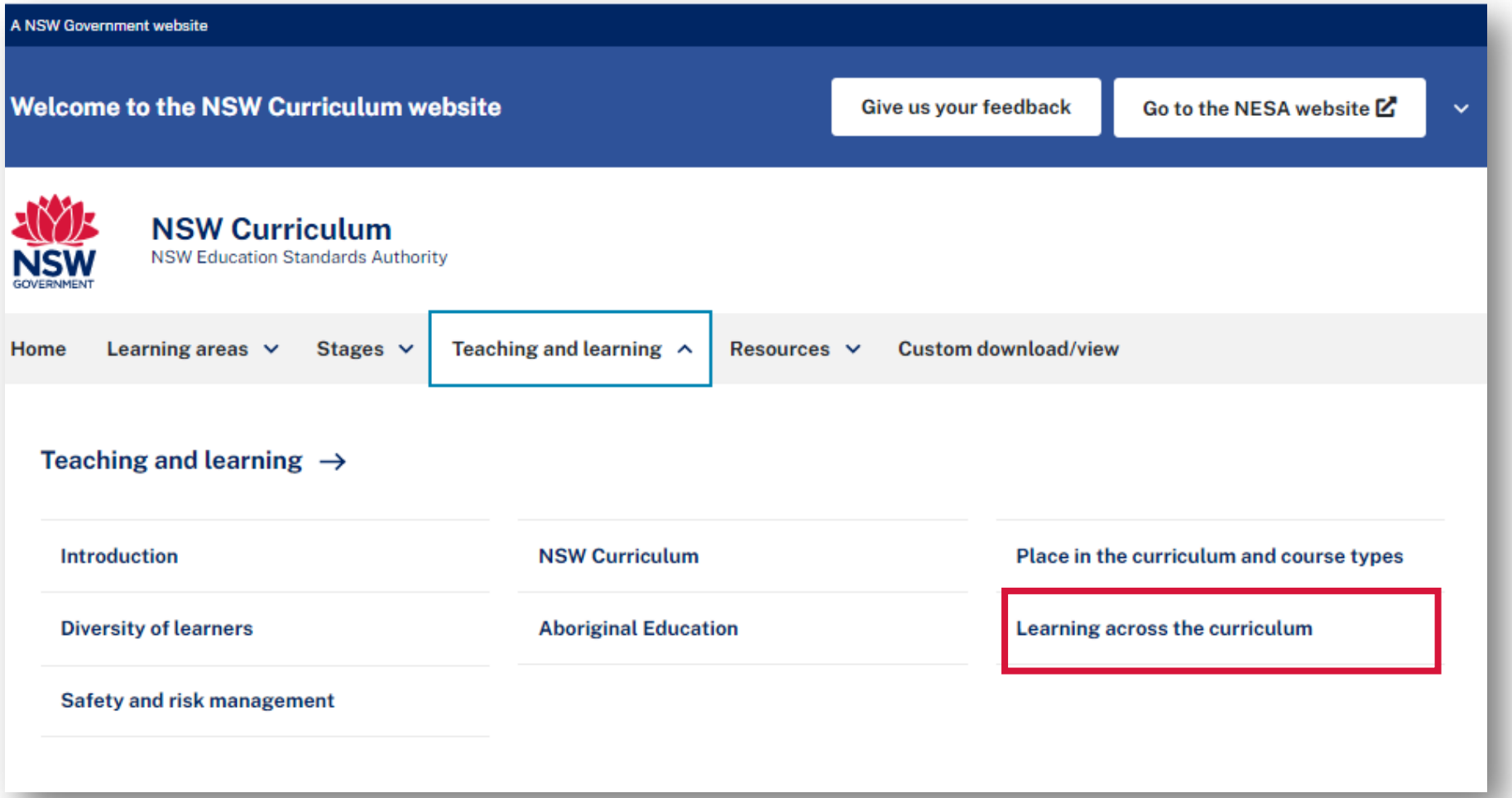


Numeracy Model

Model for 21st Century Numeracy (Goos, 2007)



Digital curriculum



The numeracy general capability

Numeracy involves understanding and applying mathematical knowledge and skills in a wide range of contexts. The application of mathematics across the curriculum enriches the study of other learning areas and helps to develop a broader and deeper understanding of numeracy.

A numerate person (Hogan, 2000) uses a blend of:

- *mathematical knowledge:* concepts and skills within mathematics
- *contextual knowledge:* to recognise and link mathematics to broader situations
- *strategic knowledge:* to apply mathematics in situations and evaluate if the solution is reasonable.

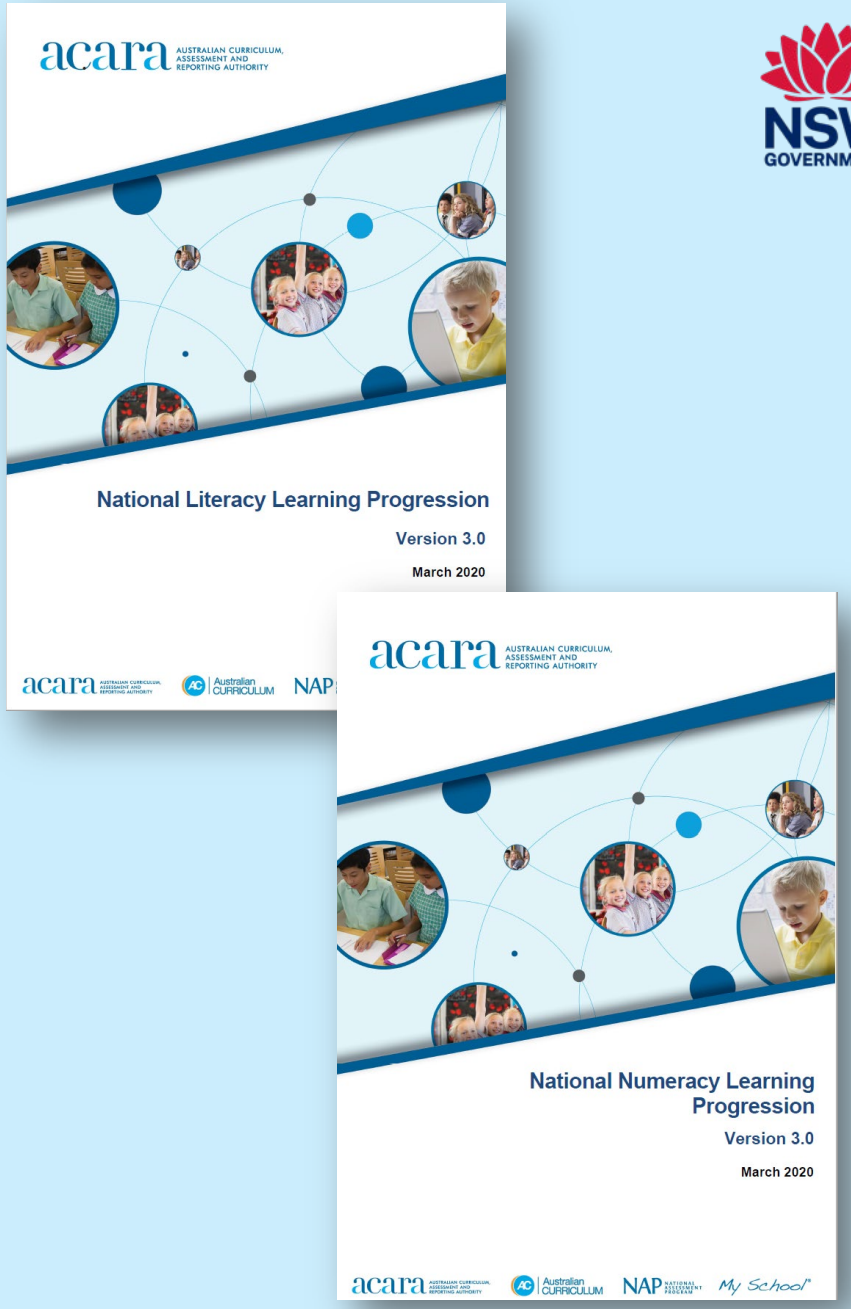
Students are provided with opportunities to:

