Aligning education with Australia's national interests

Engineers Australia's Submission to the Australian Universities Accord

April 2023

ENGINEERS
AUSTRALIA

Aligning education with Australia's national interests: Engineers Australia's Submission to the Australian Universities Accord

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Introduction

About Engineers Australia

Engineers Australia is the peak body for the engineering profession in Australia, constituted by Royal Charter to advance the science and practice of engineering for the benefit of the community. With over 115,000 members nationally we represent a profession that impacts the lives of Australians every day.

As Australia's signatory to the International Engineering Alliance, Engineers Australia maintains national professional standards, benchmarked against international norms. Engineers Australia was a founding member of the Washington Accord 1989. The Accord is a multi-lateral agreement to recognise the substantial equivalence of AQF 8/9 engineering qualifications as the agreed education base for the profession and facilitates international mobility. Engineers Australia is also a signatory of the Sydney and Dublin Accords, which recognise 3-year (AQF 7) and 2-year (AQF 6) engineering qualifications.

Under the Migration Regulations 1994, we are the designated authority to perform the assessment of potential migrant engineering professionals' skills, qualifications, and work experience to ensure they meet the occupational standards needed for employment in Australia.

Contact

Engineers Australia would appreciate the opportunity to discuss any of the points raised in this submission further. Please contact the Office of the Chief Engineer at chiefengineer@engineersaustralia.org.au.

About Engineering in Australia

There are
545,000
engineers in Australia with about 80% in the labour force.

243,000
of these engineers work in engineering occupations (56%).

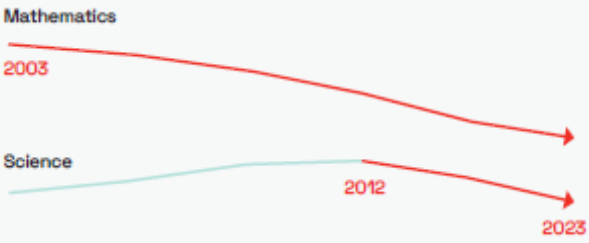
An increase of
115,000
engineers since the 2016 census.

Overseas Born
Australian Born

Australia has qualified engineers from every nation on earth.

There are over
87,000
women engineers in Australia, of these around 75% were born overseas.

STEM



The OECD reports Australian students' performance in mathematics has been declining since 2003 and our performance in science has been declining since 2012.

Higher education commencements in engineering study in Australia, for domestic students, has been declining since 2014.

Science, technology, engineering and mathematics occupations are predicted to increase by more than 12% over the coming years.

Increasing take-up of STEM subjects and building awareness of engineering is critical to boosting domestic supply.

ENGINEERING

Executive Summary

Engineers Australia (EA) embraces the opportunity to respond to the questions posed by the Accord panel. Engineers Australian has, on behalf of the engineering profession, released various reports with calls for action to higher education, industry and government. Engineers Australia will continue this commitment as any Accord progresses. We would welcome the opportunity to work with the Panel as feedback is reviewed and options for Higher Education are considered.

Engineers will continue to play a critical enabling role in Australia's sovereign capability and prosperity for the foreseeable future. They will practice locally and within global contexts. Higher education will be critical in developing members of the engineering team for this future. Universities and their staff will be at the forefront of this responsibility. The international comparability of qualifications will remain relevant as higher education in Australia, and internationally, continue to evolve.

While engineering is prominent and the focus of this submission, much of the content is equally relevant across the tertiary sector and all professions.

Engineers Australia's response to the questions posed by the Accord panel align with three critical areas for the engineering profession.

1. Strengthening the Engineering workforce

Engineering is vital to economic and social prosperity. There is a national engineering skill supply and demand challenge due to identifiable outflows from the profession which affects the supply of engineers. This threatens our sovereign capability and national resilience. This is occurring at a time of rapidly emerging and new areas of practice for Australia (eg. nuclear engineering) and a need to respond to climate change and sustainability. There is a need to reverse the decline in Australia's teaching capability and offerings in STEM in schools to ensure a robust pipeline into higher education. There is a need for greater engagement from government and industry with higher education to ensure the next generation of engineers gain real world experience with a stronger focus on student engagement, lifelong learning, and contemporary engineering practice and its sociotechnical contexts.

