Australian Government
Office of the Chief Scientist

POSITION PAPER

Australian Informed Choices for Higher Education

A strategy to improve the continuum between senior secondary schools and universities

October 2019

"As a result of attending school, every student should be exposed to, and have opportunities to learn, a common core of curriculum content and all should be expected to achieve at least minimum (but high) standards in those core areas during their school years"

- NSW Curriculum Review Interim Report, 2019, pg. 64

In the past, university entrance was determined by a combination of both Australian Tertiary Admissions Rank (ATAR)[1] success and subject requirements set by universities. Today, there is no singular message from universities about what subjects Year 10 students should choose to study in Years 11 and 12. Consequently, the ATAR has acquired greater prominence than was intended. Increasingly, students are selecting 'easier' subjects that they believe will help to maximise their ATAR score rather than more challenging subjects that might be better suited to preparing them for success at university.[2] This has resulted in a sharp drop in the numbers of students studying fundamental subjects, such as intermediate or advanced mathematics,[3] and an overall decrease in Australia's literacy and numeracy performance.[4]

School students need a solid foundation of knowledge in fundamental subjects that is built upon layer by layer from primary school through to university.

This knowledge can rarely be gained by undertaking short bridging type courses upon commencing university. Therefore, students need advice that will guide them towards choosing the fundamental subjects: subjects that will allow them to excel not only in their first university degrees, but equip them with agility and flexibility to navigate multiple career changes in the future.

The scale of the challenge requires collaboration and authoritative guidance from thought-leading universities to promote a clear, strong message to Australian school students that they are more likely to succeed in their first university degrees if they have completed studies in relevant, fundamental subjects.

When complemented by other incentives offered by universities such as prerequisites, bonus subject weighting and subject-specific pathways, students will reach their full potential, be adequately prepared for the future and contribute to Australia's capacity to compete globally going forward.

These are the steps we can take today to empower Australian school students to make confident and considered subject choices assisted by teachers, parents and career advisors.

1. Raise the aspiration of students and ensure they are adequately prepared for university, by:
   (i) creating the right incentive structures; to
   (ii) increase participation in fundamental subjects at school.

2. Collaborate, guide and nurture change, by:
   (i) creating a coalition of thought-leading universities;
   (ii) producing common advice on Year 11 and 12 subject selection principles coupled with individual university-based incentive packages;
   (iii) considering and implementing adequate training programs to correct equity disadvantage; and
   (iv) widely promoting this advice across the sector.

1. Raise the aspiration of students and ensure students are adequately prepared for university

(i) Clarifying available incentive structures

Around 70% of school leaver undergraduate university applications are determined on ATAR alone and it is arguable that almost all students are guided by the ATAR system.[5] This is a relatively new situation given that the ATAR (and its previous forms) was not intended to work alone and originally functioned alongside prerequisite requirements. Overall, however, prerequisite requirements are increasingly disappearing in Australia. Across the country, more than 70% of undergraduate degrees in architecture, computer science, health and medical sciences and economics and commerce have no requirements for mathematics of any level.[6]

Many Australian universities have programs and incentives in place to encourage students to study fundamental subjects to their highest capability. These incentives can include schemes to boost ATAR scores (such as bonus points, middle band selection and Educational Access Schemes), prerequisites, and multiple-stage admission schemes (such as the University Clinical Aptitude Test (UCAT) for some medical degrees[7]), subject-based entry and alternative entry arrangements. These schemes have had mixed levels of success.

There is a plethora of information on subject choices available for students to access, but the "burgeoning number of websites to assist people….carries with it the risk of a confusing maze of information".[8] There is no clear visibility of the range of university incentive structures or the benefits of fundamental subjects for university fields of education that is independent and distinct from individual university publicity.

A common set of authoritative, digestible and widely promoted advice about fundamental subjects for Years 11 and 12 would be useful to help students clearly see which subjects could help them in the future.

(ii) Increase participation in fundamental subjects at school

It is important for students to obtain this clear advice because fundamental learning areas such as English, mathematics and science equip students with a range of critical foundational skills. These skills help prepare students to succeed in a wide variety of university fields of education including engineering, teaching, computer science, economics and medical and health sciences. For instance, several studies indicate a correlation between competency in university mathematics, science and health science courses and the level of mathematics studied at secondary school.[9]

For many years government and industry have been sending strong messages about the importance of science, technology, engineering and mathematics (STEM) education for Australia's future. However, Australia's relative performance in international assessments such as the Programme for International Student Assessment (PISA)[10] and Trends in International Mathematics and Science Study (TIMSS)[11] has steadily declined over recent years[12,13] while per student funding for school education has increased (see Figure 1).[14,15]

For a range of reasons including perceived difficulty,[16] diminishing universal incentives from universities,[17] increasing numbers of out-of-field teachers[18] and ATAR maximisation,[19] the proportion of students studying fundamental subjects in secondary school has steadily declined over the past 30 years.[20] For example, the proportion of Year 12 students enrolled in intermediate level mathematics as their highest mathematics course has dropped from 27% in 1995 to 18.5% in 2017.[21] This means that increasing numbers of students are entering university underprepared.

