

Australian DBER: successes and challenges

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*I acknowledge the people of the lands where this work was done
(people of Kulin Nations), and pay my respects to their Elders, past and present.*

Acknowledgements

- ACDS Project Grant (2025): Empowering Australian DBER: Investigating the landscape and developing innovative resources for science education excellence
- Project team:
 - Project Lead and CER Expert: Professor Elizabeth Yuriev, Monash University
 - BER Expert: Associate Professor Gerry Rayner, RMIT University
 - PER Expert: Dr Helen Georgiou, University of Wollongong
 - RUME Expert: Jo-ann Larkins, Federation University
 - CER Expert: Dr Reyne Pullen, University of Sydney
 - Research Assistants: Dr Caely Chen, Ms Alison Etukakpan (Monash University)

Discipline-based education research (DBER) as a field

DBER is a collection of related research fields (CER, PER, BER, RUME).

The goals of DBER are to:

- understand how people learn the concepts, practices, and ways of thinking of science and engineering
- understand the nature and development of expertise in a discipline
- identify and measure appropriate learning objectives and instructional approaches that advance students toward those objectives
- contribute to the knowledge base in a way that can guide the translation of DBER findings to classroom practice

Singer et al. (2012). "Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering." National Academies Press. DOI: <https://doi.org/10.17226/13362>

DBER vs. SoTL vs. Science education research

Category	Usual focus	Typical home	Typical question
Science education research	Science learning/teaching broadly, often school or teacher education	Education faculties	How do students learn scientific reasoning?
DBER	Learning within a specific discipline	Science/discipline faculties, sometimes education	How do chemistry students understand molecular structure?
SoTL	Teaching and learning broadly, often in one's own classroom	Anywhere academics teach	Did this redesigned assessment improve my students' learning?

Empowering DBER

- Advancing DBER requires:
 - a robust infrastructure for research with adequate, sustained funding for research & training
 - venues for peer-reviewed publication
 - recognition and support within professional societies
 - professional conferences
- NRC (2012) committee recommendations:
 - science and engineering departments, professional societies, journal editors, funding agencies, and institutional leaders to clarify expectations for DBER faculty positions, emphasise high-quality DBER, provide mentoring for new DBER scholars, and support venues for DBER scholars to share their research findings at meetings and in high-quality journals
 - DBER scholars to increase their interactions and continue drawing on related disciplines (e.g., cognitive science, educational and social psychology, organizational change, psychometrics)
 - PhD programs and postdoctoral opportunities in the individual fields of DBER to advance DBER by educating scholars who will contribute to the educational research agenda and translate that research to others

Singer et al. (2012). "Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering." National Academies Press. DOI: <https://doi.org/10.17226/13362>

Australian DBER: Success stories (examples!)

- PER: Sydney University Physics Education Research (SUPER), est 1992.
Prof. Manjula Sharma
- CER groups in UQ, USyd, UNSW, Monash, UWA, Curtin
- BER: UQ Prof. Jack Wang: “BioLab Collective – an Australian Laboratory Skills Video Library for the Molecular Biosciences” (ACDS-funded)
- RUME: UoM Prof. Deborah King

Project motivation and aims

Perceptions of:

- Isolation between Australian DBER practitioners (academics and HDR students) as a challenge to conducting of DBER
- Lack of DBER-specific training as a particular challenge to supervision of HDR students

Aims

- Survey the landscape of Australian DBER
- Develop DBER-specific training resources

Project team:

- CER: Elizabeth Yuriev (lead), Reyne Pullen
- BER: Gerard Rayner
- PER: Helen Georgiou
- RUME: Jo-ann Larkins
- RAs: Caely Chen, Alison Etukakpan

Introduction: common (?) path from disciplinary to education research

My story:

- 1997: PhD in computational chemistry
 - 2001: T&R academic appointment in Monash (A -> B -> C)
 - 2013: Re-appointed as Education Focussed (EF)
 - 2019: First DBER Honours student
 - 2020: First DBER PhD student; promotion to level D (EF)
 - 2026: Promotion to level E (EF)
- Challenges: no education research coursework, lack of cohort

