LEARNING PROGRESSIONS AND ONLINE FORMATIVE ASSESSMENT NATIONAL INITIATIVE

FINAL REPORT – ATTACHMENT 2

NATIONAL LITERACY AND NUMERACY LEARNING PROGRESSIONS:

MAPPING METHODOLOGY, KEY FINDINGS AND RECOMMENDATIONS FOR REFINEMENT

Contents

1   Introduction

The National Literacy and Numeracy Learning Progressions were developed to assist teachers to locate a student's current literacy and numeracy knowledge, understanding and skills in order to better determine and identify the learning that should follow. The progressions amplify the underpinning literacy and numeracy understandings and skills required to access the Foundation–Year 10 Australian Curriculum and help deepen teacher understanding of the components of student literacy and numeracy development.

The National Literacy and Numeracy Learning Progressions (Version 2) were published on the Australian Curriculum website in January 2018 following a process of development, consultation, trialling and validation during 2016–2017.

As part of the discovery phase for the Learning Progressions and Online Formative Assessment National Initiative (the initiative), ACARA mapped and compared the National Literacy and Numeracy Learning Progressions with other existing progressions and assessments in literacy and numeracy, and analysed available empirical data from current assessments to identify the level of alignment and any areas for refinement.

The mapping process confirmed the National Literacy and Numeracy Learning Progressions are fit for purpose and robust in their current form and structure. The mapping provided evidence to support the need for some refinements to the content of the current progressions, with fewer changes to the National Literacy Learning Progression and more considerable changes to the National Numeracy Learning Progression.

As a result of this work, ACARA recommends some refinements to Version 2 of the National Literacy and Numeracy Learning Progressions, so they can more effectively support teachers with identifying 'where their students are at' in particular aspects of literacy and numeracy and then 'where to next' with their students' learning.

2   Mapping the National Literacy and Numeracy Learning Progressions

The mapping process for the National Literacy and Numeracy Learning Progressions (NLNLPs) included five separate activities:
1.   comparing the NLNLPs with the Reading and Mathematics learning progressions developed by the Australian Council for Educational Research (ACER)
2.   cross-validating the NLNLPs with ACER's Progressive Achievement Test (PAT) items for Reading and Mathematics
3.   mapping and validating an additional 400 NAPLAN Numeracy test items and a similar number of items from the NAPLAN Reading domain test sourced from NAPLAN paper tests from 2012 to 2016 to the NLNLPs
4.   comparing Brightpath writing performance data and descriptors to the Writing element of the NLNLP
5.   mapping jurisdictional assessment resources to the NLNLPs.

2.1.1   Methodology for comparing the ACER and ACARA progressions and assessments

The methodology for comparing the ACARA and ACER learning progressions (LPs) involved:
- comparing their development processes, general features and intended uses to provide insights into the defining features of learning progressions
- a systematic mapping and comparison of the content of the ACARA and ACER LPs to cross-check the two LPs with regard to:
  o   the sequence of acquisition of knowledge, skills and understandings
  o   the substantive content included in the sequence of knowledge, skills and understandings
  o   the clarity, comprehensibility and readability of the descriptions of the knowledge, skills and understandings
- a cross-validation activity to evaluate the extent to which NAPLAN and PAT assessment data supported the constructs described in the ACARA and ACER LPs.

The units for comparison for the systematic content mapping (step 2) were the:
- individual layer 3 statements from the ACER mathematics LP with individual indicators from the ACARA LP for numeracy
- individual layer 3 statements from the ACER reading LP with individual indicators from the *Reading and viewing* element and the *Listening* sub-element (found in the *Speaking and listening* element) of the ACARA LP for literacy.

A team of primary and secondary literacy and numeracy experts from each organisation undertook the content comparison independently. The two expert groups recorded their comparison data into separate standardised data entry files. The first file enabled the comparison of the ACER LPs to the ACARA NLNLPs, and the second, the reverse. The comparison process was completed in both directions in order to ensure that what was unique to each LP was identified. Four data files were generated from this exercise: two files from ACARA, one for reading and one for mathematics; and two equivalent files from ACER. The worksheets were pre-populated with coded information about the units of comparison from each of the ACER and ACARA LPs.

The main task for the expert groups was to consider each indicator and record their response to the question 'Can we see this in the ACARA progression?' in the ACER-ACARA worksheet, and 'Can we see this in the ACER progression?' in the ACARA-ACER worksheet. Data entry options for this column were limited to: 'Yes', 'No', 'Yes (inferred)' and 'Partly'. Groups recorded a justification for the decision made about any matched made between the target LP and the unit of comparison. ACER compiled the data and the teams came together to analyse the findings, make observations and discuss next steps. This session informed the final report prepared by ACER.