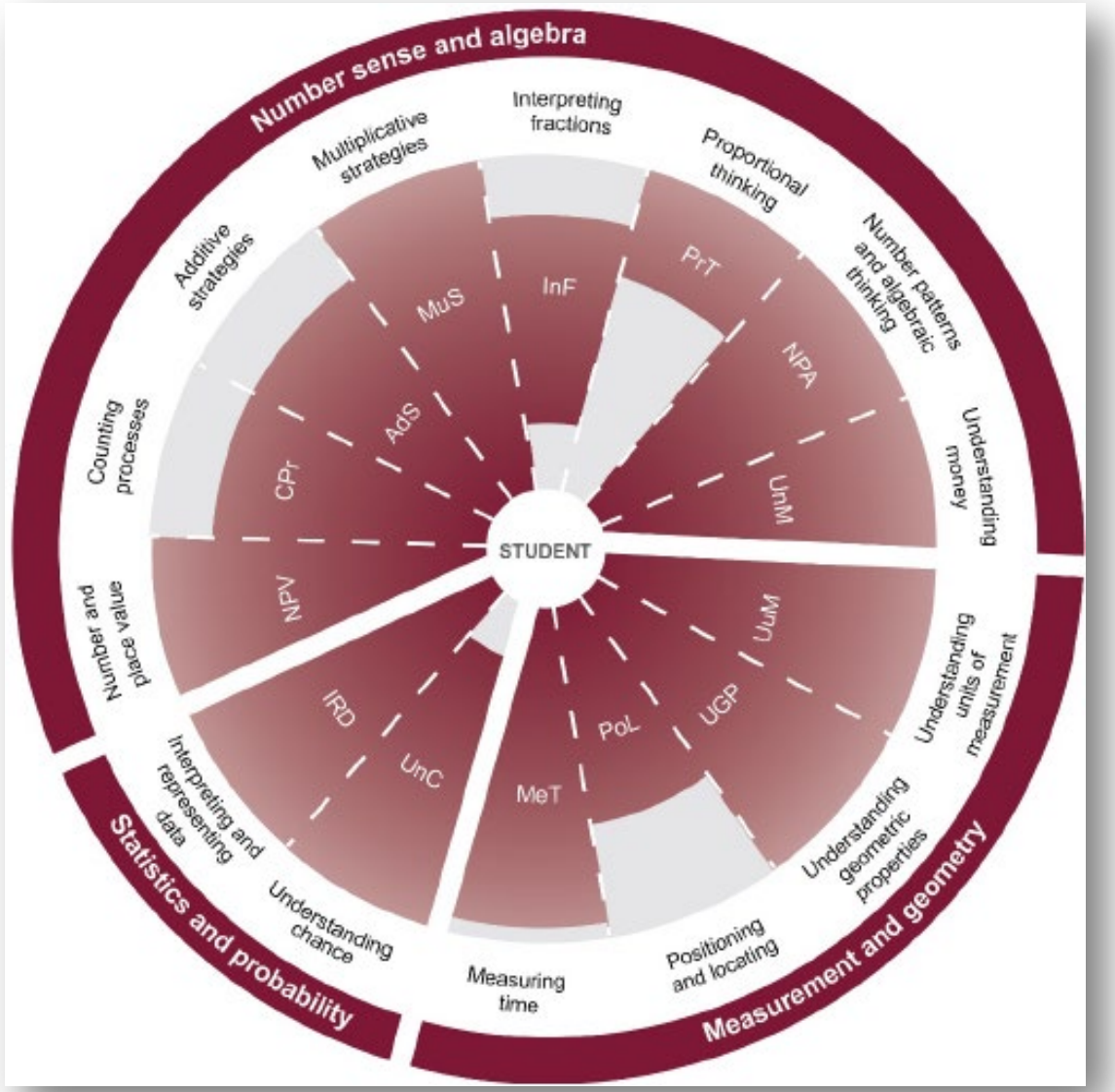
- develop knowledge and skills to use mathematics confidently at the school level and beyond
- develop the mathematical proficiencies of understanding, fluency, reasoning and problem-solving
- apply their knowledge of mathematics in a variety of contexts and circumstances, choosing the appropriate mathematical concepts, and critically evaluating its use.

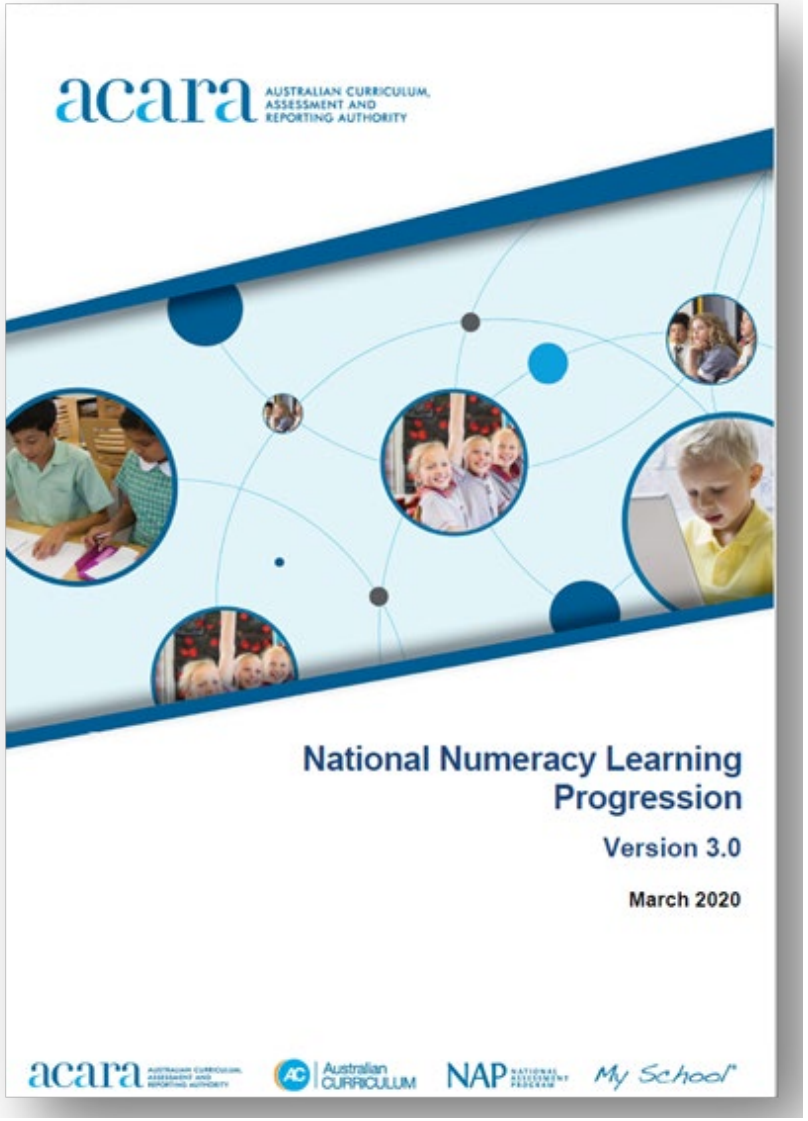
About the Literacy and Numeracy Progressions

