



NITRO-Oceania

NITRO-Oceania Submission to

**Discussion paper provided by
Australian Universities Accord**

Panel

on

**Priorities for the Australian
Universities Accord**

NITRO-Oceania, the Network of Leaders of Interdisciplinary and Transdisciplinary Research Organisations in the Oceania region, is the peak body for interdisciplinary and transdisciplinary research and education in Australia and the wider region. 52 of our more than 70 members are in leadership positions in 18 Australian research and education organisations.

DEFINITIONS

The terms interdisciplinary and transdisciplinary are often used interchangeably and also cover territory identified by the terms systems thinking, post-normal science, action research, convergence research and, for specific types of problems, sustainability science.

Simply put,

- Interdisciplinary research and education concentrate on the interfaces among disciplines
- transdisciplinary research and education involves identifying and bringing together a range of relevant perspectives from disciplines and key groups in society to develop a more comprehensive understanding of a multi-faceted issue and to determine the best possible way forward, as well as the most appropriate and effective implementation strategy.

This submission was prepared by Gabriele Bammer. Iain Gordon, Martin Bliemel and Zee Upton on behalf of the Executive and membership of NITRO-Oceania. It addresses Q4, Q8-10, Q 23-26 and Q34-35 in the Discussion paper provided by Australian Universities Accord Panel.

Q4 Looking from now to 2030 and 2040, what major national challenges and opportunities should Australian higher education be focused on meeting?

NITRO-Oceania urges the Accord Panel to focus on not only specific, identifiable challenges, but also on challenges that catch societies by surprise. Sometimes there will be structures in place that can be rapidly mobilised to meet these challenges (for example national and international field epidemiology and communicable disease networks in tackling the COVID-19 pandemic) and sometimes there will not.

In all cases (specific identifiable challenges and surprising challenges), preparation by building capacity and capability in transdisciplinary problem solving in both university education and research is essential. A way forward is highlighted in Bammer et al., (2020) "Expertise in research integration and implementation for tackling complex problems: when is it needed, where can it be found and

how can it be strengthened?" *Palgrave Communications* 6, 5 <https://doi.org/10.1057/s41599-019-0380-0>. This issue is discussed further in response to Q8-10.

Q8 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?

Q9 How should Australia ensure enough students are studying courses that align with the changing needs of the economy and society?

Q10 What role should higher education play in helping to develop high quality general learning capabilities across all age groups and industries?

Transdisciplinary problem-solving skills are skills that students can apply and continue to hone in any future job. They build on and go beyond skills recognised in the Discussion paper, i.e. *"high quality, generic skills including communication, collaboration, problem-solving, critical thinking and digital literacy are also key to success in life and work."*

In particular, they involve being able to:

- work effectively in teams with diverse expertise
- come at challenges with an open mind, avoiding narrow framings and paying attention to potential biases
- engage, respectfully listen to, and incorporate the concerns of stakeholders affected by problems under consideration
- become, or develop the capacity to support, effective decision makers, which involves honing skills in: critical thinking, overcoming cognitive biases, preparing for and managing adverse unintended consequences, avoiding disastrous tipping points, and understanding and working within the complexity of change processes
- appreciate and work with the opportunities and constraints provided by political, historical, economic, cultural and other aspects of context
- understand and work with the systemic nature of problems and solutions, especially the importance of connections and interdependencies. It also requires effectively managing imperfection, in that problems can never be fully understood and solutions will only ever be partial and temporary.