A central part of the development of learning progressions is the extent to which the hypothesised sequence of acquisition of knowledge, skills and understandings is borne out by empirical data. A cross-validation activity (step 3 above) using data from NAPLAN and ACER's PAT test items explored this with a view to identifying potential gaps in the constructs described in the two LPs. The activity involved two parts:
- examining whether the sequences of acquisition of knowledge, skills and understandings described in the ACARA and ACER LPs were supported by student achievement data from NAPLAN and PAT
- examining if the content of NAPLAN and PAT items revealed any limitations in the descriptions of knowledge, skills and understandings in the ACARA and ACER LPs.

These two aspects of the cross-validation activity were explored using the same four datasets. The ACARA and ACER reading and maths expert groups selected samples of NAPLAN and PAT items respectively, designed to span the ranges of the PAT or NAPLAN scale, and give representative coverage of the content of the assessments.

Once the items had been selected, the expert groups exchanged the samples of items, along with item metadata (such as framework classification) with the exception of item location on the assessment scale. They then attempted to map items to sets of LPs, with:
- the ACER reading expert group mapping NAPLAN Reading items to ACER LP for reading
- the ACER maths expert group mapping NAPLAN Numeracy items to ACER LP for mathematics
- the ACARA reading expert group mapping PAT Reading items to relevant parts of the ACARA LP for reading
- the ACARA maths expert group mapping PAT Maths items to the ACARA LP for numeracy.

For each item, mapping involved:
- inspecting the item and associated metadata to determine the key knowledge/skills/understandings that the item is intended to probe
- with reference to the determination of key knowledge/skills/understandings, mapping the item to a descriptor for a particular level of the LP
- rating the strength of the association between the key knowledge/skills/understandings that have been determined and the LP level descriptor, with options being strong, moderate, or weak.

Experts were instructed to try to map each item to only one LP level descriptor. Where an item appeared to require knowledge, skills and understandings that are described in more than one LP level descriptor, experts mapped the item to the LP description best matching the most central demand of the item. In addition to the mapping itself, and

strength rating, experts were able to provide commentary on their mapping where they felt a justification or explanatory comment was necessary.

After the mapping was completed, the expert groups were provided with the scale score for each item they had mapped, together with a scatterplot (or a series of scatterplots in the case of mapping to the ACARA LPs) showing the relationship between their mapping of items to LP levels, and item difficulty. They were instructed to examine and discuss outliers. As a result of these discussions, the LP level classification of a small number of items was modified.

As a final stage in the process, the ACARA and ACER teams met to reflect on the results of the cross-validation exercise.

2.1.2   Methodology for mapping additional NAPLAN items to the NLNLPs

The ACARA expert literacy and numeracy teams also mapped a set of approximately 400 NAPLAN Numeracy test items and a similar number of items from the NAPLAN Reading domain test sourced from NAPLAN paper tests from 2012 to 2016 to the NLNLPs. This activity was in addition to, and separate from, the cross-validation activity ACARA and ACER completed (as described above).

The set of NAPLAN numeracy items had previously been assembled as a representative sample of content and difficulty. The ACARA numeracy team recorded comments as each item was mapped, if the item was difficult to map, or contained multiple elements which made it difficult to map to a single indicator. Once mapped, a plot was generated for each sub-element of the LPs, showing the LP level against the NAPLAN scale score, with the intent of verifying that the sub-element did generally increase in difficulty as levels progressed. Only items that had been mapped to a single indicator with reasonable confidence were plotted, so that the range of difficulty could be interpreted as intrinsic to the LP level, rather than to some other feature of the item. As the NAPLAN test items could be ranked in order of difficulty they could also be used to provide evidence for NLLP indicators that were out of sequence or mapped to items across a range of levels.

The set of NAPLAN reading items represented the range of skills and the diversity of text types and item types assessed across the four test year levels. The test items were scanned to ensure a balance of text types, text features and were reviewed at each test level. As well, the NAPLAN texts were aligned to the text complexity scale in the NLLP. All items aligned to at least one indicator in the Understanding texts sub-element as either a direct match or a partial match. The ACARA literacy team recorded comments as each item was mapped about the nature of skill matches and text matches, the specificity of the skill in the item or the indicator in the NLLP and any possible implications for the NLLP, where matches were fractional or tenuous. Thematic analysis of the comments was conducted to identify patterns of matches, omissions or limited alignment.

2.1.3   Methodology for comparing the Brightpath performance descriptions with the National Literacy Learning Progression (Writing)

The Brightpath resource is a system for assessing students' writing using a performance scale supported with exemplar work samples. The resource is widely used by schools in WA, SA and NT. The Brightpath performance scale and accompanying descriptions are designed to assist teachers to assess students' writing, validate grading decisions and plan for future teaching. Brightpath includes performance scales with detailed indicators for a number of forms of writing including narrative, oral narrative, persuasive, recount, book review and information report. Each of these writing genres has a separate and independent scale, but descriptors for aspects of writing common to all genres, such as punctuation are often the same in each scale.

ACARA compared the Brightpath writing performance data and descriptors against the NLLP (writing) for complete or partial matches. This allowed ACARA to test the alignment for the purpose of determining any improvements to the literacy (writing element) progression.