It is time for an alternative solution to help increase participation in fundamental subjects, raise the aspirations of school students and help them gain the skills they need to be successful and productive members of society.

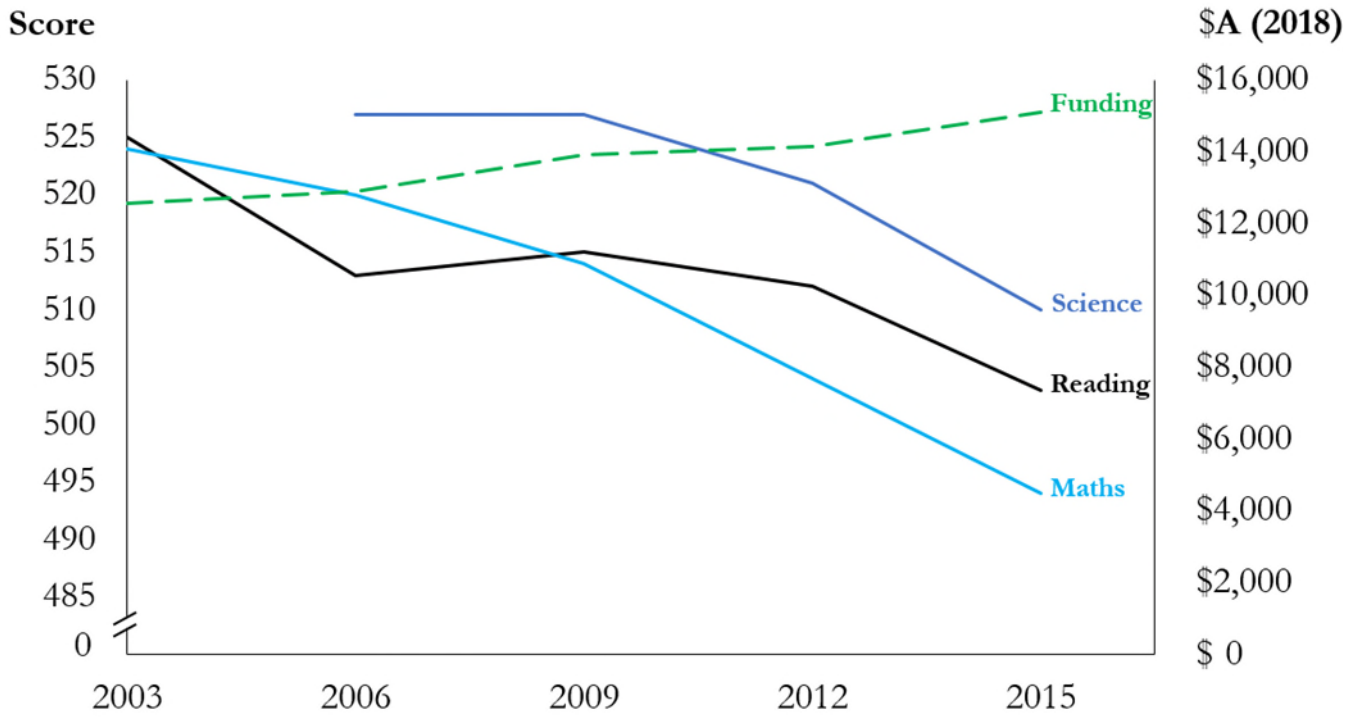

Figure 1: Australia's Programme for International Student Assessment (PISA) performance has declined in all measured areas since 2003,[22] while all government recurrent expenditure per full-time equivalent student across all schools in Australia has increased in real terms over the same period.[23]

(Source: Graph supplied by the Office of the Chief Scientist[24, 25])

2. Collaborate, guide and nurture change

There is a role for universities to provide clear information signals to all students, parents, principals, teachers and careers advisors across the continuum between secondary schools and universities.

(i) Creating a coalition of thought-leading universities

A coalition of six thought-leading Australian universities working together can send a signal to all students about the virtues of fundamental subjects, packaged as an 'Australian Informed Choices Guide'.

