Pedagogical Factors Predicting Mathematics Achievement: Analysis of the TIMSS 2019 Large-scale Data

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New Zealand's mathematics achievement at a school level has deteriorated markedly in the last two decades. This is evidenced by substantial declines in achievement indicators across the primary large-scale international studies: Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA). Out of 64 countries investigated in TIMSS in 2019, New Zealand scored significantly lower than all OECD countries, except for Chile and France, and significantly lower than the centre point for 64 countries (Morrow et al., 2022). Over time, the trend is particularly concerning for high school students, with Year 9 average achievement being the lowest recorded since 1995. Of particular note are the substantial declines among 15-year-old students in Australia (33 pts) and New Zealand (29 pts) against the relative stability of the OECD average (5 pts), as recorded by the PISA average performance indicator (Royal Society of New Zealand Expert Advisory Panel, 2021). The reasons for these declines remain largely unclear.

In this short communication, we present the results of the analysis of the TIMSS 2019 data with the aim to identify significant predictors of achievement. In addition to well-known predictors such as socio-economic status (SES), the evidence suggests that certain pedagogical choices teachers make in their day-to-day practice are significant positive predictors of performance, such as a preference for spending more time explaining new mathematics. The influence of pedagogical choices is particularly striking when considering the effect on academically resilient students—those who succeed academically despite the odds associated with economically disadvantaged backgrounds (e.g., low SES). A discussion of the results is offered, bringing in the ever-polarising debate on the merits of student-oriented, inquiry-based learning over the more traditional approaches prioritising explicit instruction (Kirschner et al., 2006), based on the recent advances in cognitive science (Dehaene, 2020).

References

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