Supporting information: A growing number of undergraduate and postgraduate courses and programs in universities are providing skills in at least some of these areas. Two universities have made undergraduate expertise in transdisciplinary problem solving central to their educational mission:

- The Australian National University has introduced three graduate attributes, which all undergraduates will be expected to attain by the end of their undergraduate degrees, one of which is *"Capability to Employ Discipline-based Knowledge in Transdisciplinary Problem Solving."* This will be rolled out starting in 2025 (<https://services.anu.edu.au/planning-governance/current-projects/anu-undergraduate-curriculum-framework>).
- University of Technology Sydney, while not introducing transdisciplinary problem-solving skills as a graduate attribute, nevertheless will require all undergraduate students to undertake one of 8 transdisciplinary electives or the *Bachelor of Creative Intelligence and Innovation*, starting in 2023 (<https://www.uts.edu.au/study/transdisciplinary-innovation/undergraduate-courses/td-electives-program>).

Q23 How should an Accord help Australia increase collaboration between industry, government and universities to solve big challenges?

Q24 What reforms will enable Australian research institutions to achieve excellence, scale and impact in particular fields

Q25 How should Australia leverage its research capacity overall and use it more effectively to develop new capabilities and solve wicked problems?

Q26 How can Australia stimulate greater industry investment in research and more effective collaboration?

Strengthening interdisciplinary and transdisciplinary research, by building the requisite expertise in knowledge integration and implementation (including being able to: define problems systemically and deal with interconnections, non-linearities and tipping points; include diverse perspectives and values; work within the limitations of context; and accommodate unintended consequences and nasty surprises) is essential for addressing the issues raised in the Discussion paper, especially:

- Helping *“to spur innovation by adding knowledge, talent and technical infrastructure to solve practical challenges and create new ways of doing things.”*
- Fostering *“Collaboration between institutions and across disciplinary boundaries ... to achieve research breakthroughs.”*
- Strengthening *“Australia’s capacity to solve wicked problems and develop new technology that advances knowledge in the national interest and contributes to long term, sustainable growth.”*
- *“Ensuring we are prepared for future challenges will likely require strengthening the ability to boost effort in various fields of research rapidly in response to new industry, government and societal needs as they emerge.”*

This requires:

- Diversifying funding sources beyond ARC and NHMRC to support interdisciplinary and transdisciplinary research.
- Developing networking and staff exchange mechanism for researchers with government, business and civil society organisations to foster the development of research that tackles key challenges in each of these areas.
- Two-stage funding mechanisms that in Stage 1 support the formation of new, innovative research teams in defining an agreed approach to a joint problem and laying the foundations for productive collaboration (recognising that collaborations take time to establish) and in Stage 2 assess the proposal in a standard way.
Such a mechanism has been successfully employed by the Swiss and Austrian National Science Funds
- Peer-review mechanisms that involve experts in the problem under consideration as well as experts in interdisciplinary and transdisciplinary research.
Such a mechanism has been successfully employed by the Berlin Universities Alliance in their Global Health Research Grand Challenges program
- Reviewing the Field of Research (FOR) codes, so that they adequately recognise interdisciplinary and transdisciplinary research, for example as distinct fields.
- Research capability development in the specific expertise required to conduct interdisciplinary and transdisciplinary research (e.g. working with different knowledge domains and cultures).
For example, Stanford University is leading a US National Science Foundation program to develop the expertise required for transdisciplinary sustainability research, with the program involving two ANU researchers (Bammer and van Kerkhoff)
Appropriately recognising research capability and achievements in promotion criteria.
Currently this tends to be somewhat haphazard, depending on the promotions panel, so that lessons need to be shared across universities to develop standardised criteria and assessment processes.
For example, a working group of the Global Alliance for Inter- and Transdisciplinarity (<https://itd-alliance.org/>), including members of NITRO-Oceania, is assessing how to

recognise the integration expertise required for transdisciplinary research projects, beyond conventional academic key performance indicators (e.g. publications, citations and grants)