The National Literacy and Numeracy Learning Progressions:

- Strengthen teacher knowledge and create shared understanding
- Help teachers to identify L&N needs, target teaching, monitor progress
- Support differentiation, feedback for next steps.
- Support syllabuses
- Support initiatives in Strategic Improvement Plans

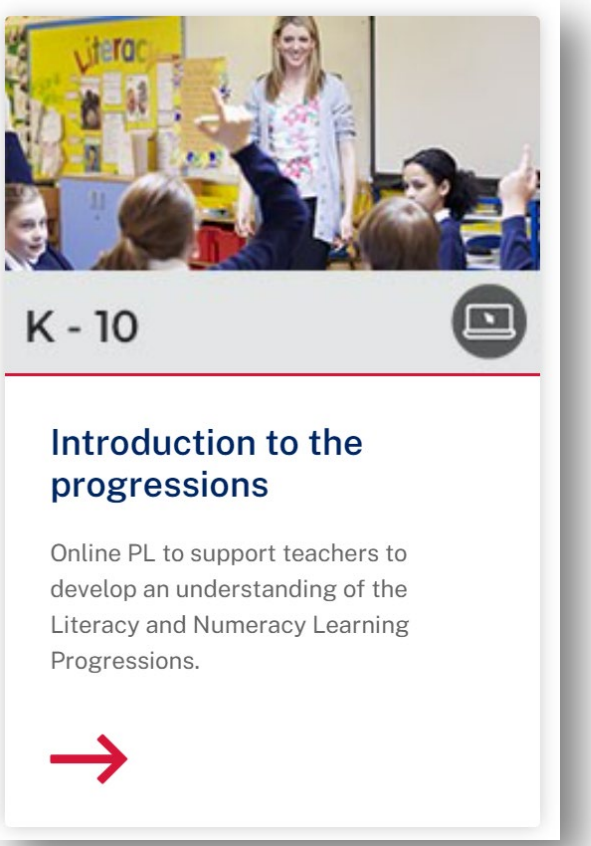


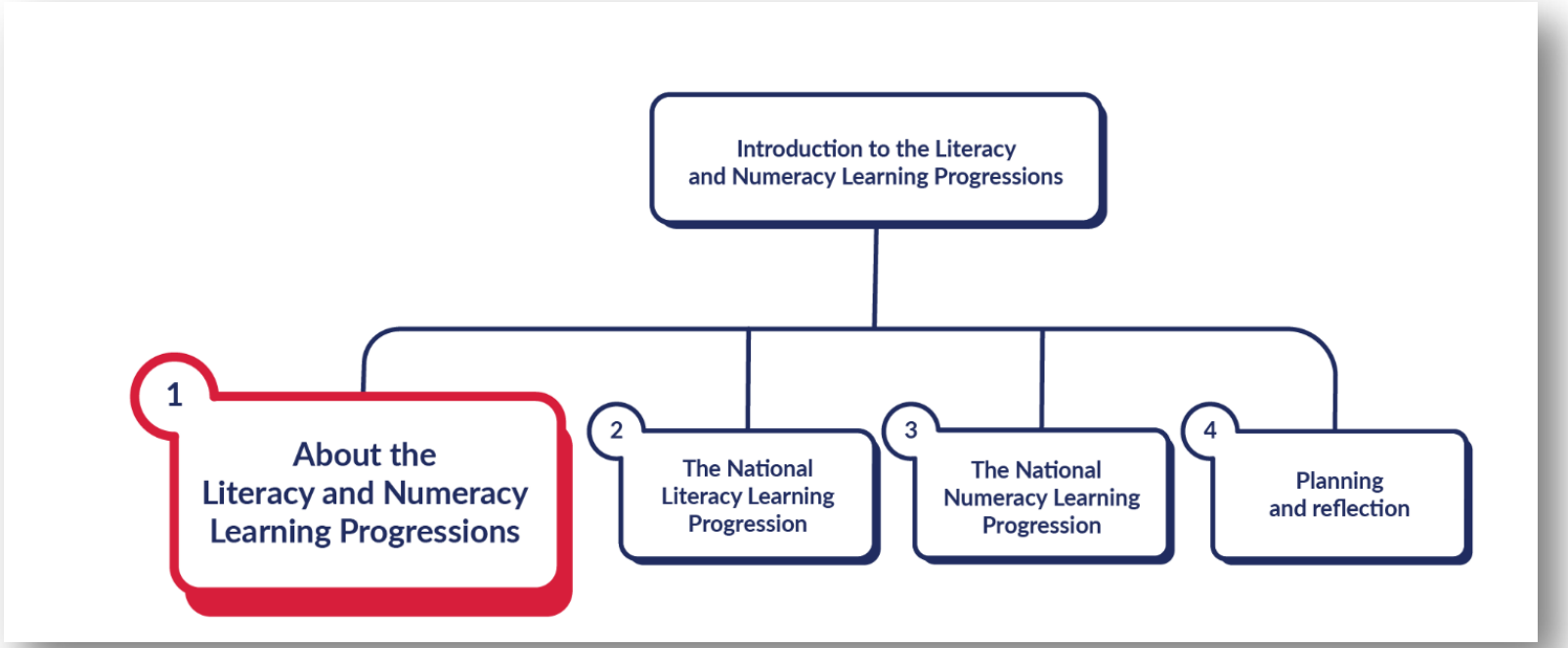




https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/resources-for-schools/learning-progressions

Introduction to the literacy and numeracy progressions





MyPL

https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/professional-learning

NSW Department of Education

Numeracy guide

Kindergarten to Year 2

A guide to support conversations about evidence-based practice for leadership teams

Literacy and numeracy
2023 Update

NSW GOVERNMENT

NSW Department of Education

Numeracy guide

3 to 8

A guide to support conversations about evidence-based practice for leadership teams

Literacy and numeracy
2023 Update

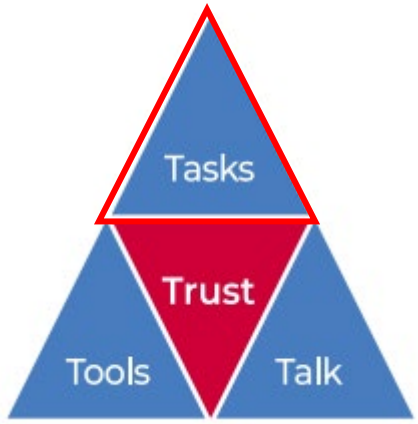
NSW GOVERNMENT

https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/resources-for-schools/guides