Brightpath provided ACARA with their performance descriptors and data behind each of their writing assessment scales. The ACARA team used that information to cross-check:

- the sequence of acquisition of knowledge, skills and understandings in the NLLP
- the content included in the sequence of knowledge, skills and understandings
- the clarity and readability of the descriptions of the knowledge, skills and understandings
- the relationship of the NLLP to some pairwise scaled student scripts
- the alignment of the NLLP indicators to the genre specific indicators in Brightpath.

2.1.4   Mapping of existing literacy and numeracy assessments

In the discovery phase, ACARA also set out to identify existing assessments in literacy and numeracy and investigate their alignment to the NLNLPs. In addition to NAPLAN items, the ACARA literacy and numeracy expert teams mapped a number of literacy and numeracy assessments used in jurisdictions to the NLNLPs. This exercise provided further opportunities to examine whether the sequences of knowledge, skills and understandings described in the NLNLPs were supported by any data from these assessments, and if the content of the assessments revealed any limitations in the descriptions of knowledge, skills and understandings in the NLNLPs.

The assessments were identified initially from a national stocktake ACARA completed in January 2019. Early in 2019, ACARA undertook a stocktake of existing assessment resources being used nationally, including assessments which states and territories have invested in and any existing commercial solutions. Through the Schools Policy Group (SPG), states and territories were contacted and asked to provide information about assessment resources that are being used in F–12 government and non-government schools, including those provided by the department, the non-government sectors, the curriculum authority, where relevant, and by external parties.

The stocktake confirmed the value in starting with literacy and numeracy in the design and development of the initiative. Most of the assessment resources in use in schools focus on various aspects of literacy and/or numeracy. Jurisdictions and schools value literacy and numeracy as key foundational areas for development of student learning. There are existing assessments and resources (e.g. ACER PAT, Brightpath and NSW Best Start assessments) with links to existing learning progressions (ACER and ACARA progressions). The established underlying data from these assessment resources can be used to inform the discovery and alpha phases.

In June, a follow up survey was sent to ACARA's F–12 Curriculum Reference Group to find out whether jurisdictional literacy and numeracy assessments had been aligned to the NLNLPs and if there was any interest in ACARA undertaking the mapping or reviewing jurisdictional mapping of these assessments to the NLNLPs. Several states (NSW, QLD, VIC and WA) reported mapping jurisdictional assessments to the NLNLPs and/or the curriculum. Other states (TAS, ACT) had not yet undertaken the mapping process of their assessments.

Following consultation with jurisdictions the ACARA literacy and numeracy expert teams mapped the following jurisdictional assessment resources to the NLNLPs:

- QLD Early Start literacy and numeracy checks – On-entry to Prep, end of Prep, end of Year 1 and end of Year 2
- SA Phonics Screening Check – Year 1
- NSW Best Start Kindergarten (Literacy and Numeracy) and Best Start Year 7 (Literacy and Numeracy)
- Victorian English Online Interview – Modules 1 and 2
- Victorian Mathematics Online Interview
- Victorian Fractions and Decimals Online Interview – Years 5-10
- WA First Steps Diagnostic Assessments (Number).

3   Key findings

The mapping and cross-validation activities completed during discovery confirmed that the NLNLPs are fit for purpose and robust in their current form and structure. The activities also provided evidence to support the need for some content refinements, with minimal changes to literacy and more considerable changes to the national numeracy learning progression.

All of the jurisdictional assessments were found to be highly aligned to the NLNLPs. Given the close alignment of these assessment resources to the NLNLPs, they can be utilised in the alpha phase, noting further work will need to be undertaken in alpha to ensure that the assessments meet the quality criteria as detailed below.

3.1   National Literacy Learning Progression

The mapping confirmed process confirmed the NLLP is fit for purpose and robust in its current form and structure. The mapping process confirmed the accuracy of developmental sequence of literacy knowledge, understanding and skills, and in particular, affirmed that in the early levels of most of the sub-elements, there was little need for changes to content. Across all levels, the investigation indicated there was no unnecessary or repetitious content. It also affirmed there was conceptual congruence across the literacy elements. The structure of the NLLP into larger sub elements, such as Creating texts supported by more detailed sub-elements, such as Spelling was endorsed by the mapping as it enabled more flexible use of the NLLP and the cogent grouping of indicators within the levels.

The need for content refinements became apparent in the sub-elements of Understanding texts, Creating texts, Phonic and word knowledge, Phonological awareness and Grammar. The data from the NAPLAN and PAT reading items and mapping to jurisdictional assessments provided little evidence for changing the indicators in the Speaking, Listening, Spelling and Punctuation sub-elements. There was no available assessment with relevant data to support a review of the sub-elements of Fluency, Handwriting and Keyboarding.

