
The Mathematics Consultation Curriculum F-10

Response to the ACARA Australian Curriculum Review Consultation

From the Australian Mathematical Sciences Institute, July 2021

Overview

The Australian Mathematical Sciences Institute (AMSI) is a national voice for the mathematical sciences with a broad membership base comprising universities, government agencies and professional societies. It operates major programs and initiatives for its members in the areas of school education, university education, research and industry collaboration.

In early April, AMSI, together with some of its key partners, released a joint statement on the proposed new curriculum “Why maths must change”. AMSI initially endorsed the revised draft curriculum in our joint statement. However, there is now an opportunity to comment on the draft curriculum, and we have revised our position, following extensive consultation with representatives of our member organisations. Many members expressed concern, and indeed alarm, at numerous proposed changes. AMSI and its members believe that the new curriculum should be delayed, and we ask ACARA to halt the current review process.

AMSI remains supportive of a review of the Australian F-10 mathematics curriculum, as part of a comprehensive strategy to address some of the challenges facing school mathematics and its teaching. We would welcome an opportunity to engage with ACARA, to assist with a thorough review and revision of the mathematics curriculum, involving a range of teachers, education experts and discipline experts, as part of a comprehensive strategy to address some of the challenges facing school mathematics and its teaching, a strategy that will also require extensive professional development for both pre- and in-service mathematics teachers.

These challenges include the declining performance of Australian students in international benchmarking tests, such as PISA and TIMSS; supply shortages of qualified secondary mathematics teachers; the high use of out of field teachers for mathematics; declining numbers of students taking advanced mathematics subjects at year 11/12; the low number of girls undertaking advanced mathematics subjects, and the gaps in outcomes between students in metropolitan areas, compared to students in regional, rural and remote Australia ¹

¹ State of the Mathematical Sciences 2020, AMSI publication, www.amsi.org.au/publications

General Comments

This section lists some of the specific concerns expressed by members. This list is not comprehensive, but rather is indicative of the wide range of concerns.

AMSI members are very concerned about the delay in the introduction/removal of key mathematics content. The explanatory document “What has changed and why” lists over 20 examples of content that is being removed or reduced. AMSI membership do not accept the rationale given for many examples that more time is needed for students to develop understanding/conceptual reasoning. The average performance by Australian students in the PISA survey declined by 33 percentage points (or about one year of schooling) since 2003. Our expectations for Australian students in the 2020s should not be lower than what was being achieved by the cohort of maths students from 20 years ago.

We also note that new content is added in the areas of logarithmic scales, error and approximation and networks and planar graphs, over the years 7-10. No clear argument is made that these topics are more important and relevant than material that is being removed from this part of the curriculum. Moreover, the impact of these changes on pathways to senior secondary mathematics curricula is not spelled out. Despite the mandate of the review to declutter, members were concerned that the changes suggested in the draft curriculum have increased the breadth of the material covered.

Some members welcomed the stronger emphasis on problem solving and inquiry, mathematical modelling and computational thinking (key consideration p13). However, members expressed considerable concern at the manner in which these had been implemented in the current curriculum, in particular noting the open-ended nature of many of the proposed inquiries was at odds with effective mathematical problem solving. Members also expressed concerns that this new emphasis comes at the expense of mastery and fluency. Mastery of mathematical approaches is needed before student problem solving can be effective. We also note that many teachers don't have the training and experience to use problem solving as an effective teaching tool.

Whilst the core concepts of mathematical structures and mathematical approaches are clear enough, it is felt that the core concept organiser ‘mathematising’ (p6 of the draft) will be confusing and ambiguous to teachers. In particular, there seems to be significant overlap between the sub-concepts listed under mathematical approaches and mathematising. Mathematising is a concept with which our highly qualified educators have no experience. How, then are early career teachers expected to understand and modify their practice accordingly? The language of the curriculum should be exemplary in terms of mathematical appropriateness and clarity. The document will be available to all including parents.

We believe that the use of ‘Space,’ for the title of a content strand will be confusing to schoolchildren and indeed, teachers, who are likely to associate the term with astronomy. We think that the strand title ‘Geometry’ is mathematically appropriate. We reiterate the importance of accuracy in mathematical language.

The cross-curriculum priorities (see p10) of Aboriginal and Torres Strait Islander Histories and Cultures and Sustainability are positive innovations and are very welcome.

Comments on specific content revisions as listed in Table 1 of “What has changed and why? Proposed revisions to the F-10 Australian Curriculum: Mathematics”

Year 1 - Tell the time to the half hour – move to year 2.

AMSI believes that telling the time to the half hour should stay at year 1. It allows the opportunity to introduce and reinforce the concept of a half and the very important introduction to fractions

Year 5 - Make connections between fractions and decimal notation - move to year 5

The severance of the link between fractions and decimals at year 4 is highly problematic. The link between tenths, $1/10$ and 0.1 should be explained as the concept of place-value is taught, as it is merely another way of writing the same concept. To reteach it as having another meaning at year 5 is more complex and could be quite confusing.

Year 7 - Solving simple linear equations - move to Year 8.

AMSI believes that it is essential for students to learn to solve simple linear equations in year 7, and not have this concept moved to year 8.

Year 10 - Solve problems involving linear equation and solve simple quadratic equations (redundant as covered in Years 8 and 9.)

AMSI believes that removing reinforcement and repetition of key concepts is risky, as these are important methods for developing mastery.

Year 10 - Solving linear equations with algebraic fractions, Operations with algebraic fractions (Not essential for all students to learn in year 10.)

“Not essential” is far from a complete and proper justification for removal of material from the curriculum.

Year 10 - Logarithmic Scale, Years 7-10 - Error and Approximation, Years 9-10 - Networks and Planar graphs - content to be added

The justifications for this content to be added to the curriculum needs to include a discussion about why it is more important and/or relevant to students than the content being removed.

AMSI is committed to champion mathematical sciences for Australia’s advancement. We look forward to making a significant contribution, not only to the design of the new curriculum, but to developing the professional learning that teachers will require to implement this curriculum in the most effective and strategic manner to ensure the best outcomes for mathematics students in Australia.