within a
disciplinary
department

Overview

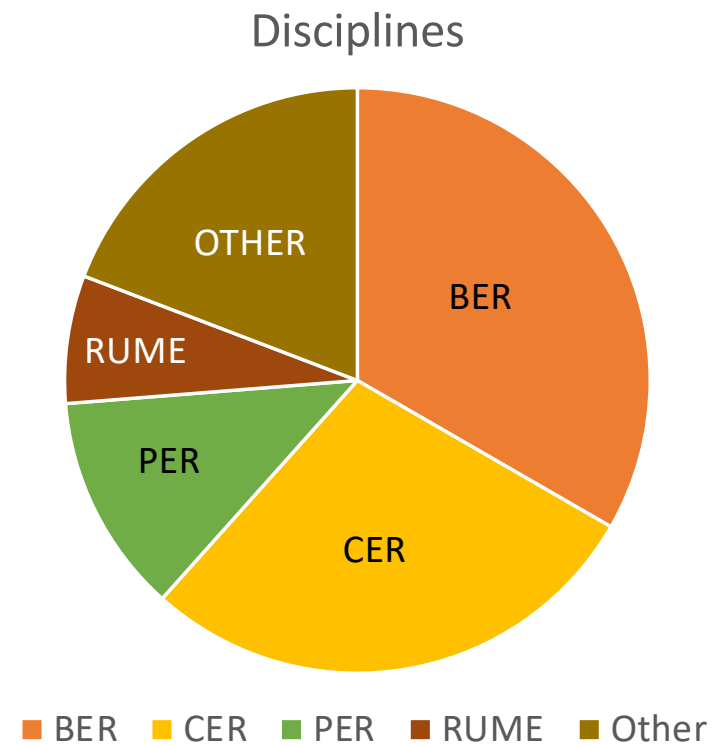
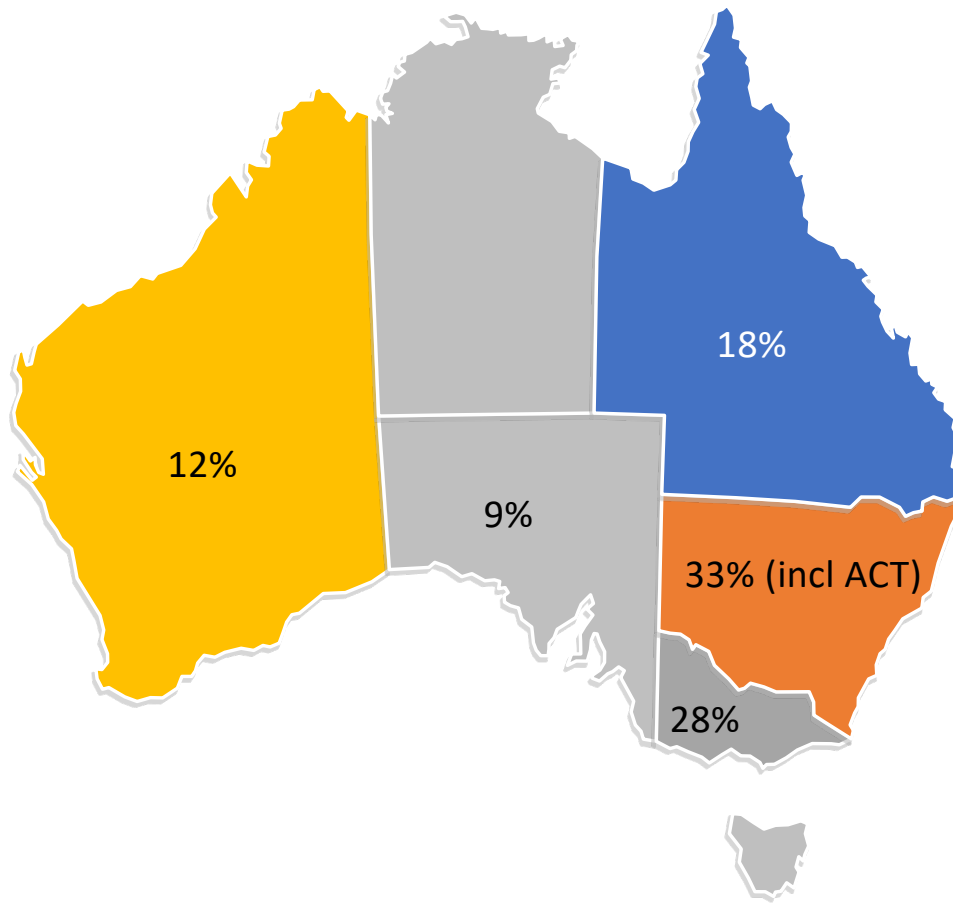
- Australian DBER landscape: findings
 - Survey (37 items; 108 participants)
 - Interviews (19 participants)
 - Instrument design was informed by the DBER NRC report (2012) and other relevant literature
- What is happening in science education research?
- What can be done to empower Australian DBER

Survey - Recruitment

- ACDS Teaching and Learning Centre Newsletter
- Publicly accessible email addresses from ACSME proceedings
- Disciplinary newsletters via:
 - ChemNet, Royal Australian Chemical Institute, Chemical Education Division
 - AIP, Australian Institute of Physics
 - AMSI, Australian Mathematical Sciences Institute
 - BEAN, Biosciences Education Australia Network

Survey – Demographics

37 items; 108 participants



Survey – who DBERers are

Q6 - 1.6. How many years have you been involved in DBER?