Different assessment resources informed the review of the NLLP in different ways, supporting either the analysis of the constrained or unconstrained literacy skills. The mapping identified that most refinements would be at the indicator level with very specific refinements needed to improve the constrained skills sub-elements. In the unconstrained skills the mapping identified the pathway of skills development across levels needed to be more systematically represented in skill sets such as comprehension and writing persuasive texts.

The mapping process highlighted issues with the clarity of some indicators. These indicators could be rewritten to provide more specific and comprehensive information. The clarity of some indicators could be improved through limited modifications to wording to eliminate generalities and incongruencies and ensure consistent use of terminology and relevance of examples. These proposed refinements would be confined to sub-elements and would not create flow-on changes to other sub-elements.

3.1.1   Writing element

There was broad alignment between the Brightpath and NLLP progressions in describing the key features of writing, such as spelling and development of ideas, that should be included in a progression. Both progressions include levels as developmental stages not indicative of intervals in time but describing the order in which students acquire the necessary skills and knowledge. In general, the Brightpath progression and the NLLP presented a similar trajectory of skill development, but at some levels the granularity of the Brightpath descriptors revealed some gaps in the NLLP, for example the development of character in imaginative texts (narratives).

The comparative analysis of the Brightpath writing scale and descriptors highlighted opportunities for improvements to the Creating texts sub-element, in particular providing indicators that systematically describe skill development in specific genres, such as persuasive writing. The mapping identified specific aspects that could be strengthened or

added, particularly at the higher levels of imaginative (narrative) and persuasive texts. The Brightpath descriptors showed the development of aspects of writing such as punctuation and spelling aligned with the NLLP supporting sub-elements such as Spelling.

NAPLAN Conventions of Language test items were mapped to the NLLP sub-elements of Spelling, Grammar and Punctuation. The NAPLAN items assessing spelling and punctuation provided strong evidence for the veracity of the Punctuation and Spelling sub-elements but exposed flaws in the Grammar sub-element. Some important grammar skills, such as noun-verb agreement and use of prepositions were either omitted or poorly represented in the Grammar sub-element, indicating a need to revise the Grammar sub-element.

3.1.2   Reading element

The comparison of Progressive Achievement Test (PAT) Reading items and Reading element of the NLLP showed that the general trajectory of reading development aligned, with over 95% PAT items matching to an indicator in the NLLP, but differences emerged in the Understanding texts sub-element where it became clear that the NLLP did not present an explicit and comprehensive developmental pathway for a number of key comprehension skills such as locating information and drawing inferences. PAT test items from a range of levels could only be mapped to indicators in levels 6 and 7 of the NLLP. This was because the necessary granularity in the description of relevant skills was not included in the NLLP, across a range of levels. Two PAT items did not match to an NLLP indicator because they assessed highly sophisticated reading skills, beyond the current levels of the NLLP. The comparison highlighted the need for more systematic and specific representation of some skills across levels in the NLLP.

Different interpretations of terminology became evident when the ACARA and ACER teams met to discuss the comparative analysis. In particular, inconsistent use of some terminology and metalanguage, such as 'locate information' in the NLLP came to light in both the Understanding texts and Phonics and word knowledge sub-elements.

The comparative analysis of the NLLP and ACER learning progressions provided evidence for some refinements to the NLLP. Where the ACER learning progression has specific strands of 'locating information', 'understanding' and 'evaluating and reflecting', the NLLP has a single comprehension strand within the Understanding texts sub-element. The comparison highlighted the need for consistent and systematic development in the Understanding text sub-element of comprehension skills of 'locating information', 'understanding' and 'evaluating and reflecting' especially in the middle levels. Jurisdictional assessment resources including Victorian Online Interviews and NSW Best Start Y7 also supported the inclusion of skills in locating information, evaluating a text and identifying author perspective at earlier levels of Understanding texts.

The mapping process highlighted issues with the clarity of some NLLP indicators. A few indicators were mapped repetitively to a range of indicators across the ACER LP levels. The clarity of these indicators could be improved through limited modifications to wording to eliminate generalities and incongruences and ensure consistent use of terminology and relevance of examples.

The NLLP Reading element is underpinned by the Text complexity appendix which describes four levels of text complexity. ACER describe fourteen levels of text complexity, suggesting that the NLLP Text complexity could be refined to provide more precise descriptions

The aligning of the NAPLAN reading test questions (items), from the four test year levels to the NLLP indicators provided evidence that supported the sequencing of NLLP levels and to a lesser extent, the clustering of the indicators within levels. In general skills represented by the NAPLAN test items correlated well with the indicators in the Understanding texts sub-element. As with the PAT items, the NAPLAN items highlighted inconsistencies in the development of a number of skills across the levels. These inconsistencies included skills which were introduced at early levels but not represented as a clear developmental pathway through the levels and omission of some knowledge and skills relevant to reading such as aspects of interpreting and drawing inferences. As with PAT items, NAPLAN items with significant variation in difficulty all aligned to the same indicator, providing further evidence for

revisions to the Understanding texts comprehension and processes threads. The range of vocabulary items tested in NAPLAN surfaced omissions in the vocabulary thread of Understanding texts, with the critical skill of understanding vocabulary in context poorly represented.