Teacher

To drive improvement in numeracy, a teacher:

- engages students in purposeful tasks and learning experiences that require deep thinking about important concepts and relationships
- creates an environment that encourages collaboration, educative risk-taking, meaningful talk, and uses students' misconceptions and errors as building blocks for learning
- provides play-based learning experiences that enable students to consolidate, practice, apply and transfer their numeracy skills
- designs opportunities for students to regularly experience productive struggle, exploring ideas and concepts to develop and use an increasingly sophisticated range of skills
- designs opportunities for students to practise what they are learning whether it be to improve fluency, problem-solving skills, or enrich conceptual understanding
- intentionally chooses and uses tasks because they meet a specific mathematical purpose, offering appropriate levels of challenge and opportunities for feedback for all students
- facilitates and plans productive classroom dialogue that encourages and supports students to justify their thinking and actions, drawing on a range of pedagogical practices and representational competencies
- supports students in connecting different strategies, approaches, representations, and concepts
- uses everyday experiences to design teaching and learning activities
- explores and uses multiple, meaningful representations to develop communicating skills, and understanding
- models how to work flexibly with numbers, operations and other critical ideas
- provides opportunities to use an ever-increasing range of representations
- builds on students' existing thinking through questioning and modifying tasks to provide alternative pathways to understanding
- plans learning experiences that enable students to build on their existing proficiencies, interests, confidence and experiences
- selects concrete materials/manipulatives that engages students in mathematical thinking to support them to represent mathematical ideas explicitly and concretely



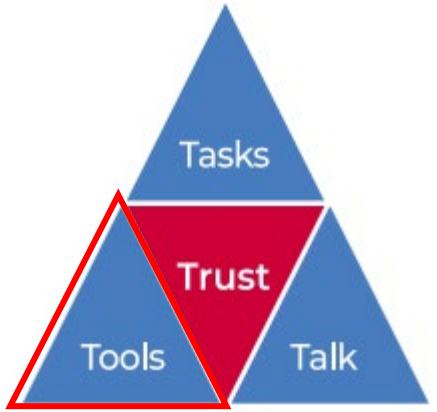
Transforming Primary Mathematics, Mike Askew (2016)

- engages students in purposeful **tasks** and learning experiences that require deep thinking about important concepts and relationships

Teacher

To drive improvement in numeracy, a teacher:

- engages students in purposeful tasks and learning experiences that require deep thinking about important concepts and relationships
- creates an environment that encourages collaboration, educative risk-taking, meaningful talk, and uses students' misconceptions and errors as building blocks for learning
- provides play-based learning experiences that enable students to consolidate, practice, apply and transfer their numeracy skills
- designs opportunities for students to regularly experience productive struggle, exploring ideas and concepts to develop and use an increasingly sophisticated range of skills
- designs opportunities for students to practise what they are learning whether it be to improve fluency, problem-solving skills, or enrich conceptual understanding
- intentionally chooses and uses tasks because they meet a specific mathematical purpose, offering appropriate levels of challenge and opportunities for feedback for all students
- facilitates and plans productive classroom dialogue that encourages and supports students to justify their thinking and actions, drawing on a range of pedagogical practices and representational competencies
- supports students in connecting different strategies, approaches, representations, and concepts
- uses everyday experiences to design teaching and learning activities
- explores and uses multiple, meaningful representations to develop communicating skills, and understanding
- models how to work flexibly with numbers, operations and other critical ideas
- provides opportunities to use an ever-increasing range of representations
- builds on students' existing thinking through questioning and modifying tasks to provide alternative pathways to understanding
- plans learning experiences that enable students to build on their existing proficiencies, interests, confidence and experiences
- selects concrete materials/manipulatives that engages students in mathematical thinking to support them to represent mathematical ideas explicitly and concretely



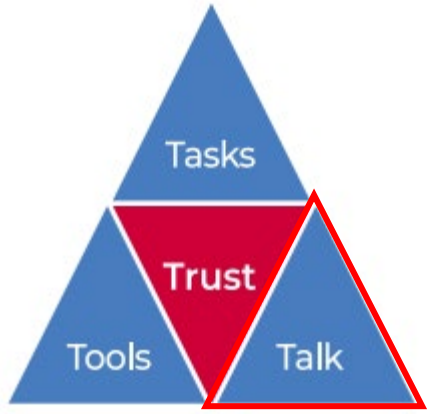
Transforming Primary Mathematics, Mike Askew (2016)

- selects concrete materials/manipulatives **(tools)** that engages students in mathematical thinking to support them to represent mathematical ideas explicitly and concretely

Teacher

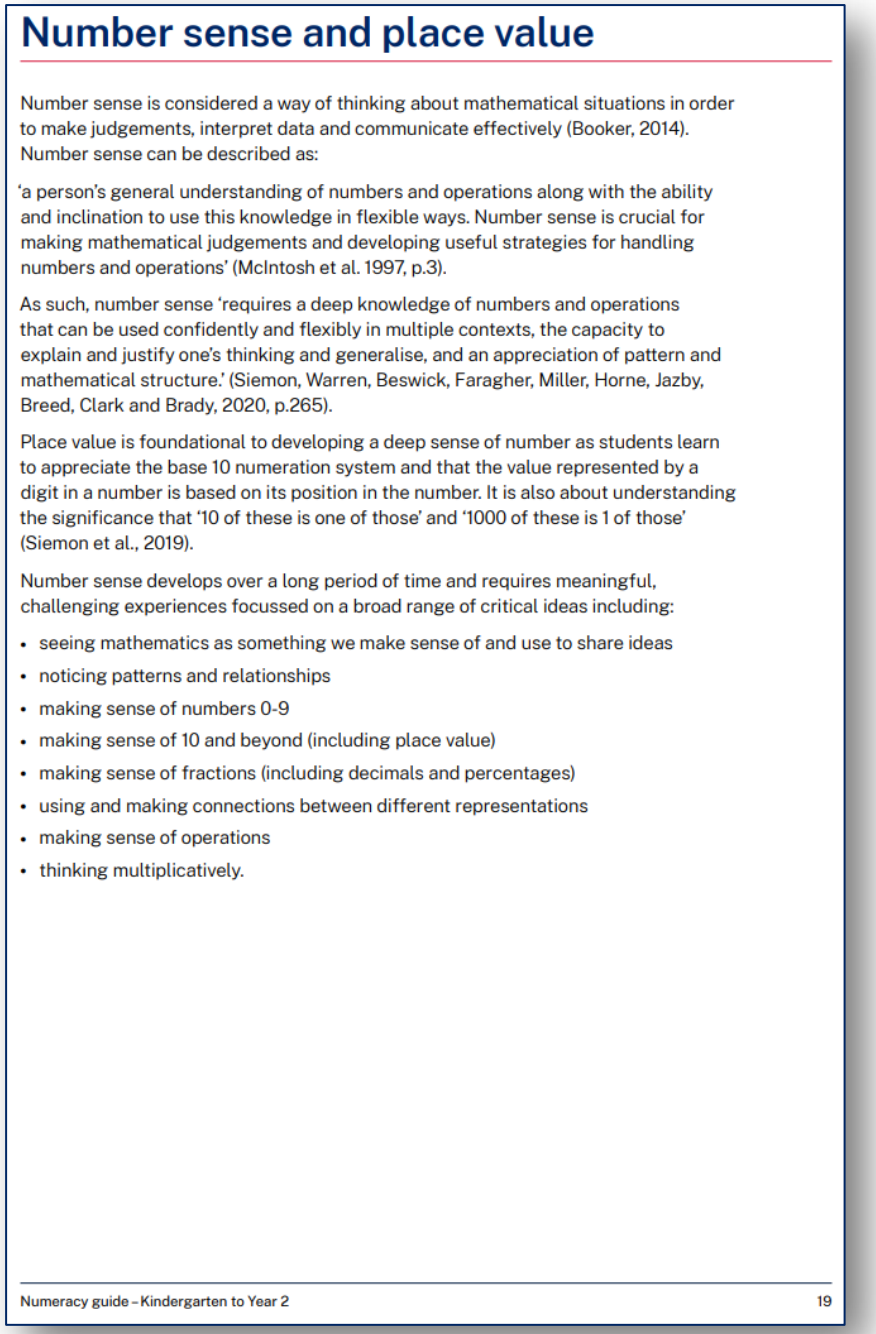
To drive improvement in numeracy, a teacher:

- engages students in purposeful tasks and learning experiences that require deep thinking about important concepts and relationships
- creates an environment that encourages collaboration, educative risk-taking, meaningful talk, and uses students' misconceptions and errors as building blocks for learning
- provides play-based learning experiences that enable students to consolidate, practice, apply and transfer their numeracy skills
- designs opportunities for students to regularly experience productive struggle, exploring ideas and concepts to develop and use an increasingly sophisticated range of skills
- designs opportunities for students to practise what they are learning whether it be to improve fluency, problem-solving skills, or enrich conceptual understanding
- intentionally chooses and uses tasks because they meet a specific mathematical purpose, offering appropriate levels of challenge and opportunities for feedback for all students
- facilitates and plans productive classroom dialogue that encourages and supports students to justify their thinking and actions, drawing on a range of pedagogical practices and representational competencies
- supports students in connecting different strategies, approaches, representations, and concepts
- uses everyday experiences to design teaching and learning activities
- explores and uses multiple, meaningful representations to develop communicating skills, and understanding
- models how to work flexibly with numbers, operations and other critical ideas
- provides opportunities to use an ever-increasing range of representations
- builds on students' existing thinking through questioning and modifying tasks to provide alternative pathways to understanding
- plans learning experiences that enable students to build on their existing proficiencies, interests, confidence and experiences
- selects concrete materials/manipulatives that engages students in mathematical thinking to support them to represent mathematical ideas explicitly and concretely



Transforming Primary Mathematics, Mike Askew (2016)

- facilitates and plans productive classroom dialogue **(talk)** that encourages and supports students to justify their thinking and actions, drawing on a range of pedagogical practices and representational competencies



Number sense and place value

Number sense is considered a way of thinking about mathematical situations in order to make judgements, interpret data and communicate effectively (Booker, 2014). Number sense can be described as:

'a person's general understanding of numbers and operations along with the ability and inclination to use this knowledge in flexible ways. Number sense is crucial for making mathematical judgements and developing useful strategies for handling numbers and operations' (McIntosh et al. 1997, p.3).

As such, number sense 'requires a deep knowledge of numbers and operations that can be used confidently and flexibly in multiple contexts, the capacity to explain and justify one's thinking and generalise, and an appreciation of pattern and mathematical structure.' (Siemon, Warren, Beswick, Faragher, Miller, Horne, Jazby, Breed, Clark and Brady, 2020, p.265).

Place value is foundational to developing a deep sense of number as students learn to appreciate the base 10 numeration system and that the value represented by a digit in a number is based on its position in the number. It is also about understanding the significance that '10 of these is one of those' and '1000 of these is 1 of those' (Siemon et al., 2019).

Number sense develops over a long period of time and requires meaningful, challenging experiences focussed on a broad range of critical ideas including:

- seeing mathematics as something we make sense of and use to share ideas
- noticing patterns and relationships
- making sense of numbers 0-9
- making sense of 10 and beyond (including place value)
- making sense of fractions (including decimals and percentages)
- using and making connections between different representations
- making sense of operations
- thinking multiplicatively.

Numeracy guide – Kindergarten to Year 2 19

Numeracy Guides

- Number sense and place value
- Patterns and algebra
- Additive thinking
- Multiplicative thinking
- Proportional thinking

Numeracy Guides

Syllabus and progression links

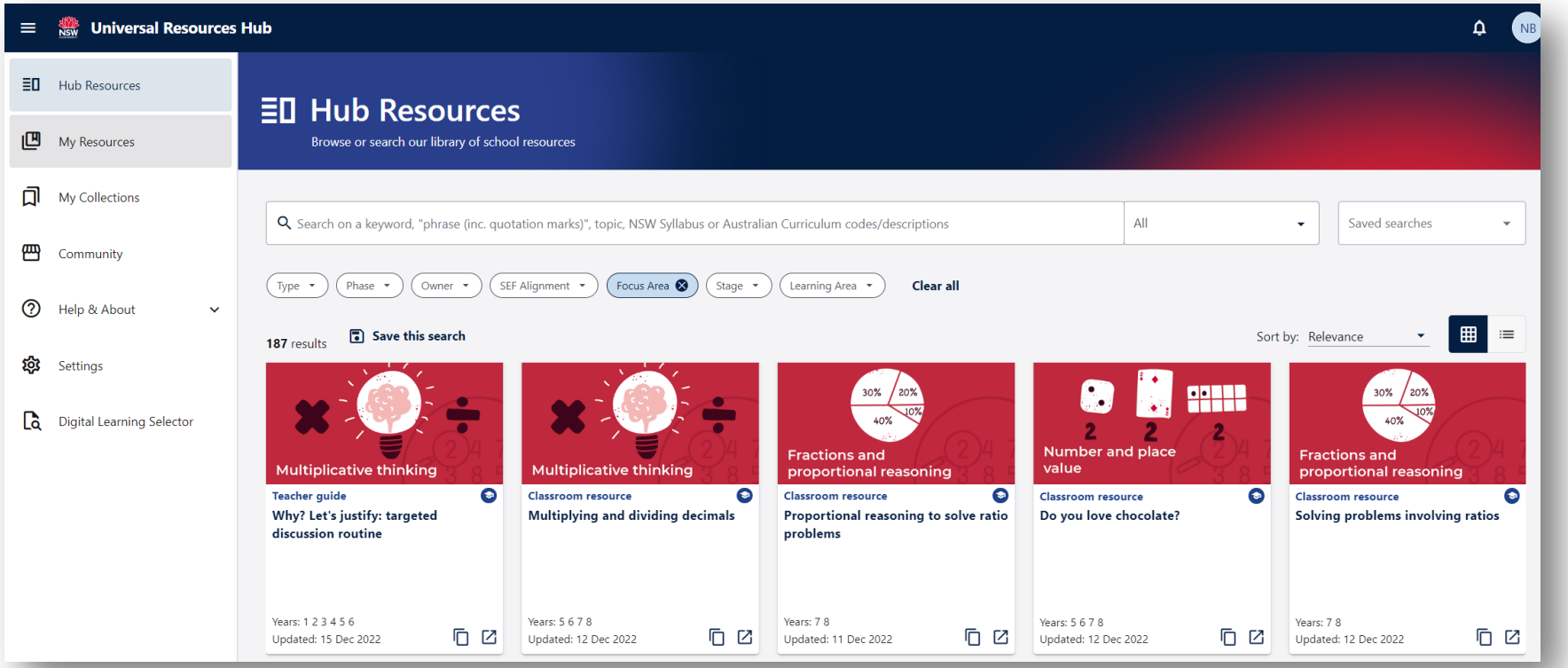
Number sense underpins all aspects of the NSW Mathematics K-10 syllabus. Achievement of outcomes in number and algebra is dependent upon students having strong number sense.

