RESEARCH REPORT
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Screening that Counts: Why Australia needs universal numeracy screening

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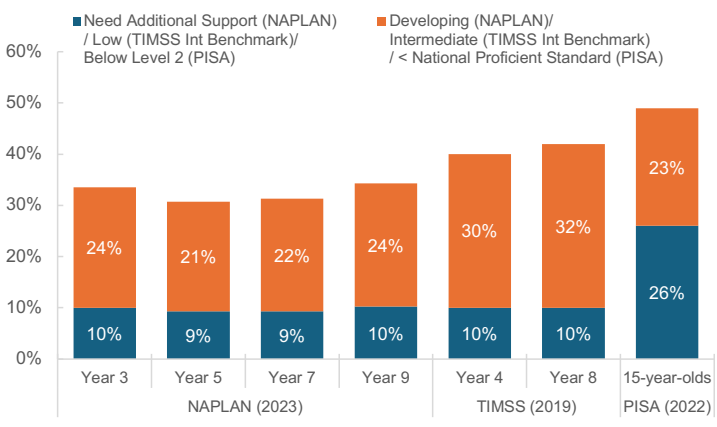
- Universal screening in schools is recognised as best practice to identify students at risk of struggling with essential and foundational skills in literacy and numeracy.
- Screening involves assessing all students to predict those most likely to need extra support through additional intervention. Early intervention can increase the probability of such students succeeding at school.
- Over the past few years, Australia's education policymakers have introduced a Phonics Screening Check that is used to identify students at risk of struggling with reading.
- Major reviews of Australia's education systems have warned that equivalent screening for early numeracy is not yet widely or effectively used. This is because current approaches to maths assessment were not designed as 'universal screeners' and hence do not accurately and efficiently collect data reflecting risk for future maths difficulties. This compromises the ability of schools to identify and intervene early enough to improve students' outcomes.
- A nationally consistent and evidence-based screening tool, focused on Early Number Sense, and delivered for all Year 1 students, should be a priority. Combined with appropriate education intervention, this would improve the outcomes of struggling students and lift overall achievement in maths.

Many students struggle with maths and need extra support to catch up

- Around 400,000 Australian students per year — or 10% of students — require additional support or are below the international benchmark in mathematics. More than 25% of 15-year-olds are low performers in the subject, according to international testing.

Proportion of Australian students achieving at levels below proficiency in domestic and international tests of numeracy and mathematical literacy.

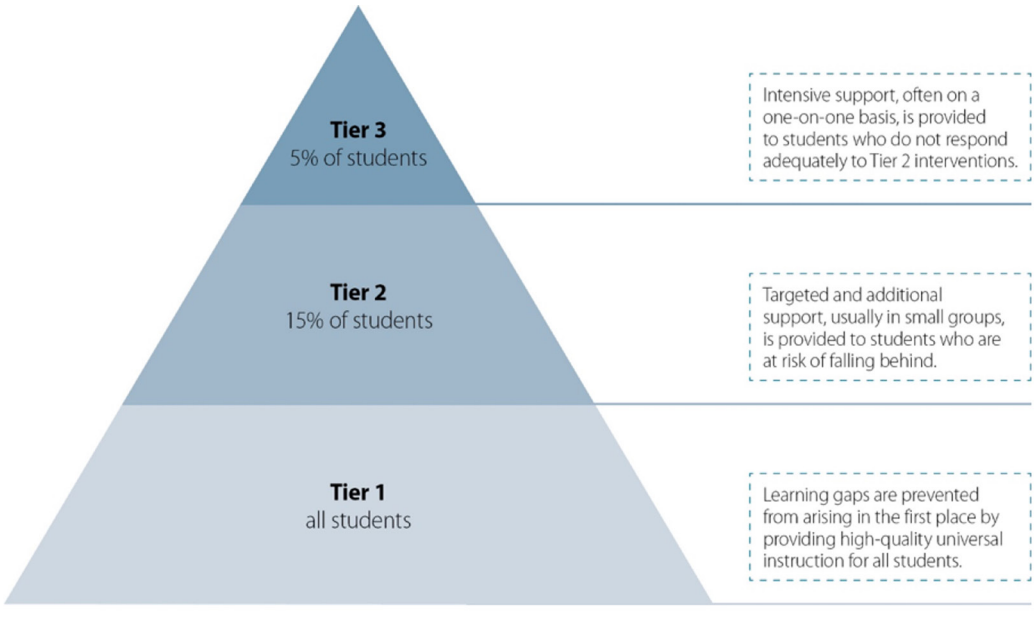


- Only around 20% of students who fall behind in maths ever catch up. This indicates a need to improve accuracy in identifying struggling students early and intervening more effectively to lift achievement.
- Disappointing outcomes cannot be attributed to a lack of money or instructional time. Australia spends around 23% more per student per year than the OECD average and requires the highest number of compulsory instructional hours in general education in the OECD.
- Early difficulties in maths can result in a 'failure cycle' — where students who struggle with the subject can go on to suffer from a negative, cumulative spiral that puts students at greater educational risk. This cycle can be prevented when difficulties are identified and addressed early.

