

## Evidence for Learning Summary

Our evaluation found that students whose teachers received Thinking Maths made, on average, one month's additional progress in maths, however there were critical differences between year levels. Primary students<sup>1</sup> made an additional two months progress in maths, which is promising, but there were two fewer months progress for Secondary students. The program had a substantial impact on teachers' knowledge, but this improvement was not fully translated into impact on students' outcomes. This result has a high security rating and is very low cost to implement.

### Program summary

A three-term professional learning program for Years 6-9 maths teachers to engage middle school students' maths learning.

### Program Developer

South Australia Department for Education

### Independent Evaluator

Australian Council for Educational Research (ACER)

Type of Trial  
Efficacy

Students  
7,068

Schools  
158

Program Grant  
\$0

Evaluation Grant  
\$195,000

### Costs

\$\$\$ \$

### Security

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### Months Impact

+1

## The program and the schools involved

Thinking Maths is developed by the South Australia Department for Education. The project involved 158 schools in South Australia, most of which were located in the metropolitan (63%) and rural (30%) areas. There was an equal distribution of schools in low, mid and high social economic areas.



Mode  
Professional  
learning



Delivered to  
students by  
Teachers




Cost per student  
\$149 AUD



Intervention Length  
4-5 weeks intervals  
over 3 terms

<sup>1</sup> The terms 'primary' and 'secondary' will be capitalised when referring to schools or Year levels, and lowercase when referring to outcomes, in order to avoid confusion.

## Research results

Intervention vs control	Effect size [95% CI]	Estimated months progress*	E4L security rating+	Number of students	P value	E4L cost rating
All students	0.05 [0.00 – 0.10]	+1		7068 students in 158 schools	0.38	\$\$\$\$\$
Primary Years 5-7	0.14 [0.08 – 0.19]	+2	N/A	5013 students in 119 schools	0.05	\$\$\$\$\$
Secondary Years 8-10	-0.16 [-0.25 – -0.07]	-2	N/A	2055 students in 56 schools	0.05	\$\$\$\$\$
School Card holders	0.11 [-0.04 – 0.27]	+1	N/A	666 students in 118 schools	0.21	\$\$\$\$\$

\* Refer to Evaluation Report Appendix A, used to translate effect size into estimated months progress.

+ Refer to Appendix B, for E4L independent assessment of the security rating.

## Evaluation conclusions

1. The Thinking Maths program had a small positive effect, equivalent to one month of additional learning progress on Years 5-10 students' performance in the PATMaths achievement test, when compared to business-as-usual mathematics classes. However, these findings were not statistically significant<sup>2</sup>, meaning we need to treat them with some caution.
2. Thinking Maths had a statistically significant impact equivalent to two months learning gain in Primary students' achievement on the PATMaths test. However, for Secondary students, there were two fewer months of learning progress.
3. Among a sub-sample of School Card holders<sup>3</sup>, the students (both Primary and Secondary) of Thinking Maths teachers had two months additional progress in performance on the PATMaths test, however this finding was not statistically significant.
4. Thinking Maths had the largest statistically significant effect on mathematics teachers' pedagogical content knowledge, as well as their professional identity and self-efficacy. The intervention also showed a small positive impact on teaching practices overall, with students reporting that Thinking Maths teachers were more likely to give extra help when needed, ask questions to check understanding and challenge their thinking. Findings showed similar gains on students' cognitive engagement, but no additional gains in metacognition. These results on student outcomes were not statistically significant. A small and statistically significant increase in students' mathematics anxiety was also found.
5. Teachers reported a number of benefits of this professional learning program including hands-on activities, expert modelling of metacognition strategies and teaching resources that supported teachers to directly transfer ideas to their classrooms. The process evaluation indicated that timetabled lessons, common tests, set text-books, and lack of time to plan were barriers to effective implementation in Secondary schools. Schools and program development should consider differences in learning contexts to better accommodate and support teachers to optimise implementation.

<sup>2</sup> Evidence for Learning has developed a plain English commentary on [statistical significance](#) to support readers in interpreting statistical results in our reports.

<sup>3</sup> The School Card scheme offers financial assistance to low-income families to assist with school fees for students attending government schools in South Australia.