108 Responses



Q20 - 4.1. Have you previously supervised or are currently supervising Undergraduate, Honours, or HDR (Masters/PhD) students in DBER? - Selected Choice

79 Responses



Survey – DBER position in our institutions

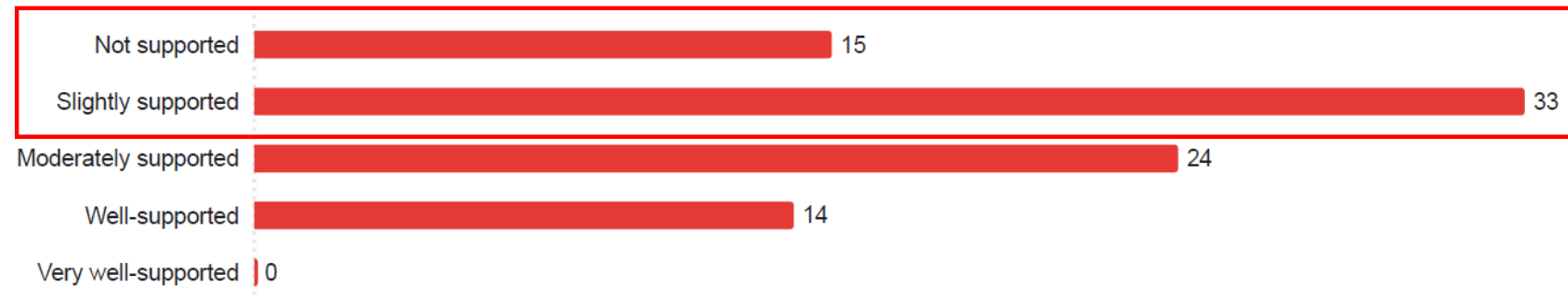
Q9 - 2.3 Is there a 'formal' DBER research group at your institution (i.e., named, active group)?

86 Responses



Q10 - 2.4 How well-supported do you feel DBER (for both staff and students) is within your institution?

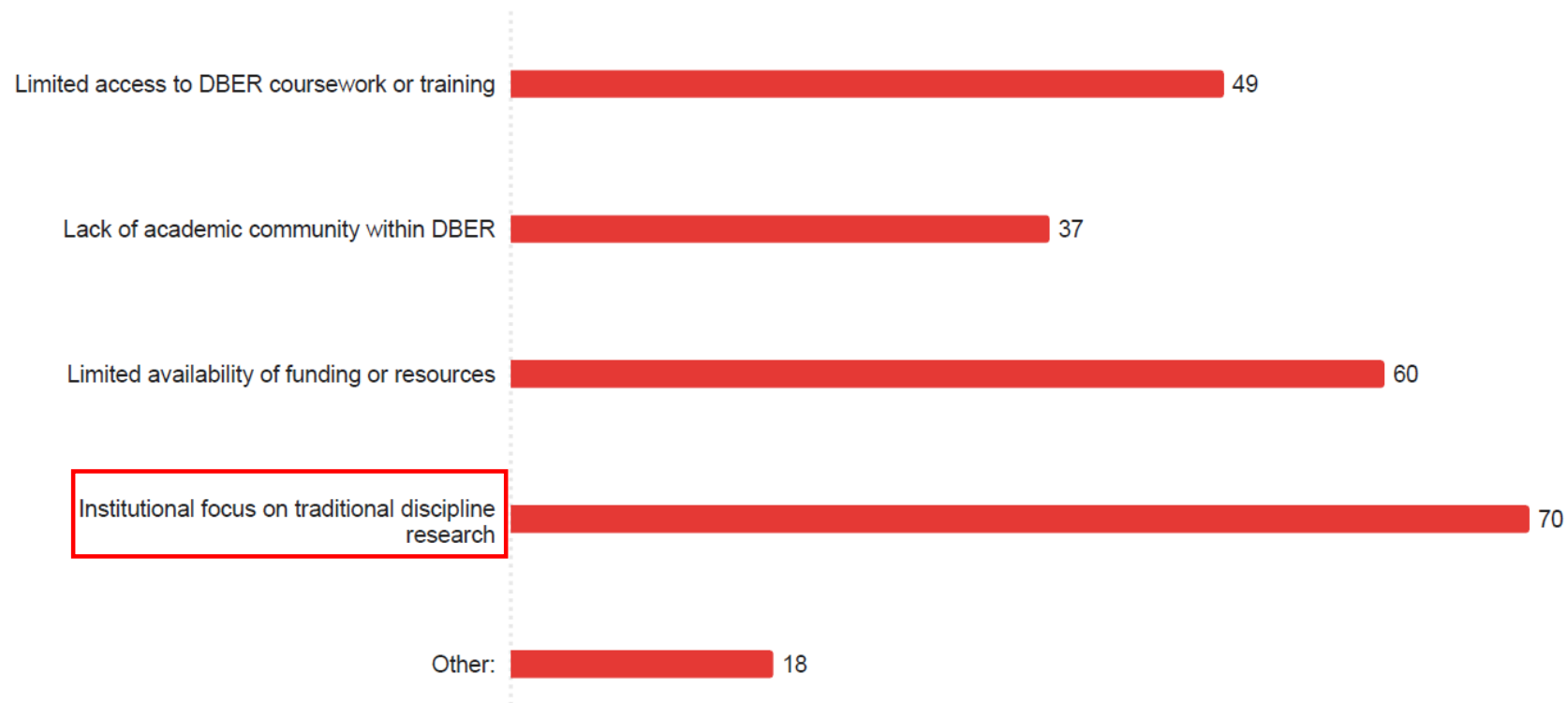
86 Responses



Survey – Challenges

Q8 - 2.2. What do you perceive as the biggest challenges for DBER students in Australia? (Select all that apply) - Selected Choice