The SA Phonics check highlighted the need for refinements to Phonic knowledge and word recognition sub-element. The NLLP does not describe the manipulation of all phonemes or the transition from single to multisyllabic words explicitly.

3.2   National Numeracy Learning Progression

The mapping process confirmed the NNLP is fit for purpose and robust in its current form and structure. The mapping did provide evidence to support the need for some refinement to the content of the current progressions. The mapping also identified gaps and the need for new content to meet the numerical needs of students required to access the Australian Curriculum.

The comparative study involved mapping both progressions in a two-way process, using each as the initial base. This was then followed by a cross-check of a small set of NAPLAN test items against the ACER Mathematics learning progression and a small set of PAT Maths items against the NNLP. The exercise confirmed there is close alignment between the two progressions, however, the NNLP provided more granularity and included specific threads of learning that were not captured in the ACER progression, whilst the ACER progression contained content outside the scope of both the Australian Curriculum: Mathematics and the NNLP.

The mapping identified some issues with the NNLP pertaining to terminology and the interpretation of content. The PAT item mapping produced some initial findings with a 79% alignment to the NNLP. Although this was only a small sample of items, the findings were supported by an analysis of further mapping conducted later in the discovery phase. The specificity of models or approaches within sub-elements limited the scope for item mapping. An example of this includes the explicit reference to the linear model in the sub-element Interpreting fractions, which limited the mapping of assessment items that used other models for representing fractions such as an area model. The need for content refinement became apparent in the sub-elements of Interpreting fractions, Comparing units, Understanding money, Measuring time, Positioning and locating, Understanding geometric properties and Understanding units of measurement.

The assessment item mapping strongly indicated the need to consider the cognitive processes that are implicit within observable behaviours. Many assessment items required the calculation of real-world problems and formulating into mathematical expressions. The nature of the items made it difficult to map the item to a specific indicator and required mapping across multiple indicators and levels and in some cases across sub-elements. This was affirmed in Additive strategies, Multiplicative strategies Quantifying numbers and Number patterns and algebraic thinking.

The extensive mapping and validation of 400 additional NAPLAN items produced several findings, some qualitative (through the mapping process alone) and some quantitative (using NAPLAN scores) that have provided support to the recommendations for refinement of the NNLP. The key findings related to:
- editing of indicators to provide a wider conceptual scope rather than a specific approach to learning within sub-elements, and rationalising into potential groups of indicators
- content that needs to be added due to identified gaps in the current NNLP
- misalignment of the sequencing of content within several sub-elements.

There were several quite substantial gaps identified which will require the addition of new content. Based upon the analysis of the NAPLAN mapping, the elements of Measurement and geometry, and Statistics and probability require the most refinement and additional content. The mapping of NAPLAN demonstrated that approximately 30% of items were not aligned to any indicators. Transformational geometry such as tessellations, congruency and similarity were identified as missing content in the NNLP. Spatial reasoning and the use of formulas to calculate area, volume and

surface area along with the developmental sequence of learning about angles as a measure of turn were all identified as omissions in the NNLP progressions.

The quantitative analysis flagged concerns with the Interpreting and representing data sub-element. NAPLAN items scoring in a range from 300–550 all mapped to level one of the NNLP suggesting there are significant levels of sophistication within one-to-one data displays lacking in the NNLP. The mapping also identified a gap in content around the collection of data and the representation of data in tables and charts.

The NAPLAN assessment mapping revealed the need to consider the developmental sequence of learning to solve multi-step problems. Multi-step problem solving is not sufficiently captured in the NNLP. Mapping an item to all the relevant indicators across multiple sub-elements, highlights the need to review the sequence of learning to problem solve mathematically.

The mapping of jurisdictional assessment resources has provided clear findings, supporting the findings from mapping of NAPLAN and PAT Maths items. All assessments aligned to the NNLP to varying degrees. The Qld Early Start on-entry to Prep and end of Prep, WA First Steps Diagnostic tasks and NSW Best Start assessments had strong alignment >93%. The Mathematics Online Interviews (MOI) had several items that did not align to any of the indicators within the NNLP resulting in an 81% overall alignment and the QLD Early Start End of Year 1 and End of Year 2 had 93% and 85% alignment respectively.

Some of the levels within sub-elements of the NNLP were not recognised in the assessments. Overall, 72% of the NNLP levels were covered as follows:
- Number sense and algebra 73%
- Measurement and geometry 69.5%
- Statistics and probability 74%

The sub-elements assessed as having poor coverage were Multiplicative strategies at 57%, Positioning and locating at 40% and Understanding money at 28%.