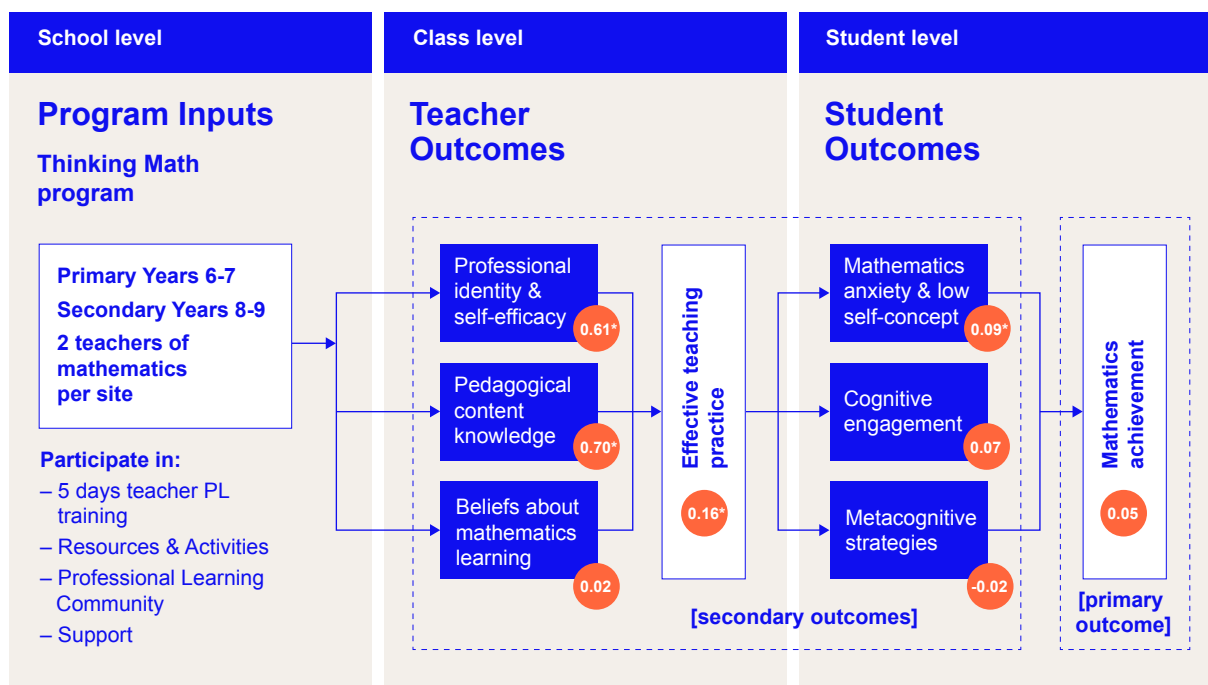
## Main findings and impact

The evaluation found evidence of a small positive effect of the intervention overall. Students whose teachers attended the Thinking Maths program made more progress in mathematics than similar students in business-as-usual classrooms. The small positive effect is equivalent to one month of additional learning progress. However, this effect was not statistically significant. Across this cohort, there was also a small positive effect on students' cognitive engagement and no effect on metacognitive strategies, which were not statistically significant. Students also showed a small and statistically significant increase in their mathematics anxiety.

There is stronger confidence about the differences between Primary and Secondary students' achievement. Primary students (Years 5-7) of Thinking Maths teachers made a learning gain of an additional two months, while Secondary students (Years 8-10) had two fewer months of learning progress.

The program had a large positive effect on how teachers perceived their pedagogical content knowledge, particularly at the Primary school level. Teachers were directly involved in a professional learning (PL) program designed, primarily, to build capacity in this domain. The evaluation also found evidence of changed teaching practices. Teachers showed commitment to implementing their learnings in the classroom to the extent that students reported recognising a small improvement in effective teaching practice, more-so in the Primary context. Since students were indirectly involved in the program through their teacher, it was anticipated that the level of impact on their achievement would be less, particularly given the short post-test timeline that did not allow for changed teaching practices to have its full impact. In most schools, students were tested only two weeks after the last PL session. That there was a positive impact so shortly after the PL was completed is encouraging and may mean even greater gains in the future for students of these teachers.

The Thinking Maths evaluation logic model with impact evaluation effect size results is below.



\*indicates statistically significant effect ( $p < 0.05$ )

Thinking Maths teachers were highly positive about the program and advocated for its wide-spread rollout. The Primary and Secondary teachers reported largely similar barriers and enablers. However, what emerged by the end of the PL sessions was that Primary teachers, more-so than Secondary teachers, reported the program had increased their mathematics understanding, their use of instructional strategies, and levels of student engagement. A correlation between student and teacher primary and secondary outcomes provided additional evidence that a stronger positive impact was experienced in the Primary schooling context. The Thinking Maths facilitators, in their role of providing consistent support across Primary and Secondary teachers, identified the following factors that may have contributed to this difference:

- **Dosage:** Secondary students were only exposed to the ‘treatment’ of changed teaching for 3 hours per week as opposed to Primary students whose class teacher’s shift in pedagogy was likely to impact more widely over the school day.
- **Resources:** A lack of concrete materials and equipment as well as shorter or inflexible lesson length may be a factor in the Secondary context.
- **Flexibility:** Fixed curriculum programming may not have allowed Secondary teachers the flexibility to trial tasks if they were off-topic.

## How much does it cost?

The cost of the Thinking Maths program is estimated at \$149 AUD per student per year. This estimate includes training and materials (\$1070 per teacher or \$43 per student), and the significant cost of five Temporary Relief Teacher (TRT) days replacement (\$2650 per teacher or \$106 per student). Estimates are based on training being delivered to a group of 35 teachers with an average class size of 25 students, reaching 875 students. This amount is rated as *very low*, according to the Evidence for Learning Cost Rating approach, based on the approximate cost per student per year of implementing the intervention over three years. As a Department-developed and delivered program, all costs were borne by the Department.



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FOR LEARNING**

To read more on the findings visit  
[evidenceforlearning.org.au/lif/our-projects/thinkingmaths/](https://evidenceforlearning.org.au/lif/our-projects/thinkingmaths/)