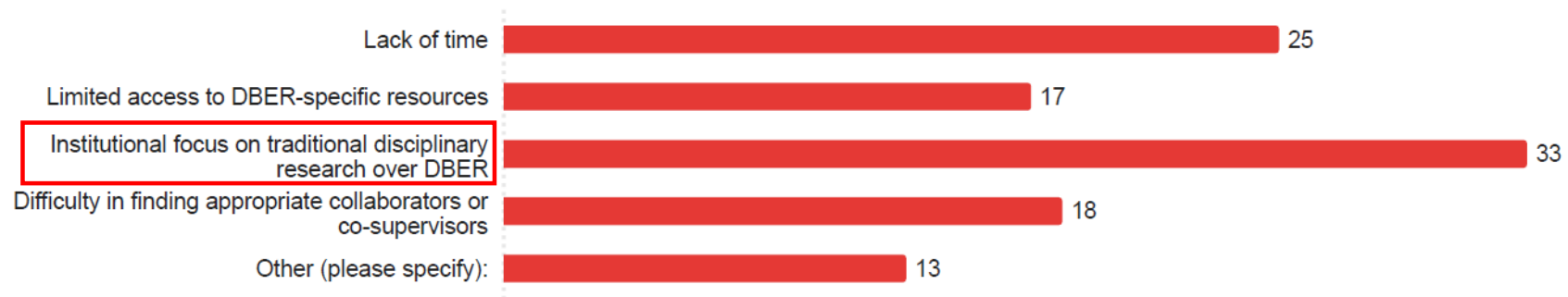
86 Responses



Survey – Challenges

Q23 - 4.4. What challenges do you face as a supervisor or mentor in DBER? (Select all that apply) - Selected Choice

48 Responses



Survey – coursework resources

Q12 - 3.1. In your institution, is there specific DBER coursework for students undertaking DBER as part of their undergraduate, Honours, or HDR courses?

86 Responses



Q14 - 3.3. How would you rate the quality of coursework or formal training in education research methods at your institution?

