

SUBMISSION

Submission to the Department of Education

# Submission to the Teacher Education Expert Panel Discussion Paper Consultation

21 April 2023

**The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together Australia's leading thinkers in applied science, technology and engineering, ATSE provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.**

Teachers are essential to exposing school students to STEM (science, technology, engineering and mathematics). Inspirational, enthusiastic STEM teachers with deep knowledge of and confidence to teach their disciplines can influence students to develop an interest in STEM and the many possible career paths it makes possible. It is therefore important for STEM education to be integrated within Initial Teacher Education (ITE) as well as ongoing professional development to develop expertise and maintain currency throughout a teaching career.

ATSE makes the following recommendations for Teacher Education Expert Panel Discussion Paper to consider in their reforms to ITE:

**Recommendation 1:** Set a target for the proportion of in-field STEM teachers, with a plan to reach this target through ITE and professional development.

**Recommendation 2:** Consider levers to increase the supply of STEM teachers through placement and mid-career pathway reforms.

**Recommendation 3:** Integrate access to STEM resources as part of 'effective practices' content in ITE.

**Recommendation 4:** Collect and publish intersectional demographic information for indicators for selection, retention, and classroom readiness.

## Enriching mathematics teaching through Initial Teacher Education

Mathematics is foundational for many STEM career paths. For example, poor uptake of senior secondary mathematics constricts the supply of engineers, a profession that is now in critical shortage. Confidence, competence, and enjoyment of mathematics begins from exposure at the earliest levels. STEM teachers who are inspiring to their students draw upon a base of deep discipline expertise that gives them confidence in the classroom (ATSE, 2015). It is critical that primary and secondary teachers are trained and resourced to provide high-quality STEM education, including through targeted interventions for mathematics teaching.

Unfortunately, there is a national shortage of qualified mathematics teachers, resulting in widespread out-of-field teaching. Nationally, less than one quarter of year seven to year ten students have an in-field mathematics teacher every year (Prince & O'Connor, 2018). This shortage is expected to worsen as mathematics teachers are retiring at a faster rate than new mathematics teachers are being recruited (Singhal, 2018). Intervention is needed to increase the supply of qualified mathematics teachers, including through supporting currently out-of-field teachers to undertake tertiary mathematics education.

ATSE agrees with the Teacher Education Expert Panel Discussion Paper's proposal that numeracy should be considered the responsibility of all teachers, and that all ITE students should develop conceptual understandings of foundational concepts in mathematics.

ATSE recommends that the Panel extends upon this by setting a target for requiring STEM qualifications for STEM teachers, and considering how these qualifications can be better integrated with ITE. Ideally, STEM teachers should possess at least a STEM bachelor's degree with an appropriate major for their teaching speciality (ATSE, 2015). At a minimum, STEM teachers should have undertaken tertiary education to a second-year university level in their subject to be considered in-field. A target for in-field STEM teaching must be accompanied with a plan to boost participation in STEM qualifications for ITE students, as well as support current teachers to access STEM qualifications and track their professional development.

**Recommendation 1:** Set a target for the proportion of in-field STEM teachers, with a plan to reach this target through ITE and professional development.

## Creating pathways for STEM professionals to teach

The reforms outlined in the Discussion Paper can be tweaked to expand the STEM teaching workforce. For example, when consolidating placement programs for ITE students, the Panel could consider how STEM students who are not simultaneously enrolled in teaching qualifications could be targeted through placement programs designed to expose them to teaching careers. As previously recommended by ATSE, a paid internship program targeted to tertiary mathematics students could be used to attract these students to teaching (ATSE, 2022). The Panel could also consider how mid-career pathways into ITE can target STEM

professionals or people with STEM qualifications, including through scholarships and programs as explored in the Discussion Paper. Another avenue to explore is attracting mid-career secondments of STEM professionals into teaching. This could include programs for STEM-qualified individuals who have worked in teaching roles in the higher education sector.

**Recommendation 2:** Consider levers to increase the supply of STEM teachers through placement and mid-career pathway reforms.

### Supporting teachers with STEM resources

There is a proliferation of learning and teaching resources for STEM teachers. Proven Australian resources include STELR (Science and Technology Education Leveraging Relevance), an ATSE program that provides hands-on sustainable energy engineering kits linked to the science curriculum with teacher resources, and Grok Academy, a free online learning platform that teaches the Digital Technologies curriculum. The challenge for many teachers is identifying which resources are high-quality and suitable. Being able to access, synergise and adapt these resources should be part of the 'effective practices' component of ITE put forward by the Discussion Paper.

Teachers' time to access and apply these resources is limited: 92% of secondary teachers report always or frequently feeling like they do not have enough time to prepare for effective teaching (Hunter, Sonnemann & Joiner, 2022). ATSE has previously recommended that the Federal Government should establish a centralised, quality-assessed database of self-serve STEM resources that can be used by teachers, including out-of-field teachers (ATSE, 2022). Addressing this would enable teachers and ITE students to prepare lessons more effectively and efficiently.

**Recommendation 3:** Integrate access to STEM resources as part of 'effective practices' content in ITE.

### Metrics for a diverse teaching workforce

The Discussion Paper proposes five performance indicators for ITE student selection: participation of Aboriginal and Torres Strait Islander students, regional and remote students, low socioeconomic status students, high achieving students, and secondary STEM students. ATSE agrees these indicators are appropriate priority areas to measure. To strengthen the usefulness of this data in identifying areas for targeted intervention, ATSE recommends that the data should be collected so that the intersections can be seen (e.g., proportion of ITE students of secondary STEM who are also regional and remote). ATSE also suggests that this demographic information also be collected for the other proposed indicator categories of retention (including future proposed data collection on teacher retention past two years) and classroom readiness.

**Recommendation 4:** Collect and publish intersectional demographic information for indicators for selection, retention, and classroom readiness of ITE students.

*ATSE thanks the Department of Education for the opportunity to respond to the Teacher Education Expert Panel Discussion Paper consultation. For further information, please contact [academypolicyteam@atse.org.au](mailto:academypolicyteam@atse.org.au).*

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