2. Increasing the university/industry sector collaboration

Engineers Australia sees significant benefits can be achieved through increased collaborations between university and industry that better understand gaps in the workforce and better prepare graduates – not just work ready – but work defining. Work integrated learning programs and higher (degree) apprenticeships afford the highest level of authentic learning. Sharing or disseminating good practice is necessary, but insufficient. Good practice needs to be adopted and adapted at the local level. Professional bodies, such as Engineers Australia, can be a critical conduit between universities and industry. These conduits could reduce the need for individual industry to university relationships that can be limiting for small to medium industry partners.

3. Improving the student experience and pathways to professions

A learner-centred approach is essential. ePassports, that include portfolio evidence of an individual's capabilities and competencies are foundational for life-long learning practices, identifying and tracking continuing professional development. Real-time aggregated data from this scheme could signal and afford greater confidence for universities to develop new programs and pathways. Alignment to the National Credentials Platform coupled with universal and consistent language and metrics for measuring credit and T&L activities across institutions may help lift performance.

Higher education needs to be agile. The government should continue to identify national priority areas and implement incentives such as post-graduate commonwealth supported places to address workforce shortages. There is a need to improve VET/Uni pathways and have mechanisms to recognise micro-credential pathways that are emerging.

Overarching principles:

Engineers Australia notes the following overarching principles for consideration by the panel:

- Improvements which best serve under-represented and disadvantaged students should be identified and prioritised; if they are supported then everyone (else) will be too;
- Pockets of world-leading practice in higher education exist in Australia. To improve outcomes, consideration should be given to initiatives that lead to adoption and adaption of these – specifically at the local teaching team/individual practice level – as opposed to broadcast dissemination approach.
- Professional bodies should have an ongoing role in setting (and evaluating) relevant skills, capabilities and competency standards required by industry;
- International comparability of qualifications will continue to provide for professional mobility at all career stages;
- Data-driven approaches and decisions should underpin the Accord. Much data exists – at the local level – that is poorly utilised. Shared, real-time, whole-of-sector data as well as analysis and insights will afford data-driven-decision-making;
- The Accord should align with other initiatives underway, including: Department of Employment and Workplace Relations (DEWR) Skills Reform changes to the VET sector, development of a National Credentials Platform and the Department of Education Australian Qualifications Framework (AQF) review; and
- Consideration is required of all learners including school leavers and, increasingly, learners that already have higher qualifications and are seeking to engage with higher education to upskill/reskill.

Engineers Australia draw the panel's attention to the following reports which have informed our responses:

- Engineers Australia Strengthening the engineering workforce in Australia – report August 2022
- Engineers Australia Women in Engineering – report June 2022
- Engineers Australia Barriers to employment for migrant engineers – report October 2021
- Australian Council of Engineering Deans Engineering Futures 2035 - 2021 Engineering Change - The future of engineering education in Australia – report May 2021

Response to discussion paper questions

The nature and purpose of Australian higher education

Question 1: How should an Accord be structured and focused to meet the challenges facing Australia's higher education system? What is needed to overcome limitations in the current approach to Australian higher education?

Lack of universal accessibility to higher education is a critical limitation in the current approach. Overcoming this limitation requires a thorough redesign of the possible pathways into higher education and the outcomes that result from participating in a university degree. The utilisation of big data and AI as tools in data-informed-decision-making underpinning the accord and future initiatives will afford insights into pathways that have not yet been considered. The introduction of a centrally administered learning epassport (or skills epassport) that accompanies a learner from the start of their education journey would enable the collection of a rich dataset that government, industry and the tertiary sector can respond to in almost real-time. This would facilitate follow-up with students who drop-out/transfer from one program to another; individual institutions cannot do this effectively. It would also support learner mobility across the tertiary sector (e.g. authenticated transcripts supporting seamless RPL processes). Further, the aggregated whole-of-sector real-time and trend data would be invaluable.

The Accord should optimise the connection between industry and the whole education sector (K-12, VET and HE). This will promote innovation and agility in the university sector, and maintain the currency and relevance of degree programs. Embedding industry in the university sector must drive more efficient use of resources and infrastructure, reduce duplication, share costs, provide access to contemporary professional practice for academics and learners, and respond to declining on-campus participation by students. International benchmarking may provide guidance. For example, industry is integral to tertiary engineering education in Germany and France. In France, placements are mandatory and have a minimum stipend specified in workplace award frameworks.