While eventually the signals and messages from the coalition will permeate across the sector, it is not necessary to compel all 40 Australian universities to join. Rather, the six universities, drawn from all regions of Australia and not limited to already established university groups, will be able to create an informative, authoritative guide that will provide value for students across the nation.

(ii) Producing common advice on Year 11 and 12 subject selection principles coupled with individual university-based incentive packages

An agreed single message emanating from this coalition will identify fundamental subjects that students should study to help them to succeed in specific degree fields at university. These could include fundamental learning areas such as English, intermediate or advanced mathematics, science, and human society and its environment. Students should study three subjects from these learning areas in a single year to demonstrate their capacity to cope with a sizeable workload. Encouraging fundamental subjects does not entail making them compulsory.

Students could take electives such as legal studies or economics to complement these fundamental subjects. Such electives are truly important to help create a well-rounded individual but it should be explained to students that these professional or elective courses are unlikely to have the same cross-disciplinary impact on university studies or future career success as fundamental subjects, even in directly related fields.

Each of the participating universities will back up the common advice with their own individualised incentives package such as prerequisites, bonus subject weighting and subject-specific entry pathways. Each university should put in place effective support mechanisms for students who have the potential to succeed in university but have not had access to the same preparation as their peers.

(iii) Considering and implementing adequate training programs to correct equity disadvantage

It is not an option to return to making secondary subjects compulsory (other than English) or to reintroduce prerequisites across the board. This is because access to certain school subjects is not evenly distributed across Australia. Students in metropolitan areas tend to have greater opportunities to study science and mathematics at higher levels than students in regional and rural areas.

There will always be a need for alternative pathways into further study for capable students who, through lack of access to specialist school teachers or other circumstances, are unable to meet entry requirements at a particular time. However, these students must be adequately supported to ensure that they can succeed at university and part of this is ensuring that students either study secondary subjects or are truly supported with comprehensive 'catch-up' options at university.

This has never been more important than with the expansion of the 'demand driven system', which has led to an increase in the number of students attending university.[26] The Productivity Commission has shown that students who would otherwise not have attended university before the demand driven system are more likely to drop out of university than their peers; by age 23, 21% had left university without receiving a qualification compared to 12% of other students.[27]

(iv) Widely promoting this advice across the sector

Given the existing plethora of information available on this topic, it is critical that the Australian Informed Choices Guide is well promoted by the coalition of thought-leading universities to students, teachers, principals, parents and careers advisors across Australia.

Neither the coalition nor the Guide can be successful or have the required impact if a concerted national communications and awareness strategy is not implemented.

The Australian Informed Choices Guide has the potential to progress the Australian education system, supporting a more holistic university system that promotes clear visibility on the importance of fundamental subjects and avoids the fixation on the ATAR. However, it can only be this way if all students and those who help them make decisions about their education are well informed about the benefits and implications of studying certain subjects in secondary school. With the right mix and balance of secondary subjects there is no reason why every Australian student cannot succeed in their chosen field at university, but they must be equipped with the base set of knowledge in order to do so.

Regardless of whether students continue on to university or vocational study when they finish school, or go straight into the workforce, every student – wherever they go to school – should have access to the best available information about subject choices, and must be encouraged to study English, mathematics and other fundamental subjects for as long as possible to keep the doors of opportunity open.

REFERENCES AND NOTES

[1] An Australian Tertiary Admission Rank (ATAR) is a percentile ranking from 30 (lowest) to 99.95 (highest) of overall academic results for all students who were due to complete senior secondary education in that year (including those students who left school early or otherwise did not actually complete senior secondary studies). The ATAR is considered equivalent across all jurisdictions.

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[2] Pilcher, S. & Torii, K. (2018). *Crunching the number: Exploring the use and usefulness of the Australian Tertiary Admission Rank (ATAR).* Mitchell Institute Paper No. 01/2018. Mitchell Institute, Melbourne. p. 10. Retrieved from: www.mitchellinstitute.org.au.

[3] Australian Mathematical Sciences Institute (AMSI) (2017). *Discipline Profile of the Mathematical Sciences*. p. 11. Retrieved from: https://amsi.org.au/wp-content/uploads/2017/10/discipline-profile-2017-web.pdf.

[4] Analysis is based on Australia's performance in Programme for International Student Assessments (PISA) from 2003 onwards.

Organisation for Economic Co-operation and Development (OECD) Education Statistics: PISA (2019). *Reading, Mathematics and Science Performance*. Retrieved from: https://data.oecd.org/pisa/reading-performance-pisa.htm#indicator-chart.

