# RELIEVING OUT OF FIELD TEACHING
## IN AUSTRALIAN SECONDARY MATHEMATICS

# UPSKILLING PROGRAM DESIGN ELEMENTS

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JANUARY 2025

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AMSI Australian Mathematical Sciences Institute
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# A National Secondary Mathematics Teacher Upskilling Program:

## DESIGN ELEMENTS, OCTOBER 2024

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On behalf of a consortium comprising: Actuaries Institute, the Australian Mathematical Sciences Institute, the Australian Mathematical Society, the Mathematics Education Research Group of Australasia, Science and Technology Australia, and the Statistical Society of Australia. The consortium is an advocacy group committed to raising awareness of the scale and implications of out-of-field teaching of mathematics and to promoting solutions to this longstanding national problem.

### Overview

This scoping statement describes a national upskilling program that would better equip out-of-field (OOF) mathematics teachers to undertake their substantive role. It outlines the Program Justification, Description, Scope and Indicative Costs.

### Justification and Need

Australia faces a significant and **widening equity gap** in school mathematics performance. PISA 2022 results show that the mathematics literacy achievement of students in the **top SES** quartile **improved** by 8 points while achievement of those in the **lowest SES** quartile **declined** by 12 points, over 2018-22[1] (noting that 20 PISA points corresponds to about three terms of schooling). There is persistent and even wider gap between the performance of **First Nations** students (average 410 score points in 2022) and non-First nations students (average 492 score points in 2022)[a]. There are also increasing PISA gaps between the achievement of students in metropolitan and regional/remote areas.

A significant factor in this decline is an ongoing long-term shortage of mathematics teachers, resulting in **high levels of out-of-field (OOF) teaching of mathematics** in Australia**.** Two in every five secondary school mathematics teachers are not mathematics trained, meaning up to 75% of Australian Year 7-10 students are likely to be taught by an out-of-field mathematics teacher during their first four years of secondary schooling.[2]

**Disadvantaged students are more likely to be taught by OOF teachers.** TIMSS 2019 results showed that only 31% of Year 8 students in low SES schools were taught by fully qualified mathematics teachers, compared with 54% of Year 8 students in high SES schools.[3] Small schools and those in remote locations are also more likely to have teachers teaching

[a]In PISA and TIMSS, Australian students were about their Aboriginal and Torres Strait origin in the Student Questionnaire. Results were reported under the terms ‘First Nations students’ and ‘Non-First Nations students’.

mathematics out-of-field.[4] This means that First Nations students – already disadvantaged by the equity gap in mathematical literacy performance – are the group most likely to be acutely affected by OOF teaching.

Unsurprisingly, **students taught by OOF teachers have lower mathematics achievement** than students taught by fully qualified mathematics teachers. In TIMSS 2019, Year 8 students taught by OOF mathematics teachers achieved a score of 511 – below the Australian mean score of 517 – while those taught by fully qualified mathematics teachers achieved a score of 531 – well above the Australian mean[5] (the 20 point gap in scores is about a quarter of the difference between High and Intermediate TIMSS benchmarks).

This situation is untenable. It is widely acknowledged that the Australian economy needs a future workforce with a strong grounding in mathematics skills, therefore our students need to be taught by trained and confident mathematics teachers.

The scale of OOF mathematics teaching is beyond reasonable proportions. Teacher recruitment and retention strategies may give long term results but are not sufficient to address the pressing current high levels of OOF teaching of mathematics. A complementary and effective strategy is required to **upskill OOF teachers who are already teaching mathematics classes**.

Currently there are some small-scale programs (in NSW, VIC and WA) available to upskill OOF mathematics teachers but there is no consistent approach nor sufficient resourcing for large scale upskilling[7]. This Program aims to address the OOF mathematics teaching gap at a national scale, with a nationwide partnership-based solution. Once in place, the Program architecture will enable national delivery of professional development modules that meet the changing needs of mathematics teachers as these arise throughout their careers (e.g., learning to teach new mathematical content added to the school curriculum).

## Program Description and Scope

The aim of this Program is to provide a nationally consistent framework and postgraduate course for upskilling OOF mathematics teachers. A steering group, which may draw on the expertise of consortium members, would advise on design, implementation, and evaluation of the upskilling program.

The Program will deliver a **Graduate Diploma** in **blended mode** (online and in-person).

It is intended that the Program be delivered by a partnership of universities, rather than a single institution. The Biostatistics Collaboration of Australia is an example of a successful consortium of universities that provides such postgraduate course work.[8]

The benefits of this approach:

- encourages collaboration and networking between institutions
- stabilises the program and delivers at the scale required
- provides uniform and portable qualifications
- provides a platform for the creation of fit for purpose content
- allows participants to enrol in their “home” institution but access courses offered across the partnership

- guarantees easy access to OOF teachers across Australia.

Specifically, the Program will**:**

- be a part-time, 8-subject, **Graduate Diploma** program that upgrades OOF teacher qualifications to the same level as fully qualified mathematics teachers
- allow for staged entry or early exit via a 4-subject Graduate Certificate
- use flexible delivery structures, such as intensive summer and winter schools, to maximise teacher engagement and commitment
- accept an anticipated intake of around **500 OOF mathematics teachers per year** initially over four years; (500 OOF teachers per annum is indicative pending more detailed data collection on Australian teachers' subject-specific qualifications).