Other considerations for the Panel include: How might the Accord reduce individualism and competition between institutions – for research money and student enrolment (money). Do research rankings drive behaviour/decisions at the institutional level. What is the return-on-investment for research spend? How could the Accord act to better manage the teaching & learning and research polarity.

Question 2: How can the diverse missions of Australian higher education providers be supported, taking into account their different operating contexts and communities they serve (for example regional universities)?

Alternate pathways to professions are emerging – the (singular) pathway to being a professional engineer via a school leaver completing a full-time degree program may be complemented by programs with embedded experiential learning pathways (e.g. higher (degree) apprenticeship model). The opportunity to change careers and/or professions throughout your working life may require different connections with universities operating in different contexts. It will be critical to professional accreditation bodies such as Engineers Australia that a future Australian Universities Accord will act to complement and/or support transition pathways and ongoing development throughout a professional career. The diversity of the Australian higher education institutions creates options and opportunities for diverse pathways and cohorts.

Other considerations for the Panel include: To what extent has the grouping of universities into Go8, ATN, IRU, RUN (and those not grouped) acted to support/improve outcomes? Do these help/hinder? Who do they serve? Would different groupings be more beneficial?

Question 3: What should the long-term target/s be for Australia's higher education attainment by 2030 and 2040, and how should these be set and adjusted over time?

Engineers Australia advocates for evidenced based initiatives that result in improved educational outcomes. Targets for primary and secondary aged learners as measured by independent agencies and compared against global data need to complement any higher education targets. As an example, "Economists had found an almost one-to-one match between PISA scores and a nation's long-term economic growth. Many other things influenced economic growth, of course, but the ability of a workforce to learn, think, and adapt was the ultimate stimulus package." *The Smartest Kids in the World and How They got That Way*, Amanda Ripley, p.241[1]. Current measures (e.g. attainment of a bachelor or higher) assume that in 2040, a bachelor degree will still be considered as the base higher education degree. With the introduction of micro-credentials this may not be a valid assumption.

Challenges and opportunities for Australia

Question 4: Looking from now to 2030 and 2040, what major national challenges and opportunities should Australian higher education be focused on meeting?

Australia is facing multiple challenges over the coming years. Ongoing stimulus spending in public infrastructure, a re-emergence in demand for minerals and a global transition to clean energy and adapting to climate change has contributed to a current engineering skills supply and demand challenge. In addition, recent geopolitical developments, extreme weather events and the COVID-19 pandemic, national priorities such as AUKUS nuclear-powered submarines and advanced manufacturing capabilities have emphasised how important increasing Australia's sovereign capability and national resilience are. Beyond these challenges, population growth, space limitations, national net zero emissions objectives and more prevalent and extreme natural disasters are also having an impact on Australia and will continue to do so.

Engineers, and the skills they possess, are vital to Australia's future economic and societal prosperity. Engineers will be critical to solving the complex problems we are facing. Demand for engineering skills continues to increase with engineering vacancies rising by over 22 per cent during the 2022 calendar year.[2] While engineering skills are extremely relevant to the challenges above, they are also skills which will be sought after by other areas of society, due to an engineer's cognitive ability to 'think' and solve complex problems.[3]