[5] Tertiary Education Quality and Standards Agency (2019). *Good Practice Note: Making higher education admissions transparent for prospective students – July 2019*. p 3. Retrieved from: https://www.teqsa.gov.au/sites/default/files/gpn-admissions-transparency-june-2019.pdf?v=1562282945.

[6] Desktop audit of Australian university prerequisite requirements conducted from March to May 2019 by the Office of the Chief Scientist (OCS) and the Australian Mathematical Sciences Institute (AMSI).

[7] The University Clinical Aptitude Test (UCAT) is an admissions test used by the UCAT ANSZ Consortium of universities in Australia and New Zealand for their medical, dental and clinical science degree programmes. The test helps universities to select applicants with the most appropriate abilities and professional behaviours required for new doctors and dentists to be successful in their clinical careers. It is used in collaboration with other admissions processes such as interviews and academic qualifications. Some pathways to medicine, dentistry or clinical sciences will not require the UCAT ANZ. For some applicants a different test may be required.

UCAT Consortium (2019). *University Clinical Aptitude Test for Australia and New Zealand (UCAT ANZ)*. Retrieved from: https://www.ucat.edu.au/.

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[9] Anderton, R., Hine, G., & Joyce, C. (2017). "Secondary Schools Mathematics and Science Matters: Academic Performance for Secondary Students Transitioning into University Allied Health and Science Courses". *International Journal of Innovation in Science and Mathematics Education 25(1).* p. 35. Retrieved from: https://openjournals.library.sydney.edu.au/index.php/CAL/article/view/11317/11058.

[10] The Organisation for Economic Co-operation and Development's Programme for International Student Assessment tests 15-year old students from around the world in reading mathematics and science every three years. The first assessment was conducted in 2000.

Organisation for Economic Co-operation and Development (OECD) (2018). *What is PISA?* Retrieved from: http://www.oecd.org/pisa/.

[11] The Trends in International Mathematics and Science Study assesses mathematics and science competency of Year 4 and Year 8 students every four years. The first assessment was conducted in 1995.

International Association for the Evaluation of Educational Achievement (2019). *TIMSS: Trends in International Mathematics and Science Study*. Retrieved from: https://timssandpirls.bc.edu/timss-landing.html.

[12] Organisation for Economic Co-operation and Development (OECD) Education Statistics: PISA. op. cit.

[13] Thomson, S., Wernert, N., O'Grady, E., & Rodrigues, S. *TIMSS 2015: Reporting Australia's Results*. Australian Council for Educational Research. Retrieved from: https://research.acer.edu.au/cgi/viewcontent.cgi?article=1002&context=timss_2015.

[14] Productivity Commission (2015). *Report on Government Services Chapter 4, Volume B. Table 4A.17*. Retrieved from: https://www.pc.gov.au/research/ongoing/report-on-government-services/2015/childcare-education-and-training/school-education.

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[17] Desktop audit of Australian university prerequisite requirements conducted from March to May 2019 by the Office of the Chief Scientist (OCS) and the Australian Mathematical Sciences Institute (AMSI).

[18] Prince, G. & O'Connor, M. (2018). *Crunching the numbers on out-of-field teaching in maths*. Australian Mathematical Sciences Institute (AMSI). Retrieved from: https://amsi.org.au/media/AMSI-Occasional-Paper-Out-of-Field-Maths-Teaching.pdf.

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[21] Data provided by the Australian Mathematical Sciences Institute (AMSI) to the Office of the Chief Scientist, 2019.

[22] Due to the staggered first full assessments of each domain (reading, mathematics and science), it is only possible to measure changes in reading literacy between PISA 2000 and 2015, changes in mathematical literacy between PISA 2003 and 2015, and changes in scientific literacy between PISA 2006 and 2015. This graph does not include the PISA reading scores for 2000 to accommodate funding comparability issues (see endnote 23).

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[23] Australian Government expenditure data presented in the Report on Government Services in 2003 and earlier reports are not directly comparable with later reports because earlier data included recurrent grants made by the Australian Government for capital expenditure, excluded notional user cost of capital for State and Territory governments and were recorded using cash-based accounting principles. Therefore, this graph begins from 2003 to accommodate these changes.

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[25] Productivity Commission (2019). *Report on Government Services*. op. cit.

[26] The 'demand driven system', which was in place between 2010 and 2017, increased the share of young people that attended university by age 22 from 43% in 2010 to an estimated 60% in 2016.

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[27] Productivity Commission (2019). *The Demand Driven University System: A Mixed Report Card*. p. 2. Retrieved from: https://www.pc.gov.au/research/completed/university-report-card/university-report-card.pdf.