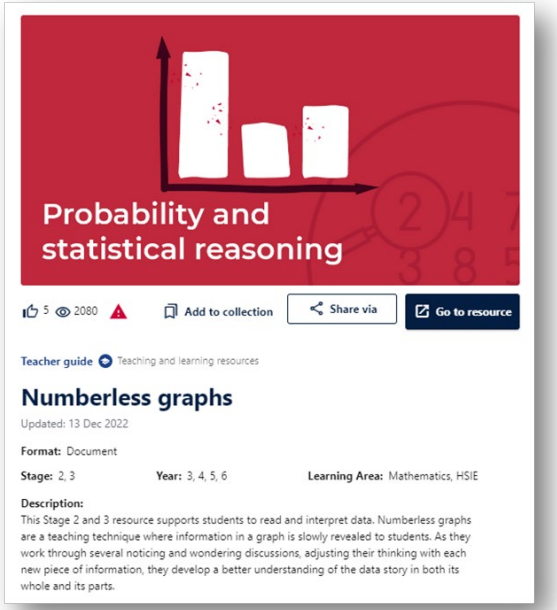
NSW Syllabus	National Numeracy Learning Progression
All teachers have a responsibility to support students to develop the general and discipline-specific numeracy requirements of students in their curriculum area. Numeracy is embedded throughout K-10 syllabus documents as a general capability. The capabilities can be found in syllabus documents, including Mathematics, Science and technology K-6, History, Geography and PDHPE. Numeracy is also embedded within Creative arts. Early Stage 1: MAO-WM-01, MAE-RWN-01, MAE-RWN-02 Stage 1: MAO-WM-01, MA1-RWN-01, MA1-RWN-02	Early Stage 1: NPV1 – NPV4, CPr1 – CPr5 and NPA1 – NPA2 Stage 1: NPV2 – NPV6 and CPr5 – CPr7

Further support

Professional learning	Assessment tools and resources
Becoming Mathematicians: How numbers and fractions work (Professional learning video with accompanying resource) Becoming mathematicians: Quantifying collections (Professional learning video with accompanying resource) Improving literacy and numeracy suite – Number and place value (primary. Quality curriculum implementation K-6 (microlearning modules focused on evidence-based practices that underpin the curriculum planning and programming, assessment and reporting process K-6) Mathematics K-6 microlearning (microlearning modules designed to support you with implementation of the Mathematics K-10 Syllabus (2022))	IfSR-Number and place value webpage Interview for student reasoning – Number and place value (IfSR-NP) diagnostic online assessment – ALAN Number knowledge resources Reading and numeracy resources URH National Numeracy Learning Progression How to – technical guide to using PLAN2

Universal Resources Hub





https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/resources-for-schools/hub

Digital Learning selector

Newman's Error Analysis

Students break down their thinking in response to worded maths problems.

#assessment #feedback and reflection #demonstration

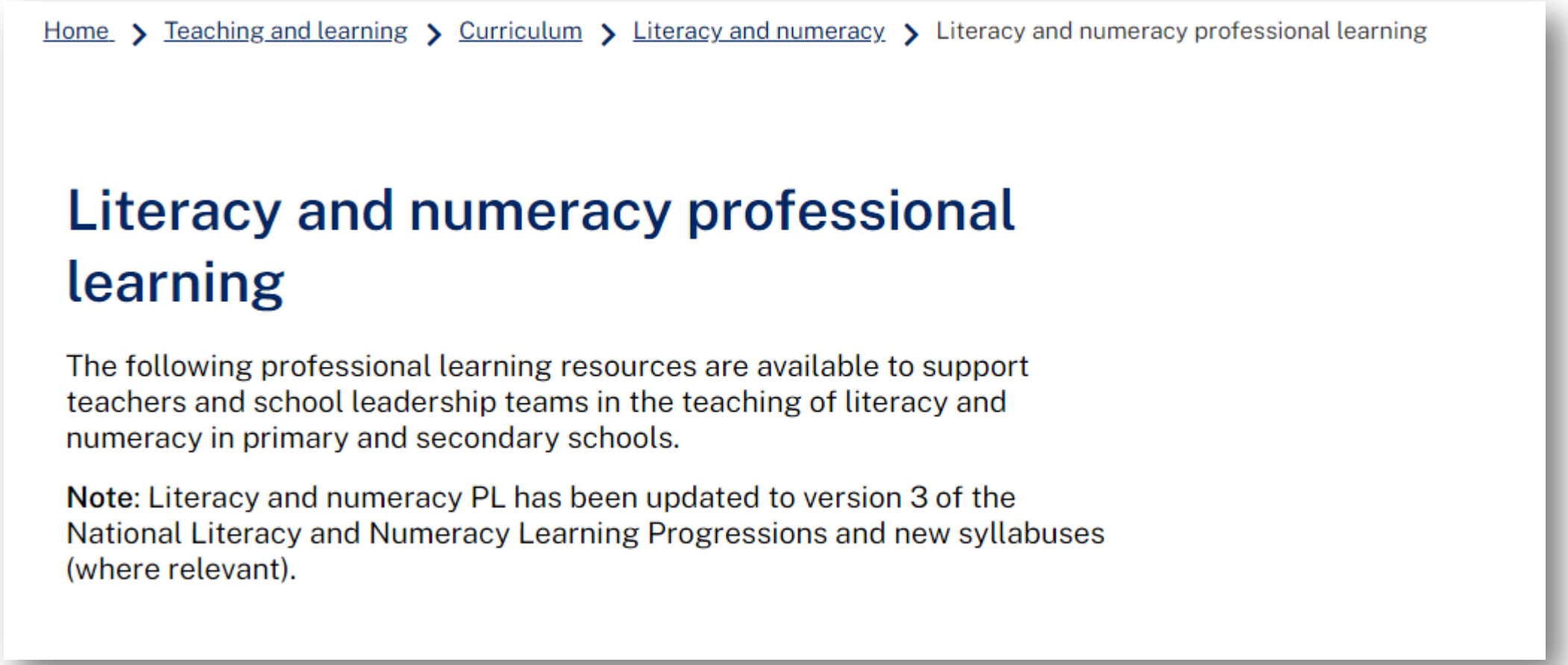
Virtual manipulatives

Students actively engage with concrete materials using digital devices.