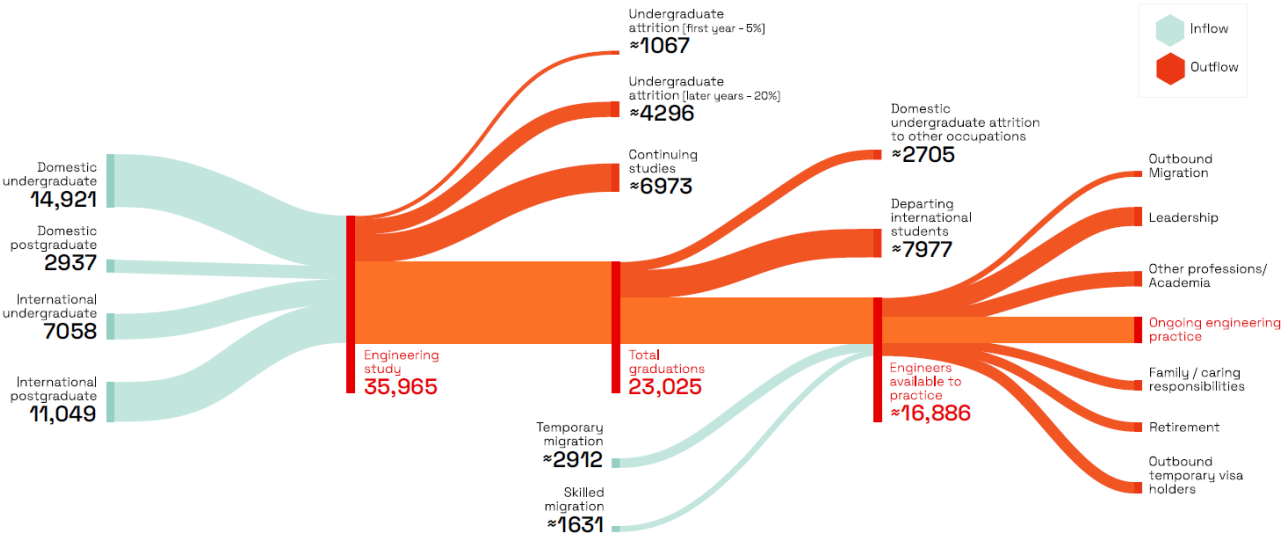
Australia has been experiencing an engineering skills supply challenge since the late 1980s. Pandemic induced border closures (limiting migration) and an increase in projects has meant many sectors are currently experiencing a cyclical shortage of experienced engineers. However, the solution to overcoming this is not as simple as increasing migration or higher education opportunities. The current shortages are being experienced at the same time as there is an economy-wide oversupply of qualified -but underutilised- migrant engineers. This is coupled with persistent challenges in the source of domestic engineers. Even once an engineer has commenced engineering study or migrated to Australia, there are various outflows which affects supply, as illustrated in Figure 1.

[1] PISA *is the OECD's Programme for International Student Assessment that tests 15 year old students from around the world, not on competency against school curriculums, but how well they can apply their knowledge to real-life situations and be equipped for full participation in society. See* http://www.oecd.org/pisa/aboutpisa/

[2] Field, L. 'Australian Engineering Employment Vacancies' *Engineers Australia* (February 2023) https://www.engineersaustralia.org.au/sites/default/files/2023-02/Australian%20Engineering%20Employment%20Vacancies%20-%20January%20to%20December%202022_0.pdf

[3] 'Skills and jobs of the future – the Four Cs' Australian Government National Skills Commission (accessed 20 March 2022) https://www.nationalskillscommission.gov.au/sites/default/files/2022-02/Skills%20and%20jobs%20of%20the%20future%20%E2%80%93%20the%20Four%20Cs.pdf

Figure 1: Inflows and outflows of professional engineers 2019[4]



This diagram is indicative only, providing provisional figures and best estimates from the data and research available. It is provided to illustrate the magnitude of inflows and outflows each year and is not an exact representation of the number of people entering and exiting the profession.

Australian Engineering Higher Education Statistics 2009-2019, Australian Council of Engineering Deans, December 2020 & King, R, Working Paper: Pipelines into Professional Engineering Occupations, Australian Council of Engineering Deans, December 2021

The education system needs to be agile enough to support the new technologies and skills which are going to be needed to solve the challenges of tomorrow (particularly uptake of digital skills). It also plays a fundamental part in ensuring Australia has the engineering workforce it needs to alleviate current and future skills shortages. Universities are pivotal in developing foundational skills for entry to practice. While the mode and form of delivery may change, required graduate attributes will continue to exist. This is will still require a purposefully designed curriculum informed by industry.

Increasing agility and innovation increases risks, which increases uncertainty, risk of failure and costs. How might the Accord influence the risk appetite of universities?

Question 5: How do the current structures of institutions, regulation and funding in higher education help or hinder Australia's ability to meet these challenges? What needs to change?

QILT and GOS typically reflect engineering programs at universities as one of the lowest ranked fields of study (in some criteria). What might the Accord put in place to incentivise and support a whole-of-field-of-study response to improve learner experience and graduate outcomes?

Do Field-of-Research (FoR) /Field-of-Education (FoE) codes restrict institution structures? Academic faculties/schools structure/align closely to research discipline areas. Do these tend to restrict research and hence courses/programs from more multi- or trans-disciplinary fields which may better serve/address society?