Representation of the failure cycle applied to mathematics

Students at risk of struggling with maths can be identified early with effective screening

- Students who struggle with maths can often be identified through effective screening as early as when they first start school.
- Though NAPLAN testing is available to all students, it is not carried out until Year 3. This is far too late to screen students for risk of difficulty with maths.
- It would be viable to conduct screening and monitor progress in Year 1 of schooling. This would:
  - Allow students who need help to be identified early enough and to receive the support they need before falling irrecoverably behind.
  - Complement the current efforts in many school systems to screen for literacy difficulties by phonics screening checks.
- Universal screening tools are most effective when they form part of a systematic process for collecting and acting upon data to ensure every student receives the level of education support appropriate for their needs.
- The goal of a numeracy screening tool must be to measure children's acquisition of skills and knowledge that **predicts future maths difficulty**.
- Screening tools administered to whole populations of students also need to be **efficient**, yield **reliable** scores, **make accurate predictions** about who is likely to struggle without further support and **lead to particular instructional actions.**
- Maths screening should occur within a multi-tiered framework (particularly the of Multi-Tiered Systems of Support (MTSS); see Figure below), which includes systematic processes for assessment and instruction at three tiers. Existing tools should be realigned to this framework, and progress-monitoring tools developed.



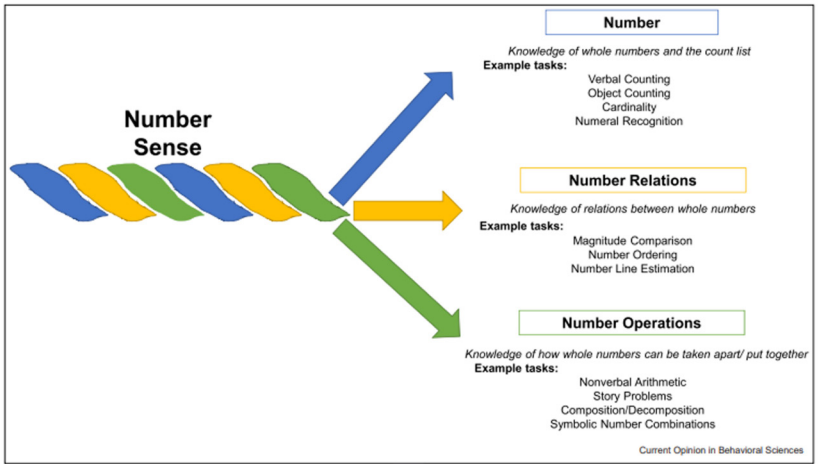
MTSS model showing a coordinated system of increasingly intensive support offered in three 'tiers'. Source: Improving Outcomes for All: The Report of the Independent Expert Panel's Review to Inform a Better and Fairer Education System

Australian school systems do not effectively screen students in maths

- Broad processes for identifying students struggling with maths in Australia generally rely on the use of individual interviews or standardised achievement tests.
    - **Interviews** involve mathematical tasks being posed to the student one-to-one, whilst the interviewer (usually a teacher or education aide) notes the student's responses and strategies.
    - **Standardised achievement assessments** involve administering paper or digital tests that score students on correct responses across the maths curriculum, and commonly classify students into levels of achievement.
- Australian schools and teachers currently lack systematic, accurate and efficient approaches to identifying students at risk of maths difficulty and providing the evidence-based intervention that would set them on the right track for school success.
- Current tools used by schools do not possess many of the characteristics that would make them effective 'screeners'.
    - Most tools currently in use to gather data across all students are time-consuming individual interviews and/or don't adequately target and measure the domains of knowledge and skill that predict future maths difficulties
    - Most do not clearly identify students 'at-risk' or necessarily lead to instructional actions that are likely to improve outcomes for identified students.
    - Though current tools may be useful for diagnostic and summative assessment purposes, they do not have the features required of screeners.

Recommendation: Early numeracy screening to focus on three components of early 'number sense'

- Three factors support early numeracy success — those comprising early 'number sense': **number**, **number relations**, and **number operations**. These three components are all necessary for success in early mathematics.
    - **Number** involves understanding about number symbols and non-symbolic representations (such as dots), the ability to count items accurately, and read, write and say numbers. It also includes early understandings about the properties of numbers such as place value (understanding numbers as composed of their place value parts, e.g. 45 as 40 and 5).
    - **Number relations** refers to understanding the magnitude of numbers. It includes knowledge of sequence (number before/number after; one less/one more) in addition to the use of a 'mental number line' which enables students to compare numbers in terms of their magnitude (e.g. which is bigger, 71 or 48?) and to have an accurate sense of where they sit on a number line in relation to other numbers (more than/less than/half way/closer to etc).
    - **Number operations** comprises understanding and knowledge about addition and subtraction. It involves understanding the operations in terms of combining, separating and adding to sets, understanding that numbers are comprised of other numbers, and knowledge about the composition of small numbers (e.g. 9 as 4 and 5 or 14 as 10 and 4).
- Universal screening for number sense should occur in mid term 1 and early term 3 of Year 1, with the latter timepoint consistent across all Australian schools and data centrally collected. This data should be accessible to individual schools and to systems to assist with educational planning, programs evaluation and student tracking. The final timepoint (end-of-year) should utilise an existing test of standardised achievement as it measures achievement and occurs after instruction.



Three factor model of number sense as visualised by Jordan, Devlin and Botello (2022)

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