Such a **nationally consistent upskilling program** will ensure Australia's students – and future workforce – can receive a solid foundation in mathematics, taught by confident and expert teachers. The program will provide the necessary **scale, uniformity and resources** to tackle the OOF mathematics teacher problem.

The **Appendix** provides further details of the Graduate Diploma content and structure.

## Project Indicative Costs

A four-year Project is proposed with the Commonwealth to:

1. Subsidise tuition fees/HECS-HELP for the Graduate Diploma. Fee-waiver costs are estimates at $2.3 million per annual cohort of 500 OOF teachers @ $4600 CSP
2. Fund leadership and management activities for the Project. The consortium would be led by a Level E professor, together with two Level 7 administrative staff. Estimated costs of $800K per year.

Any teaching relief time and other local support, for participating OOF mathematics teachers, would be provided by the State and Territory-based jurisdictions. They would also be required to choose eligible regions/schools, along with eligibility criteria, and a timetable for program roll out.

## References

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[2]Prince, G., & O'Connor, M. (2018). *Crunching the numbers on out-of-field teaching.* AMSI Occasional Paper 1. https://schools.amsi.org.au/2019/01/14/crunching-the-numbersout-of-field-teaching/

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[5]Thomson, S., Wernert, N., Buckley, S., Rodrigues, S., O'Grady, E., & Schmid, M. (2021). *TIMSS 2019 Australia. Volume II: School and classroom contexts for learning*. Australian Council for Educational Research. https://research.acer.edu.au/timss_2019/4/

[6]Goos et al. (2024). *Position paper: Relieving out of field teaching in Australian secondary mathematics.* AMSI. https://amsi.org.au/?publications=position-paper-relieving-out-of-field-teaching-in-australian-secondary-mathematics

[7]Barker, M., Goos, M., & Coupland, M. (2024). *Analysis of out-of-field secondary mathematics teacher upskilling initiatives in Australia.* AMSI. https://amsi.org.au/?publications=relieving-out-of-field-teaching-in-australian-secondary-mathematics

[8]Biostatistics Collaboration of Australia (n. d.). https://www.bca.edu.au/

[9]AITSL. (2022). *Accreditation of initial teacher education programs in Australia: Standards and Procedures*. https://www.aitsl.edu.au/docs/default-source/national-policy-framework/accreditation-of-initial-teacher-education-programs-in-australia.pdf?sfvrsn=e87cff3c_48

## Appendix: Graduate Diploma content and structure

### Content

To be fit for purpose, an upskilling program needs to meet the same mandatory content requirements for teaching mathematics that are specified by AITSL for accrediting initial teacher education programs.[9] This means that the following content is required:

- ***Mathematics***: 6 semester-long university subjects, with no more than 2 at first year level and no fewer than 2 at third year level.
- ***Mathematics curriculum and pedagogy***: At least 2 semester-long university subjects.

Mathematics curriculum and pedagogy courses would make use of materials from existing accredited initial teacher education programs on culturally responsive teaching and Aboriginal and Torres Strait Islander education.

These requirements for upskilling OOF mathematics teachers can be met by a **Graduate Diploma** program of 8 subjects (6 in mathematics and 2 in mathematics pedagogy) offered part-time over two years.

## Implementation and roll out

As out-of-field teaching is more prevalent in regional, rural, remote, and low SES areas, jurisdictions should be encouraged to direct resources to fully fund participants in areas and schools where there is greatest need. A percentage of places may be made available for teachers outside these areas to support participation in the program.

To ensure that education jurisdictions experience the intended benefits of the program, fully funded participants could be required to meet certain obligations, for example:

- Teachers may be required to stay in their schools for a defined period of time (e.g., three years) after completing the upskilling program.
- Teachers may normally be required to pay fees/HECS-HELP if they fail to complete the program or leave their school before fulfilling their post-program obligation.

To ensure that teachers fully experience the intended benefits of the program, in-school and systemic supports in addition to tuition fee relief would be needed:

- Some release time from teaching and administration duties (e.g., year level coordination)
- Full-time release from teaching and administrative duties for Aboriginal and Torres Strait teacher participants in geographical areas of acute need
- In-school or online mentoring from more experienced in-field mathematics teachers, where available
- Recognition of additional subject qualifications and expertise by school leaders and recording of these qualifications by teacher registration authorities.

Further incentives for teachers may need to be considered, based on experience with international upskilling programs.

Program effectiveness would be monitored via surveys of graduates and collection of nationally consistent data on teachers' subject-specific qualifications.

## Indicative Graduate Diploma program

***Year 1***

| Subject type and number | Delivery mode |
|---|---|
| 3 in mathematics/statistics: No more than two at 1st year level.<br>Credit could be given undergraduate mathematics and statistics subjects already completed in an undergraduate degree. | Online |
| 1 in mathematics curriculum and pedagogy: Teaching junior secondary school mathematics | Intensive in-person (e.g., week-ends, summer or winter schools); online tutorials; in-school or online mentoring of teaching. |

***Year 2***

| Subject type and number | Delivery mode |
|---|---|
| 3 in mathematics/statistics: No fewer than two at 3rd year level.<br>Credit could be given undergraduate mathematics and statistics subjects already completed in an undergraduate degree. | Online |
| 1 in mathematics curriculum and pedagogy: Teaching central topics in senior secondary school mathematics | Intensive in-person (e.g., week-ends, summer or winter schools); online tutorials; in-school or online mentoring of teaching. |