Challenges and opportunities for the higher education system

Question 8: What reforms are needed to promote a quality learning environment and to ensure graduates are entering the labour market with the skills and knowledge they need?

Engineers Australia advocates for a future engineering academic workforce with the capability to deliver a stronger focus on engineering practice and broadening outcomes. This may include mandating T&L qualifications and credentials for academics which are discipline explicit – e.g. engineering and education are two separate professions – should higher education educators have qualifications in both fields

[4] Bell, M et al, 'Strengthening the engineering workforce in Australia' *Engineers Australia* (August 2022) https://www.engineersaustralia.org.au/sites/default/files/2022-08/strengthening-engineering-workforce-australia.pdf

and/or what other models are feasible. Might the Accord include development of an Australian equivalent to the UK Advance HE Fellowship credential?

Embedding authentic learning and assessment into the curriculum through incentivising industry to be more involved with the learning experience at universities. Does the existing mark-grade-GPA assessment paradigm serve the learner? It appears to be the dominate mode – particularly in STEM fields. Alternatives exist. To what extent does this assessment paradigm ensure graduates are entering the labour market with the skills and knowledge they need?

As the internationally recognised accrediting body for engineering qualifications, Engineers Australia notes the diverse means by which various T&L metrics are reported by universities. How might the Accord lead Australian HE towards a universal and consistent language and metrics by which:

- academics contribution is measured and reported – particularly face-to-face teaching;
- describing all FTE, including casual teachers, particularly of F2F teaching/instruction/facilitation;
- describing learning activity; not lecture, tutorial, lab – it needs to reflect what the learner is doing, such as: independent or collaborative; recorded or real-time facilitated; watching, listening (for live or recorded lectures); guided lab/pracs, self-directed labs/pracs. These measures will identify and differentiate the student experience as various university. Uses richer language/descriptors for the range of learning activities possible.
- Transparency in reporting public funding expenditure on T&L, research, other.

Engineers Australia advocates the importance of professional accreditation of degree programs, particularly the focus on the academic program, the operating environment, and quality systems. Accreditation evaluation panels have representation from academia and industry – allowing multiple perspectives of 'need' to be considered.

Question 9: How should Australia ensure enough students are studying courses that align with the changing needs of the economy and society?

Engineers Australia has noted the influence parents, careers advisors and teachers have on children's post-secondary education and career options. Engineers Australia research findings noted 90% of women who didn't choose engineering didn't consider it at all, or barely considered it, and the most common reason cited was lack of awareness of the profession. Australia needs more people to choose to study engineering; the two biggest barriers are: the lack of awareness of the opportunities afforded by studying maths and science; and the lack awareness of what engineering 'is' and what engineers 'do'.

There needs to be stronger feedback loops from industry regarding their future workforce planning to tertiary education institutions and secondary schools.

All levels of government should work together to increase Australia's teaching capability, resources and offerings in STEM subjects, including offering programs to make it easier for mid-career STEM professionals to become maths, science or engineering studies teachers, increasing the number of maths and science teachers with relevant qualifications, and providing effective resources to out-of-field maths and science teachers to encourage more young Australians to choose to study maths and engineering studies.

There is an immediate need to review and improve the migration program objectives that will result in addressing the engineering skills shortage in Australia. Engineers Australia advocates for increased support to assist skilled migrant's entrance to the workforce. Initiatives and programs exist, financial support is needed to expand their impact. International comparability of qualifications, aligned to existing multinational agreements, such as the International Engineering Alliance, is essential to foster global mobility and to increase the available pool of engineers.

Question 10: What role should higher education play in helping to develop high quality general learning capabilities across all age groups and industries?

Higher education's purpose is not for the sole benefit of producing graduates for the professions. Engineers Australia acknowledges the highly sought-after and diverse capabilities and attributes of engineering graduates in society – not all enter the engineering workforce. Those attributes include developing lifelong learning mindsets and habits, higher-order thinking skills that are versatile and perennial, coping with ambiguity, adaptability to change, methods for defining and solving complex problems, and personal and professional attributes such as ethical conduct and accountability.

The Accord must improve accessibility to high quality education – initiatives must improve participation and completion of higher education qualifications for (presently) under-represented groups, e.g. those with lower social capital or financial support.

Question 11: How should Australia boost demand from people to study in the higher education system?