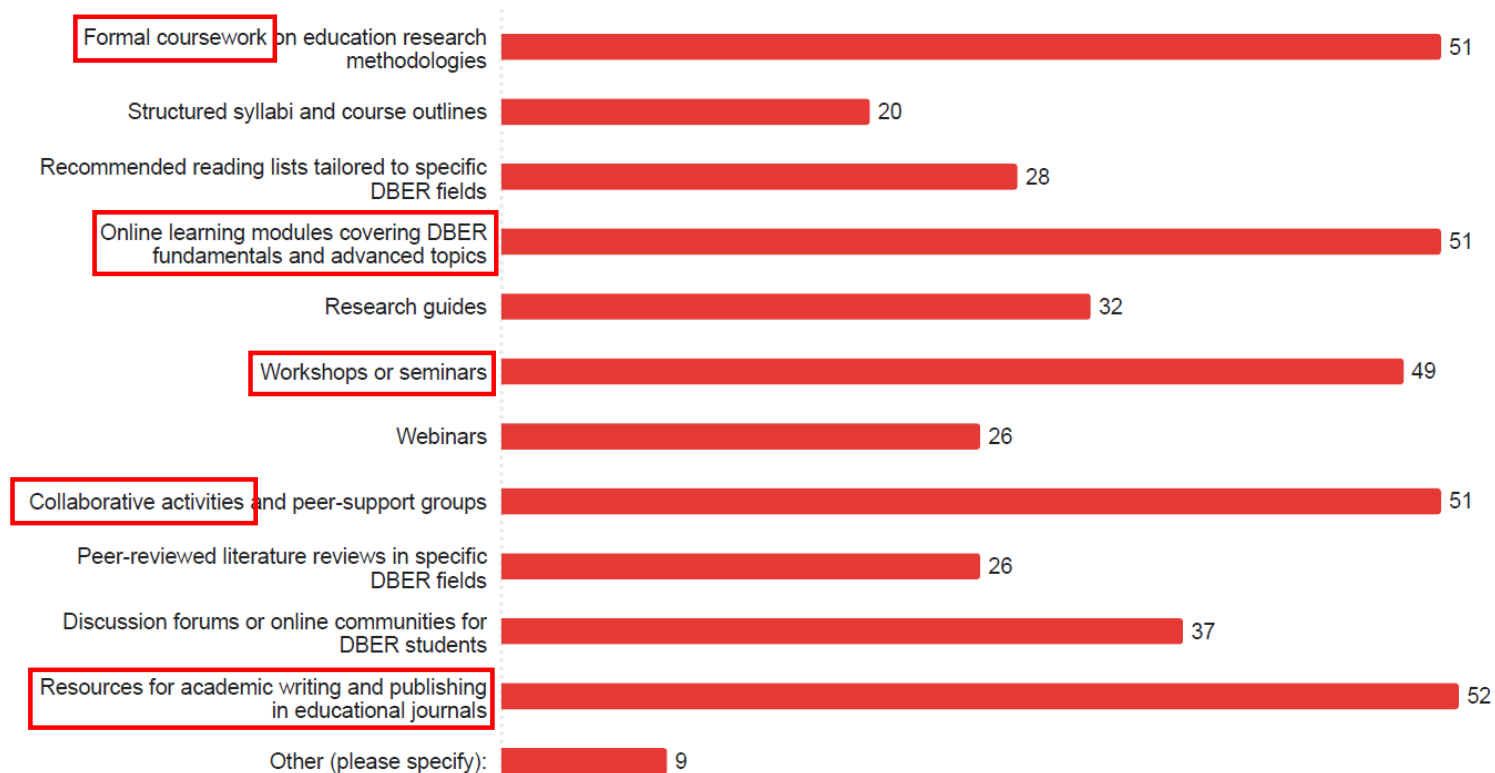
16 Responses



Survey – coursework resources (needs)

Q19 - 3.8. What types of educational resources would be most beneficial to DBER students?
(Select all that apply) - Selected Choice

79 Responses



Survey – Student CoP (or lack thereof?)

Q22 - 4.3. How often do your DBER students collaborate with peers within their institution?

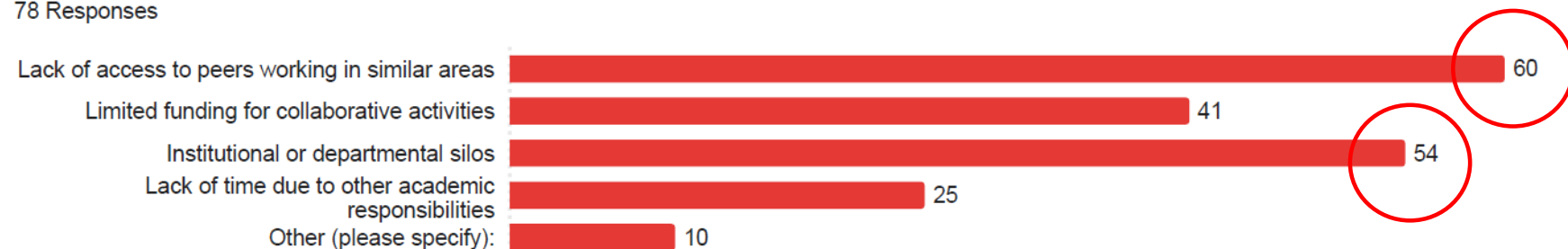
48 Responses



Q24 - 4.5. What do you see as the biggest barriers to collaboration among DBER students?

