



From Beliefs to Practice: Secondary Mathematics Teachers' Conceptions and the Teaching of Mathematical Proof in Singapore Classrooms

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Proof in school mathematics involves not only presenting formally correct arguments but also explaining why relationships hold and making reasoning visible (Stylianides, 2007); Harel and Sowder's (1998) proof schemes -- external, empirical and analytical -- provide a lens for examining what teachers accept as proof. Earlier research examined proof within the Singapore secondary curriculum (Thanabalasingam, 2024) and teachers' conceptions, beliefs and challenges related to teaching proof (Thanabalasingam et al, 2025).

Building on these two earlier works, the present qualitative study examined two Singapore secondary mathematics teachers using nine proof tasks, a beliefs questionnaire and interviews. Both associated proof with reasoning beyond routine procedures and linked their confidence to advanced mathematical experiences; their work was generally deductive, although some justifications remained implicit.

Although the teachers valued proof for developing explanation and understanding, uneven circular opportunities, lesson pacing and students' preference for applying rather than deriving formulas or theorems constrained its classroom emphasis. Their reported practices suggest requiring students to identify the precise properties used rather than give ambiguous reasons such as "alternate angles", using visual demonstrations to bridge intuition and deduction, and employing guided discussion to make reasoning visible. These findings invite teachers to reflect on the conception of proof communicated through their tasks and explanations.

References

- Harel, G., & Sowder, L. (1998). Students' proof schemes: Results from exploratory studies. In A. Schoenfeld, J. Kaput, & E. Dubinsky (Eds.). *Research in collegiate mathematics education III* (pp. 234–238). American Mathematical Society.
- Stylianides, A. J. (2007). Proof and proving in school mathematics. *Journal for Research in Mathematics Education*, 38(3), 289-321. <https://doi.org/10.2307/30034869>
- Thanabalasingam, N. (2024). Proof and proving in the Singapore secondary school mathematics curriculum. [Doctoral dissertation, Nanyang Technological University].
- Thanabalasingam, N., Ho, W. K., & Kaur, B. (2025). An exploration into secondary mathematics teachers' instruction of mathematical proof in Singapore: Understanding their conceptions, beliefs, and challenges related to teaching proofs. In S. M. Patahuddin, L. Gaunt, D., Harris, & K. Tripet (Eds.), *Unlocking minds in mathematics education: Proceedings of the 47th Annual Conference of the Mathematics Education Research Group of Australasia* (pp. 421–428). MERGA.

For more information, please refer to the following paper presented at the 48th Annual Conference of MERGA in July 2026.
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