Similar to Question 9, it is critical for there to be a broader understanding of the value that higher education brings to the individual, their community and society generally. If there is a lack of awareness of the opportunities that different professions (or higher education) provide, then demand will continue to be a challenge.

To help to address the skills shortage in engineering, Engineers Australia advocates for Commonwealth Supported Places (CSPs) for two-year postgraduate Masters – specially those which are identified as national priority areas. Offering CSPs for accredited engineering masters courses – those which qualify as entry-to-professional-practice, will facilitate more opportunity for graduates from other STEM fields to become professional engineers. The ability for individual to upskill/reskill should not always carry a financial burden.

While incentives such as the stimulus program (second half of 2021) where the Australian Government funded (CSP) 0.25EFTSL Graduate Certificates in areas of national priorities was welcomed by some, it is unclear whether the intended outcomes were achieved.

There are likely to initiatives that increase diversity, reduce barriers to accessing higher education and increase completion and employment rates at the local (institutional level). These are either in-place or could be appropriately resourced to put in-place and scale. Rather than one-size-fits-all approach, there is merit in understanding the success factors for these initiatives, how are they targeted and specific in meeting needs of individuals. As an example, collaborative models such as higher-apprenticeships, where government and industry and higher education work in partnership with the individual learner.

Question 13: How could an Accord support cooperation between providers, accreditation bodies, government and industry to ensure graduates have relevant skills for the workforce?

In Australia, Engineers Australia is the internationally recognised accreditation body for engineering education. Through its Australian Engineering Accreditation Centre, Engineers Australia evaluates engineering courses against the entry-to-practice competencies for the levels of professional engineer, engineering technologist and engineering associate.

Accreditation by professional bodies involves an independent evaluation of the course curriculum, learning outcomes, teaching staff, and facilities to ensure that they meet the standards set by the profession and expected internationally. Engineering students who graduate from an accredited course have greater mobility as their degrees are recognised in many countries that are signatories to the accords under which we are authorised to accredit programs.

An important principle of the engineering accreditation process is to evaluate the relevant industry needs and whether the graduates have attained sufficient skills and knowledge at the entry to practice level.

Entry to practice is a concept that could be better understood by industry as the graduate cannot be expected to have obtained all of the necessary knowledge and skills over the course of their degree. An important outcome of engineering education, or any education, should be that the student learns how to learn in their specific field of study. Industry's role in the further education journey of their employee, particularly graduate formation, needs to be better defined. The Accord has a critical role developing this understanding across industry (and higher education).

Most higher education programs develop the basic skills required of any graduate in the workplace (critical thinking, communication, problem solving, collaboration, research and analysis, ethical and social responsibility) and additional technical and practical skills in the field of study would also be developed. These base skills mirror the UN's Sustainable Development Goals (SDGs). As Australia has committed to advance these, aligning graduate attributes attained through higher education with the SDGs may provide a mechanism for collecting data to further inform how Australia is addressing the SDGs. These data could then feed into the Australian Government's Reporting Platform on the SDG Indicators.

Further, the Accord could support industry and higher education providers through cooperative and more authentic learning experiences in the curriculum including work integrated leaning, practice or problem-based learning, studio-based learning. More innovative programs could see these expand to be cross- and inter-disciplinary programs as well as through-out whole degree programs (and potentially across professions). Understanding and addressing barriers to these programs – particularly costs and scale is needed.

Question 14: How should placement arrangements and work-integrated learning (WIL) in higher education change in the decades ahead?

Authentic learning and assessment are critical for maintaining the integrity of the education system in Australia, particularly with the advent of AI. Work-integrated learning will be an essential component of developing authentic learning and assessment. For a higher-education provider to have a professional engineering program accredited, they are required to engage students with professional engineering practice through work integrated learning opportunities (WIL). Greater engagement is needed from both government and industry to ensure the next generation of engineers gain real world experience which will enhance their employability and skills set, making them more useful to employers.

Partnerships between universities and industry are fundamental to WIL opportunities. Through stronger partnerships we can ensure the learning experiences reflect the work being done in industry, helping to facilitate the transfer of theory to application. These partnerships need to move away from industry acting as a 'host' to students, to more of a collaborative and cooperative relationship.[5] The Australian Collaborative Education Network (ACEN) National Strategy on Work Integrated Learning in University Education Strategy is premised on collaboration between educational institutions and industry partners. The Strategy promotes WIL as a key strategy for improving graduate employability and ensuring the economic sustainability of Australia.[6] Engineers Australia recommends this strategy be reviewed by the panel in their deliberations as a good framework.