Across all assessment resources the difficulty in determining the mental strategies students may have used influenced the results of the mapping. Given that the indicators in the NNLP are written as observable behaviours, many matches from the mapping were found to be partial or inferred. From the MOI and Fractions and Decimals Online Interview (FDOI), 19% of the MOI and 6% of the FDOI assessment items were not aligned. This has indicated potential gaps in the NNLP such as estimating quantities, use of number lines and the ordering of numbers greater than 1000.

The most significant area of misalignment was the abstraction of a problem into mathematical symbology. Several questions required students to either read and interpret symbology or convert a problem into the appropriate number sentence. The visualisation of shapes and objects requiring students to reason spatially also attributed to the misalignment to the NNLP. Several of the sub-elements contain indicators that explicitly provide one approach to learning, which eliminates the potential of mapping items that assess a different approach. This has highlighted the need to make clear distinction between explicit content (observed behaviours demonstrating an underlying concept) and the examples of the behaviours expected at each level. The granularity of indicators within a level also led to several items only mapping to a level rather than a specific indicator. This indicates the need to rationalise the levels of sub-elements.

3.3   Alignment of existing assessments

Existing jurisdictional literacy and numeracy assessments were mapped to targeted sub-elements of the NLNLPs. None of the assessment resources mapped to all sub-elements of the NLNLPs. For example, the SA (UK) phonics screening check only targets one sub-element in the literacy progression, phonic recognition and word knowledge, while the Qld Early Start On-Entry covered most of the sub-elements of the NLNLPs.

All of the jurisdictional assessments were highly aligned to the NLNLPs. A well aligned assessment was defined as having at least 75 per cent alignment of test items to indicators. The average alignment across all assessments was 90 per cent, with the SA (UK) Phonics Screening Check, NSW Best Start numeracy assessments and WA First Steps Diagnostic Assessment (Number) assessed as 100 per cent aligned.

The mapping analysis of existing assessments also identified areas for refinement of the content of the NLNLPs, and in some cases affirmed the findings of the other mapping exercises described previously.

Tables 1 and 2 below illustrate the coverage of the assessments against the literacy and numeracy sub-elements of the NLNLPs.

Table 1: Coverage of Literacy sub-elements

Literacy Assessments

Sub-elements

	Early Start (QLD)	Phonics UK Y1 (SA)	Best Start Kindergarten (NSW)	Best Start Yr 7 (NSW)	English Online Interviews – Foundation Module 1 (VIC)
Phonological awareness	✓		✓		✓
Phonic Knowledge and word recognition	✓	✓	✓		✓
Fluency	✓				✓
Understanding texts	✓		✓	✓	✓
Creating texts	✓		✓	✓	✓
Grammar	✓			✓	✓
Punctuation	✓			✓	✓
Spelling	✓			✓	✓
Handwriting and Keyboarding	✓				✓
Listening	✓		✓		
Interacting			✓		
Speaking	✓		✓		✓

Table 2: Coverage of Numeracy sub-elements

Numeracy assessments

Sub-elements	Best Start Kindergarten (NSW)	Best Start Yr 7 (NSW)	Early Start (QLD)	Fractions and Decimals (Years 5 – 10) (VIC)	Mathematics Years Online Interview (VIC)	First Steps – Number (K-2) (WA)
Quantifying numbers	✓	✓	✓	✓	✓	✓
Additive Strategies	✓	✓	✓		✓	✓
Multiplicative strategies		✓	✓		✓	✓
Operating with decimals		✓		✓		✓
Understanding money			✓	✓		✓
Number patterns and algebraic thinking	✓	✓	✓		✓	✓
Comparing units (ratio, rates and proportion)				✓		
Interpreting fractions		✓	✓	✓		✓
Understanding units of measurement		✓	✓	✓	✓	
Understanding geometric properties		✓	✓		✓	
Positioning and locating			✓			
Measuring time		✓	✓		✓	
Understanding chance		✓	✓			
Interpreting and representing data		✓	✓			

*First Steps – Measurement, Space, Chance and Data were not mapped

Most jurisdictional assessments aligned well to the NLNLPs. Mapping test items often involved a degree of interpretation as the purpose and design of the assessments is quite different to the purpose and design of the NLNLPs. An assessment item does not necessarily enable judgements about student behaviour, nor allow for judgements about the methods students may have used to answer a test item.

Table 3 below shows the alignment of each assessment resource to the NLNLP.

Table 3: Alignment of each assessment to the NLNLPs

Assessment Resource	Literacy % of items aligned	Numeracy % of items aligned
Qld Early Start On-Entry	90	93
Qld Early Start End of Prep	91	95
Qld Early Start End of Yr 1	96	
Qld Early Start End of Yr 2	74	
SA Phonics screening check	100	
NSW Best Start Kindergarten Assessment	94	
NSW Best Start Yr 7	87	
VIC English online interview (MOI)	71	
VIC Fractions and Online Decimals	-	
WA First Steps Diagnostics	-	

4   Recommendations to refine the National Literacy and Numeracy Learning Progressions

As a result of the mapping and cross-validation exercises conducted by ACARA it is recommended that content refinements be made to the NLNLPs in four broad areas. These areas are interrelated, and some indicators may be impacted in more than one area.