- Showcasing high quality interdisciplinary and transdisciplinary research and its impact, including the requisite expertise.
Although there is considerable anecdotal evidence of positive impact, success stories are poorly documented, and the documentation that exists is fragmented; see, for example.
 - <https://nitro-oceania.net/success-stories/>
 - <https://iced.s.anu.edu.au/research/research-stories>
 - <https://www.uts.edu.au/sites/default/files/2022-06/ISF%20Our%20approach%20to%20impact.pdf>.
- Learning from key international initiatives, such as convergence research in the US, which fosters transdisciplinary research for innovation that can lead to commercialisation. A landmark report recognising this is the 2014 US National Research Council report “*Convergence: Facilitating Transdisciplinary Integration of Life Sciences, Physical Sciences, Engineering, and Beyond*” (Washington, DC: The National Academies Press. <https://doi.org/10.17226/18722>). Success stories are available at: <https://beta.nsf.gov/od/oia/ia/growing-convergence-research-nsf>
- Developing the skills of current and future leaders of interdisciplinary and transdisciplinary research organisations, building on work undertaken by members of a global network of such leaders, including members of NITRO-Oceania - see Gordon et al., 2019 ‘Forging future organizational leaders for sustainability science’ *Nature Sustainability* 2: 647-649; doi:10.1038/s41893-019-0357-4 and Boone et al. (2020) ‘Preparing interdisciplinary leadership for a sustainable future.’ *Sustainability Science* 15, 1723-1733 <http://link.springer.com/article/10.1007/s11625-020-00823-9> and <https://doi.org/10.1007/s11625-020-00823-9>.

Q34 How should the contribution of higher education providers to community engagement be encouraged and promoted?

Q35 Where providers make a distinctive contribution to national objectives through community, location-based or specialised economic development, how should this contribution be identified and invested in?

Community engagement is an essential component of transdisciplinary research, which can be instrumental in achieving many of the outcomes highlighted by the Discussion paper, such as:

- *“contribute directly to the development of, their diverse and multi-layered communities. They co-exist with the obligation of higher education to serve the public interest.”*
- *“Australia’s unique geography is reflected in a wide spread of higher education institutions with connections to their communities ranging across international, state, city and local boundaries and encompassing their alumni diaspora. Many institutions are influential in the economic, social and physical development of their communities, and important contributors to place-making and infrastructure development.”*
- *“Community engagement and partnership varies widely, extending from an institution’s staff and students to local communities, including schools and civic organisations, to industry and business, to international partners and networks.”*
- *“It is essential that institutions are supported to continue to develop and contribute to the communities they serve.”*

Transdisciplinary research provides theory and methods for strengthening community engagement and for training the next generation of researchers to be adept in this key activity.

Examples include: a transdisciplinary stakeholder engagement primer, which applies to community engagement (<https://i2insights.org/primers/stakeholder-engagement-primer/>).

Success stories also need to be collected and highlighted, with this US case providing an exemplar: Hart, D. D. et al., (2022). Collaboration on the mudflats: How community-university partnerships can strengthen deliberative and democratic practices. *Issues in Science and Technology*, **39**, 1: 71–76. (Online - open access): <https://issues.org/collaboration-on-the-mudflats/>
This exemplar also demonstrates the role community engagement can play in strengthening democracy and how, through increased community-based action, universities can play a vital role in serving not only the communities, but also in preserving democratic processes.

MORE INFORMATION ABOUT NITRO-OCEANIA

NITRO-Oceania's mission is inspiring and supporting researchers to achieve transformational impact on global challenges by:

- Fostering attention to grand challenges of particular significance to the Oceania region
- Creating supportive environments and infrastructure
- Developing effective metrics for excellence, impact and return on investment
- Improving funding availability and outcomes
- Supporting next generation organisational leaders
- Providing effective career paths and role models for interdisciplinarians and transdisciplinarians at all levels, and especially to support early-career researchers
- Developing workable transition pathways to implementation of new metrics and effective career paths.

More information about NITRO-Oceania can be found at <https://nitro-oceania.net/>.

We would be pleased to provide further information and to support initiatives strengthening interdisciplinary and transdisciplinary research and education that arise from the deliberations of the Australian Universities Accord Panel.