(Select all that apply) - Selected Choice

78 Responses



Survey – way forward

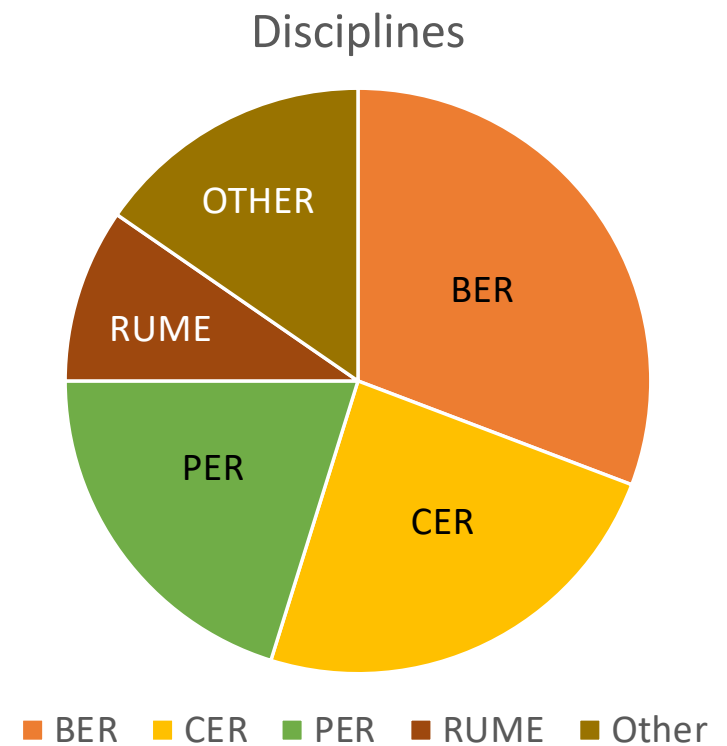
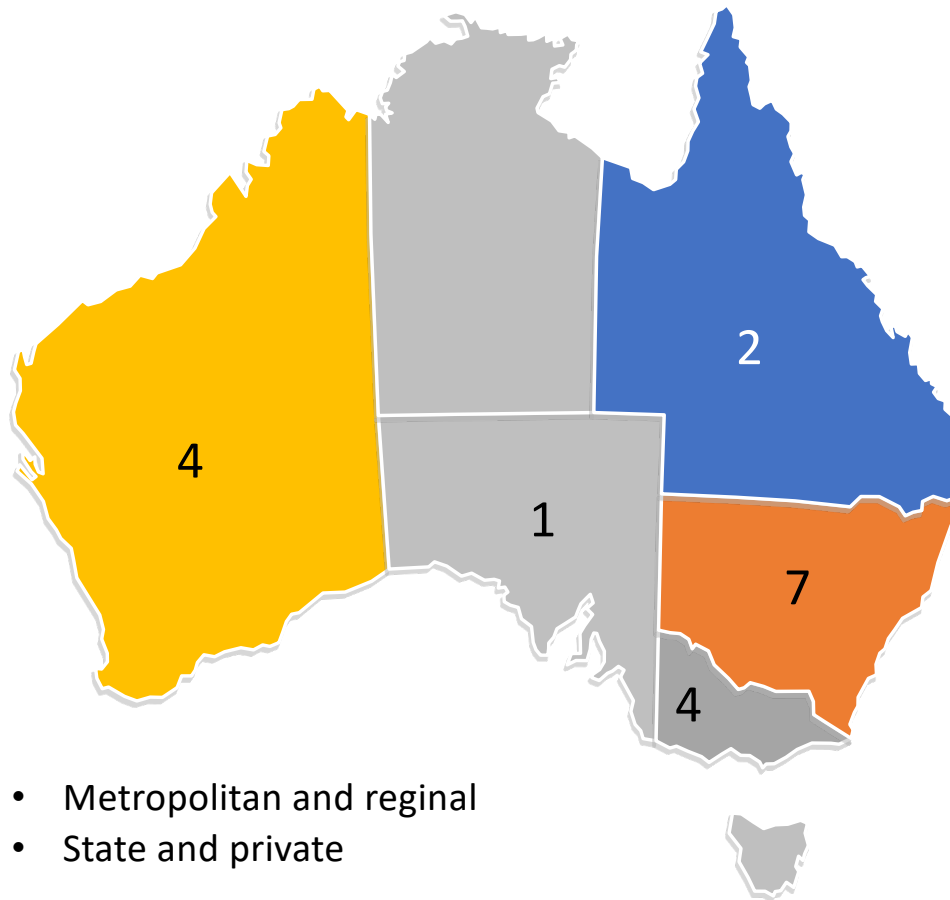
Q33 - 6.2. Do you believe there is a need for a national network of DBER students and academics in Australia?

76 Responses



ACSME and ACDS are a great foundation. But what appears to be missing is a dedicated “space” for DBER researchers and DBER students.

19 Interviews – Demographics



Interview analysis: Data familiarisation / initial coding

Universally shared themes

- **Supervision & publication:** need for co-supervision
- **Resource scarcity:** lack of DBER-specific resources
- **Collaboration & networks:** strong support for informal and formal collaboration, with many advocating for national DBER network(s)
- **Career pathways:** DBER is widely seen as undervalued compared to disciplinary research, with unclear career trajectories
- **Funding challenges:** lack of ARC-level funding and institutional support
- **Leadership & cultural change:** most participants emphasised the role of leadership and institutional support in legitimising DBER

Interview analysis: Data familiarisation / initial coding

Some unique themes

- **Ethics & bureaucracy:** some critiqued ethics approval processes and institutional bureaucracy as barriers to DBER research
- **Undergraduate preparation:** students often enter DBER without foundational knowledge in education research, highlighting the need for preparatory modules

Interview analysis: theoretical framing

Community of Practice

1. Mutual engagement

how DBER people work together and what forms engagement takes

2. Joint enterprise

purpose, values, and negotiated meaning within Australian DBER

3. Shared repertoire

common tools, conceptual resources, and methodological practices used in research

4. Boundary processes

boundary crossings, especially newcomers moving from peripheral/partial participation to full “membership”