Go to activity

https://app.education.nsw.gov.au/digital-learning-selector/?cache_id=6e1b9

Literacy and Numeracy Professional Learning



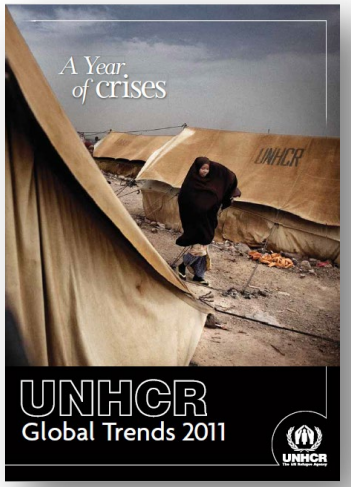
Improving reading and numeracy suite PL

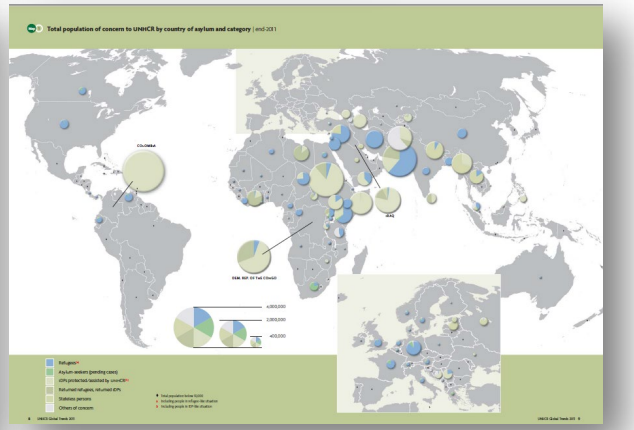
Numeracy

- Additive thinking (K-8) - MyPL course code NR31670
- Fractions and proportional reasoning (primary) - MyPL course code NR31680
- Fractions and proportional reasoning (secondary) - MyPL course code NR31681
- Measurement and geometric reasoning - MyPL course code NR31673
- Multiplicative thinking (K-8) - MyPL course code NR31653
- Number and place value (primary) - MyPL course code NR31671
- Number and place value (secondary) - MyPL course code NR31675
- Statistics and probability - MyPL course code NR31672