1. clarity of progression
2. consistent use of terminology within and across levels
3. level of specificity and clarity of indicators and examples
4. gaps in content.

The tables on the following pages illustrate actions and examples for refining the NLNLPs against each of these four areas.

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4.1   Suggested refinements to the National Literacy Learning Progression

Table 4: Clarity of the Literacy Progression

Findings	Recommendations	Actions	Example/s
Analysis showed that indicators were in the right order but not always systematically represented in some skills areas.	Review indicators for continuity of knowledge, understanding and skill development across levels.	Revise sub-elements and amend indicators in specific skill areas to eliminate gaps	**Understanding texts** • Review the comprehension skills of locating, inferring and identifying main idea across levels.
The mapping showed the middle levels of the progression lacked necessary detail in some skill areas.	Unpack the middle levels to ensure the continuity of skill development.	Ensure a complete and consistent developmental pathway.	**Creating texts** • Review persuasive texts in writing to ensure increasing sophistication of writing conclusions. **Grammar** • Extend developmental pathway into the upper levels for aspects such as noun verb agreement and tenses.
The mapping showed the middle levels of the progression lacked necessary detail in some skill areas.	Revise Text complexity to produce a tool that effectively underpins skills development in Understanding texts.	Create an additional level for Text complexity to improve the functionality and clarity in the two top levels.	**Text complexity appendix** • Expand the content relating to text structure in moderately complex texts (second highest level) and sophisticated texts (highest level).

Table 5: Consistent use of terminology within and across levels

Findings	Recommendations	Actions	Example/s
Analysis surfaced inconsistencies and disparities in expression, use of terminology and metalanguage.	Establish protocols for use of terminology.	Revise indicators for consistency of terminology and expression.	**Understanding texts** • Revise indicators to ensure clear and consistent references to multimodal and digital text.

Table 6: Gaps in content

Findings	Recommendations	Actions	Example/s
Comprehensive representation of constrained skills Analysis of the assessment resources revealed limited missing content within the constrained skill (Phonic knowledge and word recognition).	Review relevant sub-element coverage	Add indicators where required.	**Phonic knowledge and word recognition** Add • Reads multisyllabic words with common double graphemes • Says and represents a new word when an initial phoneme is deleted (cat/at)

Table 7: Levels of specificity and clarity of indicators and examples

Findings	Recommendations	Actions	Example/s
Analysis surfaced issues in interpretation of indicators.	Rewording of indicators for clarity of language	Revise indicators to ensure the key skill is foregrounded and review qualifying language	**Understanding texts** • Revise ambiguous indicators which include multiple skills (e.g. UnT9.12). **Phonic knowledge and word recognition** • Review the qualifying language used to describe phonemes.

Understanding texts			
Level 4	Level 5	Level 6	Level 7
Understanding Comprehension • makes relevant comments or asks relevant questions to demonstrate understanding of the text (existing indicator)	Understanding text Comprehension • Describes the main idea in a simple text with a clear main idea (new indicator)	Understanding text Comprehension • Identifies main idea by synthesising information across a simple text (new indicator)	Understanding text Comprehension • Identifies main idea in a predictable text (existing indicator)

Creating texts			
Level 8	Level 9	Level 10	Level 11
Organises persuasive ideas to support the reader: Concludes with a repetitive restatement (amended indicator)	Concludes with a summative statement (amended indicator)	Concludes with a statement that emphasises the most relevant arguments (new indicator)	Concludes with an authoritative statement which may include a direct appeal to the reader or a call to action. (new indicator)

Indicators amended for clarity and specificity. New indicators added to complete sequence

Figure 1: The example above illustrates these recommended actions for and Understanding texts (Level 5).

4.2   Suggested refinements to the National Numeracy Learning Progression

Table 8: Consistent use of terminology within and across levels

Findings	Recommendations	Actions	Example/s
Some indicators were inconsistent with the language of the Australian Curriculum: Mathematics. This can lead to confusion and misinterpretation of the indicators.	NNLP uses terminology consistent with the Australian Curriculum: Mathematics	Edit indicators to reflect the language of the Australian Curriculum: Mathematics	**Quantifying numbers** • Compares the size of decimals (including ragged decimals such as 0.5, 0.25, 0.125) Recommended rewording • Compare the size of decimals, including decimals expressed to a different number of decimal places.

Table 9: Level of specificity and clarity of indicators

Findings	Recommendations	Actions	Example/s
Ambiguity is created through generalizing counting principles, structure of number and place value within Quantifying numbers.	Separate the sub-element into two new sub-elements Number and Place Value (to capture the structural aspects) and Counting Principles (adding in ordinality and cardinality).	Refer to the literature, empirical evidence from mapping exercises and other sources.	**Quantifying numbers** • Additional content can be added to Number and Place Value (NPV) sub-element to eliminate the identified gaps. NPV should be extended to cover, subitizing beyond 5 (including perceptual and conceptual subitizing) the structure of decimals, integers, irrational numbers such as π and scientific notation.