5. Trajectories

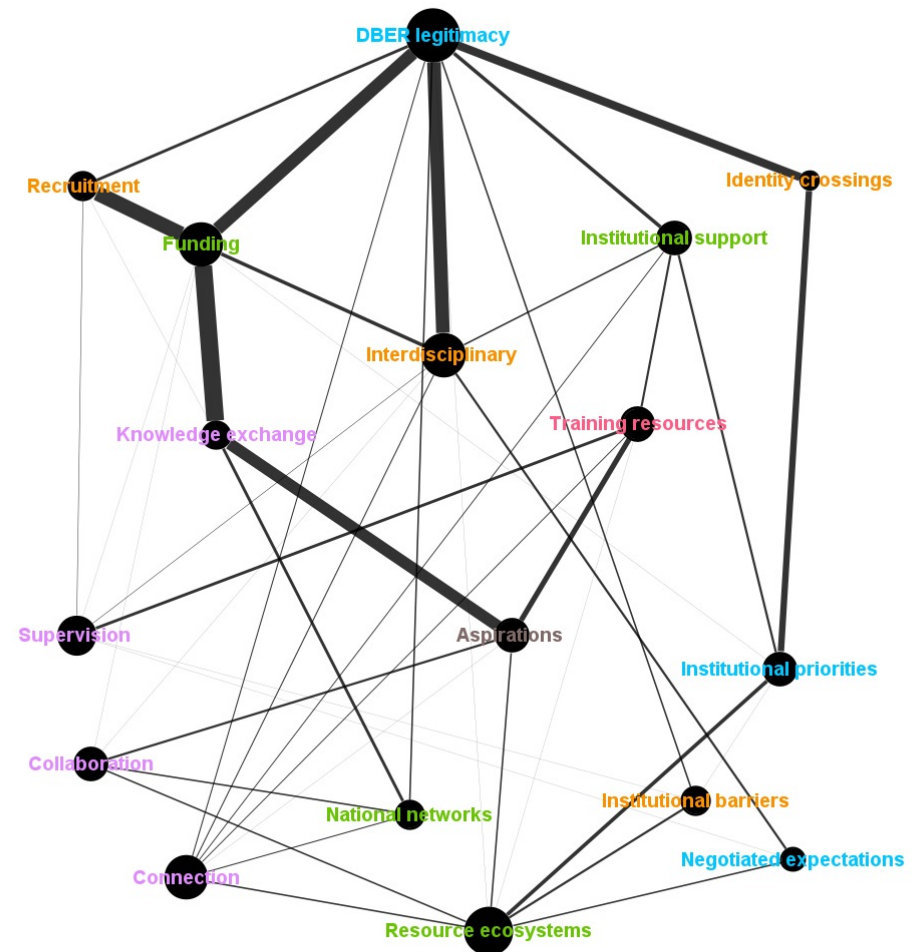
learning pathways and long-term development

6. Community infrastructure

structural conditions enabling or hindering the CoP

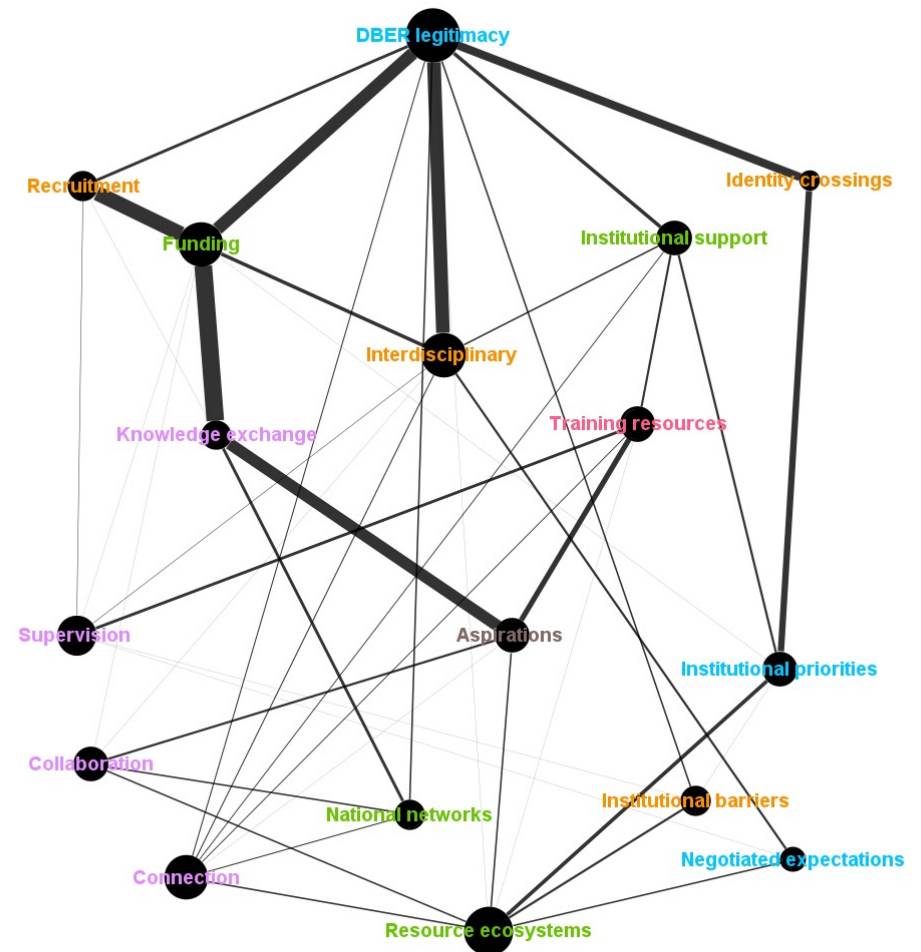
Interview analysis (main findings): Identity

