Consultation on the Accord Interim Report

AMSI Submission
August 2023

Introduction and executive summary

AMSI welcomes the opportunity to respond to the University Accord Interim Report. As a peak body representing the mathematical sciences (which includes mathematics, statistics and data science) in Australia across the pipeline from school to tertiary education and transition into the workforce, we are well placed to provide comment relating to university teaching and research in the mathematical sciences as well as the subsequent employment of graduates in the mathematical sciences workforce.

AMSI has 40 members, spanning universities, government agencies, professional societies and corporates. A consultation session regarding the Accord Interim Report was held for the AMSI members in mid-August. This document represents their views and suggestions to support and improve university teaching and research in Australia in this once-in-a-generation opportunity to review the university sector and ensure than it educates a workforce capable to support the future Australian modern data-driven economy.

Australia's economic prosperity relies on a strong supply of mathematically capable graduates for the growing data and analysis driven workforce. Our future national wealth will be influenced by advancement in new technologies that will reshape our lives. The mathematical sciences underpin advances in digital technology and future productivity and therefore play a vital role. The jobs that will drive these advances all require skill sets that are highly mathematical in nature; only recently, the Australian Industry Group revealed that 43% of surveyed employers listed cyber security in their top three of needed digital capabilities, while 42% listed data analytics.[1] Moreover, a comparison of job vacancies for data scientists revealed a considerable and growing shortage of candidates since 2015[2].

The mathematical sciences are of fundamental importance to a broad range of disciplines in STEM and the social sciences. Besides our strong disciplinary profile, which is centred on educating mathematicians, statisticians and data scientists, our members also play a key role in educating students in many other fields including engineering, computer science, commerce, education and the sciences. This submission is informed by the insights and broad teaching, research and schools outreach experiences of our members in the academic mathematical sciences workforce.

Our future high-technology and data-driven economy requires major initiatives, both within the school and university sectors, to meet industry demands for a larger, more skilled and more diverse mathematical sciences workforce. The University Accord represents a unique opportunity to reshape the university sector and AMSI stands ready to support the government and the sector to meet these future needs.

In this document, we offer three reflections on the Interim report. These reflections cover the issues of school to university transitions, the relative roles of "education" and "training", and the importance of supporting teaching capacity in the mathematical sciences at all universities, in

[1] Skills urgency – Transforming Australia's workplaces, AIG, April 2021, p. 15 and 19

[2] A good match: Optimising Australia's permanent skilled migration, Committee for Economic Development of Australia, 2021, Figure 2.9, page 44

particular those located in the regions. In addition, we would like to query an area of the Interim report considered lacking, namely the provision of adequate support for basic and strategic basic research.

School to university transitions

Ensuring that school students are adequately prepared to make the transition to first-year university study and beyond is a fundamental issue. However, participation rates in Year 12 mathematics, particularly at the more advanced level, have been declining for many years. Many students, particularly those from under-represented groups, enter universities without adequate preparation for the university mathematics subjects that form an important part of STEM degrees and other degrees with quantitative components.

To increase equitable access and continued academic success for under-represented groups both the university and school sectors have a role to play in providing incentives and opportunities for students to study advanced mathematics in their academic preparation for university. This would include more affordable access to foundation study courses and extending the role of regional university hubs to include secondary schools that are able to lead and be the focal point for their region for the delivery of higher level mathematics.

The difference between "education" and "training"

AMSI believes that universities are places for both "education" and "training" – which have overlapping but different purposes. In the final Accord Report, AMSI would be in favour of the Panel proving commentary on what it sees as the fundamental purpose of universities, how the Accord will contribute to achieving the dual objectives of educating and training the workforce, and the relative merits of both.

While the Interim Report places a prime focus on student employability and genuinely useful university training through micro-credentials and work-integrated learning, the primary role of universities as providers of education through multi-year degrees does not receive the same attention. In AMSI's view, universities have a central purpose in educating well-rounded individuals who can apply their knowledge and critical thinking wherever they participate in society and contribute to driving the country forward in their fields of expertise – through innovation, transfer of knowledge, solving "wicked" problems and a myriad of other ways. Obtaining a university education requires deep engagement with the subject matter of the degree for an extended period of time; while vital, shorter-term training offerings are a complement to, but no replacement for "traditional" degrees.

Supporting mathematical sciences academic capability at all universities

To tackle workforce demand for employees with quantitative skills across Australia – for example, regional shortages of maths teachers in secondary schools are particularly acute – students need opportunities to study mathematical sciences subjects at universities close to their home. This requires ensuring sufficient mathematical sciences capability at all universities, not only to allow students to study for mathematical science majors within their own region, but also to ensure high quality teaching into other STEM and quantitative degrees at these universities.