Table 10: Clarity of the Numeracy Progressions

Findings	Recommendations	Actions	Example/s
Errors in content and content found outside of the Australian Curriculum	NNLP only include content within the Australian Curriculum	Review the content within the sub-elements.	The following indicators are mathematically incorrect: **Number patterns and algebraic thinking** • recognises that any number multiplied by 0 equals 0 which means that one of the factors is 0 (3 x ? = 0) **Operating with percentages** • interprets per cent as meaning 'out of 100' **Measuring time** • identifies issues associated with different time zones • identifies the relationship between <u>longitude</u> and time zones (investigates the location of the international date line)
The Understanding money sub-element only refers to coins as representations of money rather than notes and digital currency (which includes 1 – 99 cents).	Extend the sub-element to include 'digital currency', 'budgets','% discounts', 'best buys', 'profit and loss', 'interest and loans' and 'taxation'.	Refer to the literature, empirical evidence from mapping exercises and other sources.	**Understanding money** Recommended new content: • use rounding to estimate the total amount of money needed for a transaction such as rounding up the prices of items to gain an approximate total for shopping. • plan a simple budget • calculate the interest payable on a credit card transaction • solves problems involving money in real-world contexts that apply knowledge of positive and negative integers, for example calculating negative interest rates
The Interpreting and representing data (IRD) sub-element needs review based on the ACER and NAPLAN mapping exercises.	Review the IRD sub-element	Refer to the literature, empirical evidence from mapping exercises and other sources.	**Interpreting and representing data** • The statistical enquiry cycle is not captured with the posing of statistical questions, collection of data and investigations.

Findings	Recommendations	Actions	Example/s
The grouping of skills and knowledge across Measurement and geometry has created ambiguity.	Review the skill development and key concepts such as distinguishing between 2D and 3D	Refer to the literature, empirical evidence from mapping exercises and other sources.	**Understanding units of measurement** • This indicator is too broad and doesn't capture the varying levels of sophistication • measures, compares and estimates length, area, mass, volume and capacity using standard formal units

Table 11: Gaps in content

Findings	Recommendations	Actions	Example/s
Aspects of problem-solving and reasoning numerically are not captured in the progressions such as learning to solve multi-step problems, abstraction in formulating a problem (choosing the mathematics for the problem at hand).	Add content that captures the developmental stages students' progress in solving more sophisticated numerical problems. This would include strategic thinking, computation and estimation (approximation). Review Additive strategies (AS) and Multiplicative strategies (MS) as sub-elements to include the symbolic representation of numbers and operations, thinking and reasoning	Refer to the literature, empirical evidence from mapping exercises and other sources.	**Multiplicative strategies** Recommended additions • Students recognize and understand the purpose of some mathematical numerals and symbols such as + 3 means add 3 more. • With guidance the student can pose and answer simple questions that can be solved using one step mathematical computations such as counting, grouping and sorting. • Connects and converts decimals to fractions to assist in mental computation involving multiplication and division (to find 16 x 0.25, recognises 0.25 as a quarter, and finds a quarter of 16, to determine $0.5 \div 0.25$, recognises the answer is 2 as there are two quarters in one-half)

Findings	Recommendations	Actions	Example/s
			Operating with percentages Recommended additions: • determines the whole given a percentage, for example given 20% is 13 mL, determines the whole is 65 mL • solves problems using ratios and scale factors in a range of contexts, for example mixing liquid solutions, enlarging images and objects, changing recipes **Interpreting fractions** Recommend additions: • applies fractions as division to solve problems, for example to solve 'Two chocolate bars shared among three people' understands that it is 2 divided by 3 therefore they each get 2/3 of a chocolate bar
Geometric transformations (translation, rotation, reflection, scale factor enlargement and reduction) are poorly explored: development of angles as both a measure of turn and as a geometric shape.	Transformations and tessellations should be included in the ACARA LPs.	Refer to the literature, empirical evidence from mapping exercises and other sources.	**Understanding geometric properties** Indicators for Understanding angles are only included in UGP2 and UGP5. Measuring angles or degrees as units of measurement is required. Extend the progression for basic transformations and symmetry because they are only introduced at UGP2 and UGP4.
Key content and numerical concepts missing from the progressions such as use of number lines (numerically represented as scales of measurement, axes on a graph etc.)	Review NNLP elements to ensure all numerical 'big ideas' are included within developmental sequences.	Refer to the literature, empirical evidence from mapping exercises and other sources.	Example of content missing from the NNLP sub-elements **Quantifying Numbers** • recognise, locate, model and order numbers to at least 1000 (uses a number line with an appropriate scale to locate 2 and 3-digit numbers)