The Mental Maths Gap: What 6,098 Students Revealed

An assessment of mental calculation in Chilean schools and what it told us about foundational mathematical skills

Sylvia Langford | Chile | 2015

When learning maths doesn't lead to fluency

Children start learning addition and subtraction early in school. Multiplication and division come later.

As they advance, they're expected to use these operations with more confidence and independence.

But what happens when students move through school without getting fluent at the basics?

In 2015, Sylvia Langford ran an assessment involving 6,098 students from public and government-subsidised private schools in four Chilean municipalities.

She wanted to see how students performed at mental calculation and whether those skills were actually getting stronger as students moved up through the year levels.

The assessment

During October and November 2015, students from Years 2 to 12 took part in assessments in Temuco, Pitrufquén, Castro and Chonchi.

Two groups of operations were tested.

Assessment	School years	Students
Addition and subtraction	Years 2-3	1,466
Division	Years 4-12	4,632
Total		6,098 students

Each assessment had 36 calculations to be completed in two minutes.

The assessments were designed to test whether students could perform familiar calculations quickly and accurately, not just whether they'd been taught the operations.

That's a real difference. A student might understand how to solve a calculation but still take a long time getting through it.

The results showed how students performed under timed conditions, though they couldn't tell us exactly why individual students struggled.

What the results showed

Addition and subtraction: the early school years

Students in Years 2 and 3 had serious trouble completing basic addition and subtraction within the time allowed.

Year 2: An average of 5.5 correct out of 36, with 96.1% answering fewer than half correctly.

Year 3: An average of 8.6 correct out of 36, with 92.4% answering fewer than half correctly.

Averages improved between the two year levels, but most students in both groups couldn't finish half the calculations in time.

The question this raised: were students getting enough chances to practise basic calculations until they could do them with some ease?

Division: difficulties that continued through school

The division results showed the problem wasn't limited to young students.

In Year 4, students averaged 4.9 correct out of 36. About 92.4% got fewer than half right, and 39.3% didn't get a single correct answer within two minutes.

Performance did improve in higher years, but the difficulties stuck around.

By Year 8, the average reached 16.1 correct answers, with 59.6% still getting fewer than half right.

Sylvia then extended the assessment to smaller groups in Years 9 to 12.

Among the 80 Year 12 students tested, the average was 21.3 correct answers, and 37.5% still answered fewer than half correctly.

These results don't mean students couldn't do division at all. But many of them didn't show accurate, fluent performance under time pressure, even after years of maths education.

The results also raised questions about how well students knew their multiplication facts, since those are the foundation for division.

What students said about maths

Some of the most telling observations came from Sylvia's conversations with students after the assessments.

She asked about their experiences with mental arithmetic and how they felt about it.

Students who got more than 70% correct often described practising calculations daily in their early school years until they'd become good at them. They also felt more confident about maths generally.

Students who answered fewer than half correctly tended to describe maths as difficult, boring or frustrating. Some believed they just weren't good at it and had negative feelings about anything involving numbers.

But when Sylvia asked whether they wanted to be good at maths, they said yes.

They wanted to succeed. Many of them just didn't believe they could.

These were informal conversations, not a structured study. But they pointed to a connection between repeated difficulty and how students felt about their own abilities.

The role of practice

The assessments drew attention to a gap between being taught an operation and being able to perform it fluently.

Understanding how to add, subtract, multiply or divide matters. But understanding on its own doesn't guarantee that a student can do those operations quickly and accurately.

Mental calculation also takes practice.

Regular opportunities to apply what they've learned help students get better at retrieving and using mathematical knowledge.

For Sylvia, the findings pointed to the value of starting where each learner actually is and providing activities that get progressively harder, so knowledge turns into a usable skill.

The students' responses also hinted at a connection between successful learning experiences and motivation. When children keep struggling, they may start doubting their ability. When they can see their own progress, they may be more willing to keep going.

These connections were suggested by the observations, not proven by them.

Why this matters for Bamboo

The 2015 assessment showed the kind of educational gap that structured mental calculation programs like Bamboo are designed to fill.

Bamboo provides progressive activities in addition, subtraction, multiplication and division.

Instead of deciding what a student should practise based only on their school year, Bamboo offers different difficulty levels and opportunities to build foundational skills step by step.

Through short, structured sessions and regular practice, Bamboo is designed to help children get more accurate and fluent at mental calculation.

The point isn't speed for its own sake. It's helping children build the maths skills they need, so they can use them with more confidence and independence.

The 2015 assessments documented the difficulties students were having and help explain why programs focused on systematic practice exist.

Understanding the findings

This assessment involved a large number of students, but it wasn't a nationally representative study of mathematical ability in Chile.

It included students from selected schools in four municipalities. The groups tested in Years 9 to 12 were much smaller than those in earlier years.

The two-minute time limit measured both accuracy and speed. Lower scores don't automatically mean students didn't understand maths.

The conversations with students offered useful educational observations, but they didn't prove that insufficient practice caused the low scores, or that low scores caused negative attitudes.

The findings should be read as a historical snapshot of mental calculation performance and the questions it raised.

Final reflection

The main observation wasn't just that many students scored low.

It was that difficulties with basic calculations persisted across year levels, while some students described losing confidence and interest in maths along the way.

The findings pointed to the value of checking whether students have actually developed the skills to use what they've been taught.

For Sylvia, they showed the importance of clear instruction, the right level of difficulty and enough chances to practise.

Learning a mathematical operation is a first step. Being able to use it accurately, fluently and independently takes continued practice.

This case study presents findings from assessments conducted by Sylvia Langford in Chile in 2015. It describes students' mental calculation performance and the educational questions raised by the results.