

Evaluation Summary

Thinking Maths is a professional learning program for teachers of middle years maths (Years 6-9), designed to develop teachers' pedagogical content knowledge in order to improve students' mathematical achievement. At \$149 per student the program is low cost to implement.

The evaluation found that:

1

Thinking Maths may have had a small overall impact on students' maths achievement.

The program may be effective in supporting students. Students of teachers who received Thinking Maths made, on average, one month's additional progress in maths, compared to students of teachers who did not. The program may have an additional positive effect on students from disadvantaged backgrounds, however these findings were not statistically significant, meaning we need to treat them with some caution.¹

2

The program is effective for Primary but not Secondary schools.

Primary students made an additional two months' progress in maths, which is very promising, but Secondary students made two fewer months' learning progress in maths.

3

Thinking Maths substantially increased teachers' pedagogical content knowledge but this did not fully translate into better student learning.

The program had the largest effect on maths teachers' pedagogical content knowledge, particularly for Primary teachers. However, this improvement was not fully translated to a positive impact on students' learning outcomes. There was a small impact on students' cognitive engagement and no effect on students' metacognition was found. Students of Thinking Maths teachers, particularly in Secondary schools, experienced more anxiety in maths learning.

Overall, the Thinking Maths program has substantially increased teachers' pedagogical content knowledge, particularly for Primary teachers. The program is effective for Primary schools, but not in Secondary schools yet. This increase in teachers' pedagogical content knowledge has not completely translated into better student learning outcomes.

The evaluation overall has a high security (or confidence) rating based on the trial design and statistical analysis of the results.

¹ Evidence for Learning has developed a plain English commentary on [statistical significance](#) to support readers in interpreting statistical results in our reports

Implications from the Evaluation

Thinking Maths content should be better targeted to cater for the differences between Primary and Secondary school teaching.

The evaluation found a critical difference in the program's impact between Primary and Secondary students. There was strong evidence that the program was effective in a Primary school setting, boosting students' progress by an additional two months. But the evidence also showed two fewer months' learning progress for Secondary students. Teachers reported that structures such as timetabling and test-based curriculum may be barriers to implementing the strategies they had learned. Teachers suggested tailoring the program to cater to the different teaching environments in Primary and Secondary schools and responding to the needs of diverse learning groups.

Thinking Maths boosts teacher knowledge but translating that into an impact on student achievement is difficult.

Thinking Maths' most significant effect was improving teachers' pedagogical content knowledge, particularly for Primary teachers. The evidence however, suggested a much smaller effect on overall student maths achievement (Primary and Secondary) and cognitive engagement, and no effect on their metacognitive capabilities. These findings were not statistically significant, meaning we need to treat them with some caution.

It takes a lot more than Primary teachers' changed teaching practices to improve student learning.

In Thinking Maths, teachers were taught to use effective questioning (and other strategies) to support students in solving maths problems. Thinking Maths did shift Primary teachers' teaching practices towards a more metacognitive teaching approach but this was less so for Secondary teachers. Evidence suggested that Primary teachers' changed practices were not sufficient to improve students' metacognitive capabilities in Primary schools during the course of this evaluation. Students of Thinking Maths teachers in both Primary and Secondary settings reported that their teachers were more likely to ask questions to check understanding and challenged their thinking, but it was unclear overall how consistently the methods shown in the professional learning were replicated, as teacher practices were not observed.

Unanswered Questions

- **On the Primary-Secondary school difference:** There is insufficient evidence to determine which specific aspects of Thinking Maths made the biggest difference to Primary students' maths achievement. There is suggestive, but inconclusive evidence of the barriers that Secondary teachers faced in using Thinking Maths in their settings, as the content and delivery of the program was not tailored for each setting.
- **The teaching aspects that influenced student outcomes:** Whilst we know they received the training, we do not know the extent to which teachers implemented the Thinking Maths strategies (including cognitive engagement and metacognition) in their classrooms, and which aspects of these teaching strategies were effective in improving student learning, as teachers' classroom practices were not observed as part of the evaluation.
- **On Thinking Maths' longer-term impact:** We do not know Thinking Maths' longer-term impact. It may be that the benefits to students from the teaching practices will take longer to become apparent. Also, the program is currently run by two expert facilitators from the South Australia Department for Education – other staff or facilitators may need to be trained to deliver the program more widely and this might affect the consistency of the professional learning.
Future trials that run for a longer period of time and delivered by other staff, could examine whether there are longer term impacts on student achievement.

Considerations

Teachers



Primary teachers should consider Thinking Maths as a cost effective and valuable professional learning program that increases maths pedagogical content knowledge and has evidence of impact on student achievement. They should consider how they can translate changes in their learning into practices for students in their classrooms.

Secondary school teachers should recognise the value of increased maths pedagogical content knowledge from the program but should think about whether structures in their school contexts can be adapted to support the Thinking Maths strategies. Alternatively, Secondary school teachers might consider the program if tailoring for Secondary school contexts is provided.

Both Primary and Secondary teachers should think carefully about how they turn their knowledge into changed activity in the classroom.

School Leaders

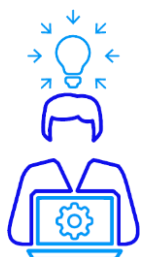


Primary school leaders should consider Thinking Maths as a cost effective and valuable professional learning program that increases maths pedagogical content knowledge and has evidence of impact on student achievement.

Secondary school leaders should recognise the value of increased maths pedagogical content knowledge from the program but carefully consider whether structures in their school contexts could be adapted to support the Thinking Maths strategies. Alternatively, they may wish to wait until the program has targeted content for Secondary school contexts.

For Primary and Secondary schools, school leaders should ensure support for planning, implementation and evaluation of impact in the classrooms.

Program Developer



The Thinking Maths team and other program developers should better target the content and delivery of their programs for Primary and Secondary teaching and learning contexts. They should build specific support for implementation fidelity into classroom activity, and consider creating methods of in-school evaluation for teachers and leaders to see if improved pedagogical content knowledge can be translated to better student perceptions about their learning and ultimate achievement.

Systems



System leaders should consider Thinking Maths as a cost effective professional learning program that increases maths pedagogical content knowledge and has evidence of impact on Primary student achievement. They should consider carefully its use in Secondary schools unless tailoring for the Secondary contexts is provided. For Primary and Secondary schools, they should ensure the professional learning is combined with support for good implementation of changed practices and evaluation of local impact/benefit.



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To read more on the findings visit
evidenceforlearning.org.au/lif/our-projects/thinkingmaths/