The importance of basic and strategic basic research

It is regrettable that there is little acknowledgement in the Accord of the critical role of basic and strategic basic research, which yields a high return on investment and can strengthen prosperity well into the future. AMSI believes that the Accord should send a stronger message to the sector on the continuing importance of basic research and should factor in appropriate funding.

Reflections on the Interim Report

School to university transitions

AMSI welcomes the emphasis on equity and access to university education and agrees that making this a central issue is very important, not just to broadly increase the number of university graduates in the Australian population but also to foster a more diverse workforce and more equitable societal outcomes. As the "M" in STEM, increasing equity and access for under-represented groups in the mathematical sciences has been a long-standing and ongoing challenge. Renewed and concerted efforts to increase diversity have broad support in the mathematical sciences community. Increasing and widening participation in mathematical sciences will also be essential to meet the growing demand in the mathematical workforce, including filling the shortages of fully qualified mathematics teachers in schools.

In a more general sense, mathematical literacy is increasingly important to all workforces. An AIG group survey indicated that 39% of employers indicated that their businesses were highly affected by low levels of literacy and numeracy.[3] From an equity perspective, it is critical that schoolchildren receive adequate mathematical education to equip them for direct workforce entry, or for tertiary pathways to VET and university.

A fundamental issue within the context of higher education is to ensure that school students are adequately prepared to make the transition to first-year university study and beyond. Participation rates in Year 12 mathematics, particularly at the more advanced level, have been declining for many years (and at an accelerated rate during the pandemic). The result is that many students, particularly those from under-represented groups, enter universities without adequate preparation for the university mathematics subjects that form an important part of STEM degrees and other degrees with quantitative components. Current measures to overcome some of these gaps – such as bridging courses in mathematics– are piecemeal and supported with widely differing levels of government funding.

Admitting students who do not have a sufficient mathematical background to mathematics or STEM degrees will not serve them well – or increase university graduation outcomes for under-represented groups. Achieving equity for under-represented groups at the university level requires the school and university sectors to be considered as an integrated whole, where both sectors undertake actions to improve students' preparation and transition to university to ensure that these students will be successful.

It is of particular importance to provide incentives and opportunities for senior secondary school students to study advanced mathematics subjects in order for the country to sustainably increase university access for under-represented groups.

Actions that could help address these issues:

- Aligning fees for diplomas and other foundation study courses to bridge knowledge gaps to those for comparable undergraduate degrees. Whilst many domestic students undertaking

[3] AiG Survey Report: Skilling: A National Imperative (2018)

diplomas are eligible for FEE-HELP, the higher fee levels for such courses are likely to discourage many students from under-represented groups to catch up to their more advantaged peers in the mathematics subjects needed for STEM degrees. More affordable access to foundation study courses would mean students are sufficiently prepared for first year study in STEM degrees.

- Using regional university hubs to their full potential by including secondary schools that are able to lead and be the focal point for their region for the delivery of higher level mathematics. This can particularly be useful to mitigate the disadvantage that some of the regional students have around access to higher level mathematics subjects and provides huge potential for cooperation and linkage between regional schools and universities in smoothing the transition to tertiary education.
- Open the HECS system to Australian permanent residents. Many in this cohort are youth from disadvantaged groups, whose families have migrated to Australia. The current requirement to pay fees upfront is a significant disadvantage to university study.
- Avoiding financial incentives and disincentives that might be ineffective or even counterproductive, particularly imposing fines for universities that do not provide "adequate" support to struggling students. Most universities have wide-ranging support mechanisms in place for students. Introducing fines might prove to be a disincentive for universities to take on students from under-represented groups targeted by the Accord.

The difference between "education" and "training"

AMSI believes that universities are places for both "education" and "training" – which have overlapping but different purposes. In the final Accord Report, AMSI would be in favour of the Panel proving commentary on what it sees as the fundamental purpose of universities, how the Accord will contribute to achieving the dual objectives of educating and training the workforce, and the relative merits of both.

This Interim Report places a prime focus on student employability. To achieve that, much emphasis is placed on university training through micro-credentials, short courses, stackable learning, work-integrated learning and other teaching mechanisms that are genuinely useful in developing workplace skills. These training pathways are vital to ensure a seamless connection between university study and employment and – for those already in the workforce – a reliable way to receive up-to-date training in their field or additional skills training from reputable higher education providers.