For international students, if Australia wants to continue being seen as a destination of choice, we need to ensure our reputation for graduate outcomes remains strong. Greater support is required for international students to ensure they receive work-integrated learning opportunities.

Engineering Education Australia offers a Professional Year program for international graduates, which bridges the gap between full time study and employment and prepares participants for an engineering job. It is a 12-month program developing graduates' skills and local experience and provides participants migration points upon completion. Analysis shows participants of this program achieve similar employment outcomes as domestic engineering graduates. The Professional Year program, while successful, requires both a heavy investment both financially and in time.

[5] For benefits of greater collaboration see question 26

[6] 'National strategy on work integrated learning in university education' (accessed 20 March 2023) https://acen.edu.au/wp-content/uploads/2015/11/National-WIL-Strategy-in-university-education-032015.pdf?x83050

Excluding recognised WIL programs (that sit outside a student's registered course curriculum) from the maximum hours of work permitted under international student visas would make these programs more accessible. Engineers Australia recommends the Commonwealth Government support providers to assist in the develop and implementation of programs which builds the skills sought after by employers, that are shorter and less expensive, than the limited courses currently available.

In addition, for greater collaboration with universities and the development of WIL opportunities to be prioritised by industry, tax incentives could be provided for businesses that engage with learning and teaching at activities in partnerships with universities. As an example, innovative education programs such as a higher apprenticeships where learners are indentured to their employer, released to attend study as required, undertake in-workplace credit bearing studies.

In regards to funding, generally, work-experience or WIL is undertaken extra-curricular. It might be a requirement to undertake it in some programs, but is doesn't 'count' towards academic credit and hence there is little/no funding to support programs. Genuine work-integrated-learning – which has the highest level of authentic learning – has it placed in real work environments and counting as academic credit. Is there an opportunity for the Accord to bring the university and industry sectors together – require a component of WIL in all degree programs – perhaps variable between minimum/maximum limits – that counts as academic credit and therefore has government (CSP) funding to incentivise and make it happen? The added benefit is that students in work environments will need to have some support/oversight from academics - which will in-turn facilitate the academics experience of contemporary professional practice when they visit students – which will in-turn increase university/industry relationships.

Further, it is routine practice in some disciplines (eg. health, nursing, teaching) to support an embedded and enduring approach to supporting new professionals into their practice. It's just expected that a nurse or teaching practitioner will need to support/supervise a student (nurse or teacher) on their practicum – just as they were. How might the Accord establish supporting student practicums as routine practice across all professional disciplines and practice by 2035.

In regards to paying learners on internships, this is a recognised pain point for students in programs where there is a required work-experience component. A student on an internship is adding value in a work place; designing internships such that the work undertaken is valued by all (including being paid) will create a more constructive environment. Australia could learn from Europe in this regard. In some disciplines (e.g. journalism, legal) is almost accepted that interns will work for nothing. How might the Accord influence Australian industrial relations to address the practice employers not paying interns?

Question 15: What changes are needed to grow a culture of lifelong learning in Australia?

There needs to be a cultural shift in Australia to support greater recognition of micro-credentials and other short courses. This includes greater access to university post-graduate units, without having to complete a full course or qualification. A individual's learning epassport - that included portfolio evidence of achievement and incorporated appropriate profession capability/competency standards would act as a useful platform to facilitate lifelong learning. This may be aligned with work on a National Credentials Platform.

Question 20: How can pathways between VET and higher education be improved, and how can students be helped to navigate these pathways?

Engineers Australia advocates for increased tertiary sector and industry collaboration to identify and develop pathways programs that result in an increase in VET program participation and progression to degree qualification. This can be supported by whole-of-sector initiatives such as shared data and analysis to infirm decisions by tertiary sector and industry, as well as epassports that record and support a whole-of-career pathway of learning and professional development. Universal bridging and support programs may be needed. Often, for engineering, gaps in underpinning knowledge are exacerbated by foundational knowledge gained in senior secondary school needing to be bridged.

Question 26: How can Australia stimulate greater industry investment in research and more effective collaboration?