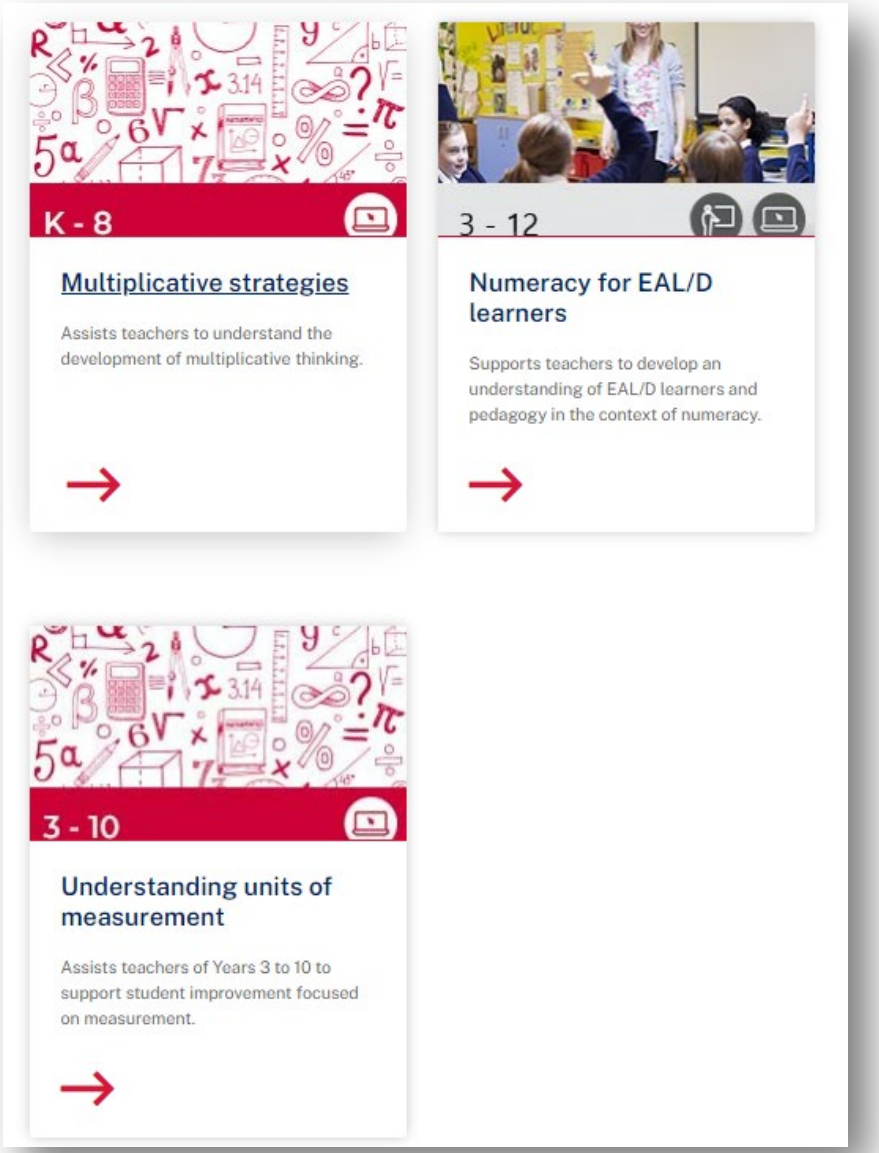
English- Stage 5

In their position unit of work

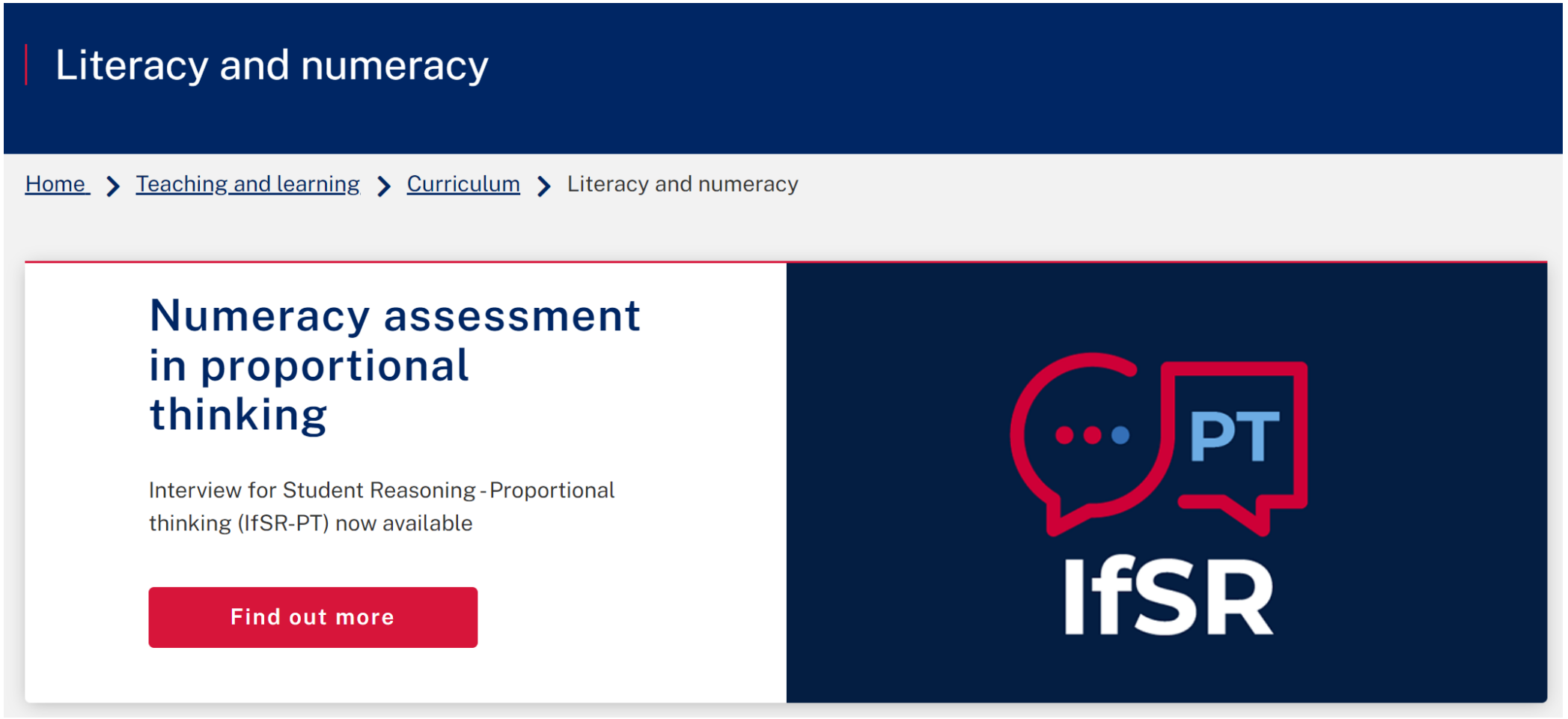




Numeracy professional learning



Assessments- IfSR



https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/assessment-resources

Assessment resources

Assessments in this section support teachers to know more about students' literacy and numeracy skills at different stages throughout their schooling. Student responses are mapped to NSW syllabuses and the National Literacy and Numeracy Learning Progressions. Feedback from these assessments allow for targeted teaching that meets students' specific learning needs.

Resources are available to assist teachers to access and analyse assessment feedback, inform teaching and learning and communicate with parents and carers about student progress.

In this section

Transition to Year 7 assessment

The Transition to Year 7 assessment and new Scout reports replace Best Start Year 7 from 2023.

Check-in assessment

Reading and numeracy assessments available for students in Years 3 to 9.

Best Start Kindergarten Assessment

A literacy and numeracy assessment for kindergarten students.

Interview for Student Reasoning

Assessments to support monitoring and feedback of numeracy skills.

Phonics diagnostic assessment

An on-demand assessment tool available to both primary and secondary teachers.

Phonological awareness diagnostic assessment

An on-demand assessment tool available to both primary and secondary teachers.

Spelling diagnostic assessment trial

A paper-based assessment assessing the ability to coordinate all three word forms when spelling.

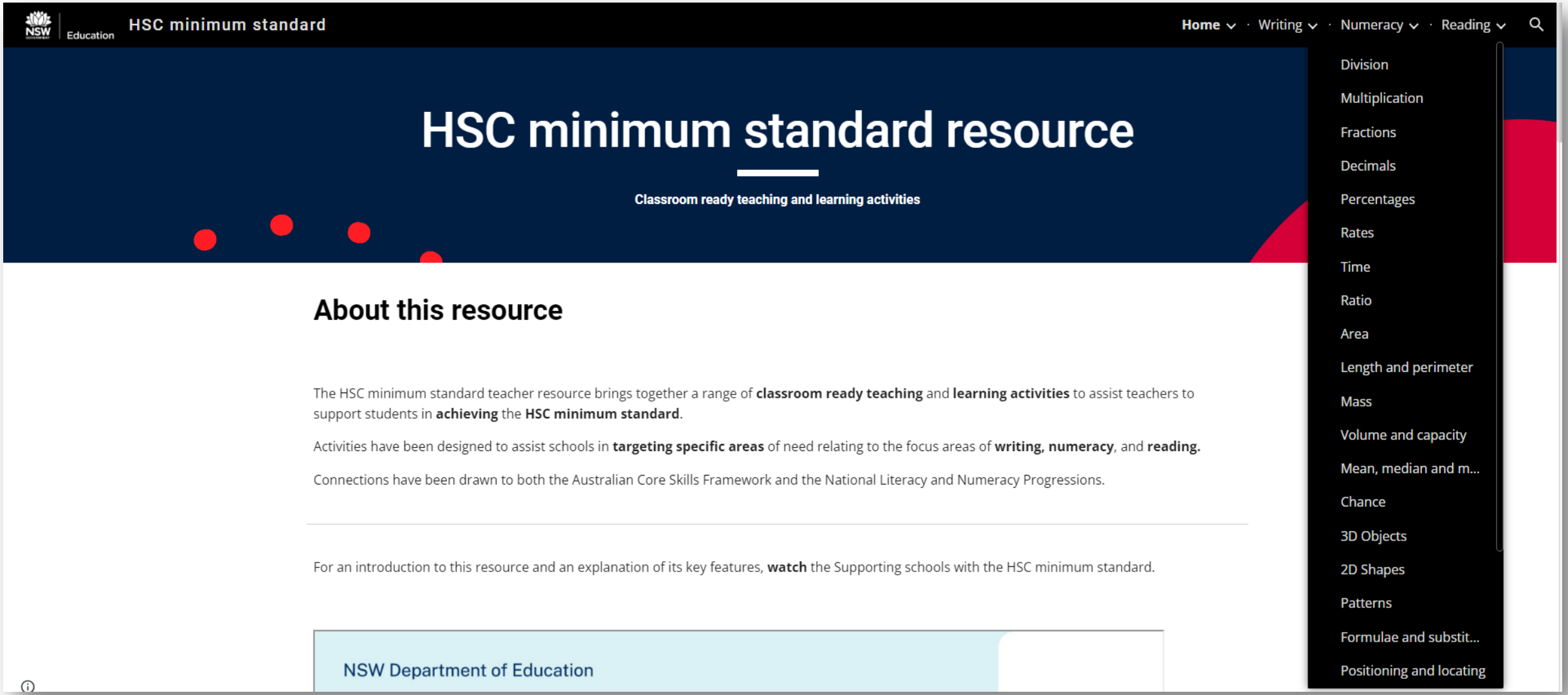
Stage based assessment

Stage snapshots and short assessments to support monitoring and feedback of literacy and numeracy skills.

Year 1 Phonics Screening Check

A short assessment that tells teachers how students are progressing in phonics

HSC minimum standard



https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/hsc-minimum-standard

Linda De Marcellis: Numeracy Coordinator P-6

Nicole Brennan: Numeracy Coordinator 7-12

Contact us: literacy.numeracy@det.nsw.edu.au

NSW GOVERNMENT