However, the Interim Report does not pay the same attention on the university role in "education" of the Australian population. A university is a place for people to receive a well-rounded education, with the purpose of becoming experts in their field who can apply their knowledge and critical thinking wherever they participate in society and contribute to driving the country forward in their fields of expertise – through innovation, transfer of knowledge, solving "wicked" problems and a myriad of other ways.

Ideally, a university education teaches the student to approach the world in a certain manner, which fundamentally shapes who they are and allows them to critically engage with and learn new knowledge and technical innovations as they may arise in the future. This requires deep engagement

with the subject matter of the degree for an extended period of time. This is particularly salient in the mathematical sciences, where new concepts are gradually introduced in a layered way to allow for deep understanding to unfold and to enable the graduate to apply their knowledge anywhere. A good university education provides opportunity for personal growth, introspection and analysis, the development of a person as a critical thinker and analyst, which only comes with time. It is important to recognise that stackable micro-credentials and short courses which are offered outside of the layered context and gradual buildup of integrated knowledge that makes up a traditional degree can provide a vital complement to, but never a replacement for this type of education.

Universities can, and should, play a central role in both training and education as complementary activities, but with a firm eye on the long term and the real and unique value universities bring to Australia. Providing Australians with a well-balanced, high quality university education will ensure the most profound long-term advantages for society and Australia's prosperity into the future.

Supporting mathematical sciences academic capability at all universities

The concerted effort required to provide university access to more low SES students brings the role of smaller and regional universities into special focus. To tackle increased workforce demand for employees with quantitative skills across Australia – for example, regional shortages of maths teachers in secondary schools are particularly acute – students need opportunities to study mathematical sciences subjects at universities close to their home. This requires ensuring sufficient mathematical sciences capability at all universities, not only to allow students to study for mathematical science majors within their own region, but also to ensure high quality teaching into other STEM and quantitative degrees at these universities.

According to AMSI analysis, the undergraduate mathematical sciences teaching load is not spread equally across all Australian universities but has become increasingly concentrated at the Group of Eight universities in the last decade. With mathematical sciences teaching increasingly concentrated, some smaller and regional universities are struggling to maintain minimum student numbers for a viable maths degree or major. At some of these universities, significant restructures have taken place within mathematical sciences departments, and many academics are working under a persistent threat of redundancy. The restructures often occur with insufficient regard for the increasing need within the regional workforce for graduates with well-developed mathematics, statistics and STEM skills.

While the restructures may satisfy short-term commercial interests, they are not to Australia's long-term national benefit. With regard to regional workforce shortages in mathematics teachers, supporting maths teaching degrees for regional students requires protection and even expansion of the capacity to offer maths majors within regional universities. As suggested earlier in the transition from school to university, strengthening the regional hubs and coordination with regional schools to build the mathematical capability within regions can be of use here as well. Collaborative teaching by universities allows smaller universities to broaden their curriculum to shore up their degrees and fosters connections across the academic mathematical sciences discipline in Australia to the collective benefit of all. This is exemplified in AMSI's very successful long-standing online teaching collaborations and Summer and Winter schools in the mathematical sciences.

The importance of basic and strategic basic research

AMSI firmly believes that some clarification is needed on what the Panel sees as the role of universities in the research landscape, particularly when it comes to basic and strategic basic research. AMSI fully agrees with and supports the Science and Technology Australia (STA) submission that the Interim Report misses a once-in-a-generation opportunity to shift the dial on research in Australia's best interests. As publicly funded organisations with a not-for-profit motive and provider of services in the national interest, universities are the best – and really only – organisations placed to carry out the full spectrum of basic and strategic basic research of the highest quality, including in the mathematical sciences.

All technological innovations and industry-focused research is built on basic research that preceded it (sometimes by many years or decades), so it is critical that the pool of basic research knowledge continues to grow. Moreover, in Australia research of this nature is of high quality, as evidenced by journal publications and their citations. These measures of the quality of basic and strategic basic research directly influence the university rankings, which are so important in attracting international students to Australia. Hence basic research forms an important part of a virtuous circle, on which the health of the university sector and economic innovation relies.

It is regrettable that there is little acknowledgement in the Accord of the critical role of basic and strategic basic research, which yields a high return on investment and can strengthen prosperity well into the future. AMSI believes that the Accord should send a stronger message to the sector on the continuing importance of basic research and should factor in appropriate funding.

Currently many universities are required to support their research through international student income, so that the suggested levy on this income, essentially a tax on universities, is likely to be highly counterproductive. There is a real concern that redistributing income from universities with high numbers of international students may divert investment away from research or from the higher education sector altogether. Moreover, the international student market has many other study options (for example, UK, USA and Canada) and may react negatively to such a levy, as not all of the fees paid by students and their families will contribute to their university of study.