Universities should be encouraged and supported to collaborate with industry in understanding gaps in the workforce and work to develop the skills needed. Greater collaboration will enable[7]:

- Relevance and meaning in curriculum and assessment design;
- Diverse working integrated learning (WIL) experiences to be embedded across a degree;
- Improved student engagement and motivation;
- Authentic feedback for students to inform the development of professional skills;
- Currency of content and focus;
- Capacity building of all stakeholders;
- Enriched creativity, innovation and research;
- Extended networks;
- Shared resources and expertise; and
- Strengthened social, cultural and human capital.

Engineers Australia supports the work of the Australian Council of Engineers Deans and their recommendations for change in the sector. The Australian Council of Engineering Deans compiled a report, Engineering Change: The future of engineering education in Australia.[8] It is recommended this report is reviewed as part of this consultation.

Through accreditation activities, Engineers Australia has observed innovative course structures that feature industry-led university electives, creating opportunities for businesses to play a crucial role in education and cultivate skills in specialized or new areas that are not traditionally included in the curriculum. It is important for government at all levels to encourage the recognition, sharing, and expansion of best practices among universities. Industry led or inspired coursework has many benefits including, industry being able to identify talent and students accelerating their understanding of industry while still in the classroom.

Engineers Australia recommends governments work together to evaluate the engineering skills required to meet their objectives and collaborate with university and industry to invest in providing elective courses in specialized or new areas with a shortage of qualified professionals, or those that are expected to grow rapidly. Developing these partnerships will help to stimulate greater industry investment through them being more involved with the education processes and assisting with identification of critical research areas.

Question 31: How can the costs of participation, including living expenses, be most effectively alleviated?

A professional engineer will typically complete a four-year undergraduate degree and then continue to develop their competence under the guidance of professional engineers for five to seven years before being assessed as competent to practice independently.

An engineering qualification is time intensive. It requires online and in-person attendance and engagement with broad range of on-campus and off-campus learning activities. Unlike other qualifications which can be done more online, engineering requires greater hands-on experiences. Due to this, engineering students are often unable to undertake full-time study, and this is being reported for those students who are required to work to cover the cost of living. Higher-apprenticeship model affords one option of paid employment/income during periods of internship and study. This requires incentives to establish and provide governance for these schemes that brings higher education and industry and government together. The funding model for such schemes would need consideration.

Further, students who do gain employment in engineering – particularly at a time of skills shortages – can be well renumerated and have very high quality opportunities, even before graduation. These are

[7] 'Providing Work Experiences to Engineering Students' *Engineers Australia* (accessed 20 March 2023) https://www.engineersaustralia.org.au/sites/default/files/WA%20Work%20Experience%20Brochure%20-%20Sept%202020.pdf
[8] 'Engineering change: the future of engineering education in Australia' *ACED* (accessed 10 May 2022) https://aced.edu.au/downloads/2021%20Engineering%20Change%20-%20The%20future%20of%20engineering%20education%20in%20Australia.pdf

contributing factors to why only around 25 to 35 per cent of higher education engineering students complete their undergraduate degree in the 'minimum time'. This means the development of a competent professional engineer is often greater than 10 years.

Consideration could also be given to providing a living allowance through mechanisms such as youth allowance and Austudy to engineering students to help lift engineering study completion rates and reduce time-to-completion. Means testing should also be reviewed for dependents, as family income isn't always a deciding factor on if a student needs to work while studying or not.

Question 42: What settings are needed to ensure academic integrity, and how can new technologies and innovative assessment practices be leveraged to improve academic integrity?

As an (external) accrediting body focussed on outcomes-based evaluation of programs, Engineers Australia acknowledges the critical role that academic integrity and identity verification plays in establishing and maintaining high levels of confidence in the capabilities of graduates.

High stakes written assessments are problematic. Invigilated examinations, while appealing, are not without risk of cheating.

One of the most effective means of minimising risk is to design it out via the use of more authentic learning and assessment practices where the teachers assuring the learning know the learner. Industry inspired and authentic project and problem-based learning have demonstrated outcomes in engineering. However, these can be resource intensive and require continual engagement by multiple parties.

Technology may play a part, but like all technology it's important to know exactly what problem is that it is solving. Tools such as ChatGPT are still being understood – will they be embraced by industry? How will this impact higher education?

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