- **Interdisciplinary negotiations** (disciplinary research vs. education research): persistent “*challenging friction*”, a constant balancing act between maintaining a scientific identity and adopting social science methodologies
- **DBER identity and legitimacy**: a strong internal sense of purpose, yet struggle against external perceptions and structural invisibility, with DBER identity in Australia currently “*emerging and fragmented*”



Interview analysis (main findings): Community

- **Knowledge exchange:** viewed as a critical aspect of mutual engagement for DBER as a research-focused Community of Practice (research seminars, peer review, conferences as knowledge hubs, and digital and informal exchange spaces)
- **Aspirations for CoP development:** moving beyond “*chatting about education*” to a more formalised, systematic ecosystem (high-impact, structured research projects, formal PD and skill sharing, strategic visibility and national branding, strengthening career pathways)



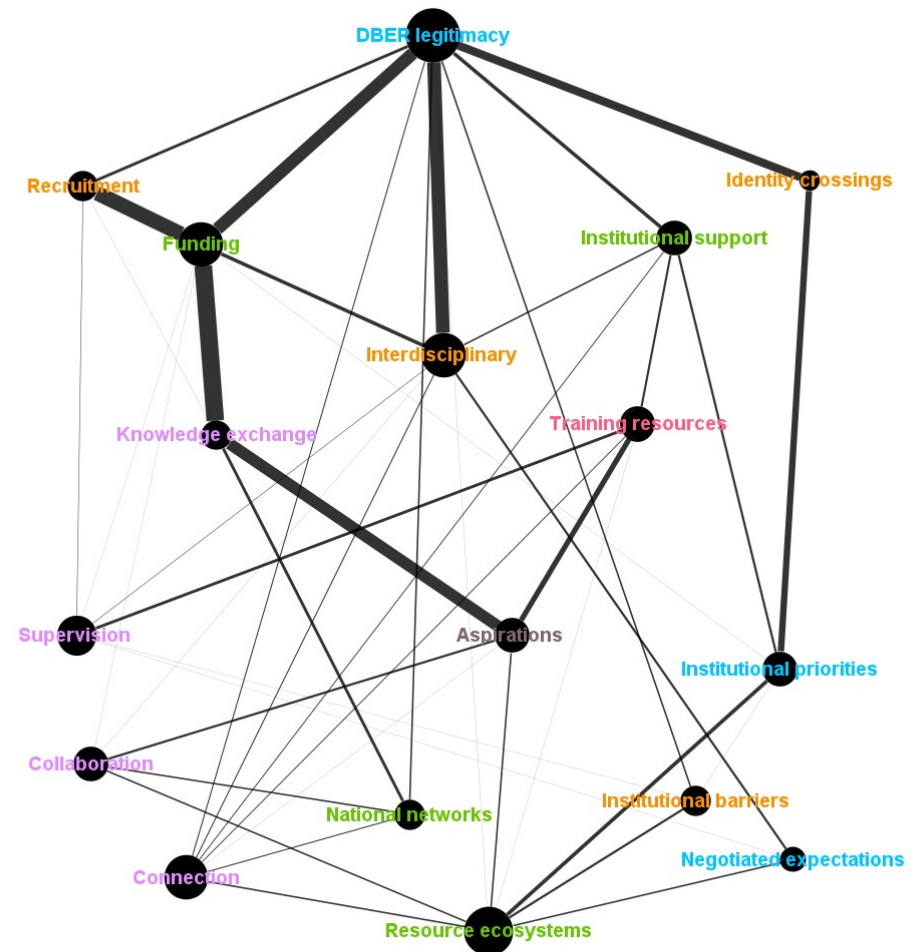
Interview analysis (main findings): Challenges

Funding for DBER:

- fragmented model that relies heavily on institutional discretion and researchers' personal sacrifices (*“fork out of their own pockets”*), compared to previously established national support (OLT)
- precarious, with a significant lack of external funding, compared with traditional science

HDR recruitment:

- lack of formal, systematic processes across many Australian universities
- barriers, including disciplinary pushback, the *“wetlab norms”*, and the funding gap



What was outside of the project scope

- Statistics of DBER productivity in Australia: papers, Honours and PhD enrolments and completion, funding, etc.
- Formal analysis of institutional processes for DBER and DBER training
- First-hand experiences and perceptions of DBER Honours and PhD students, due to participant identification and recruitment challenges
- Perspectives of institutional leaders
- We would like to pursue some or all of these in future work

What is happening in Science Ed research?

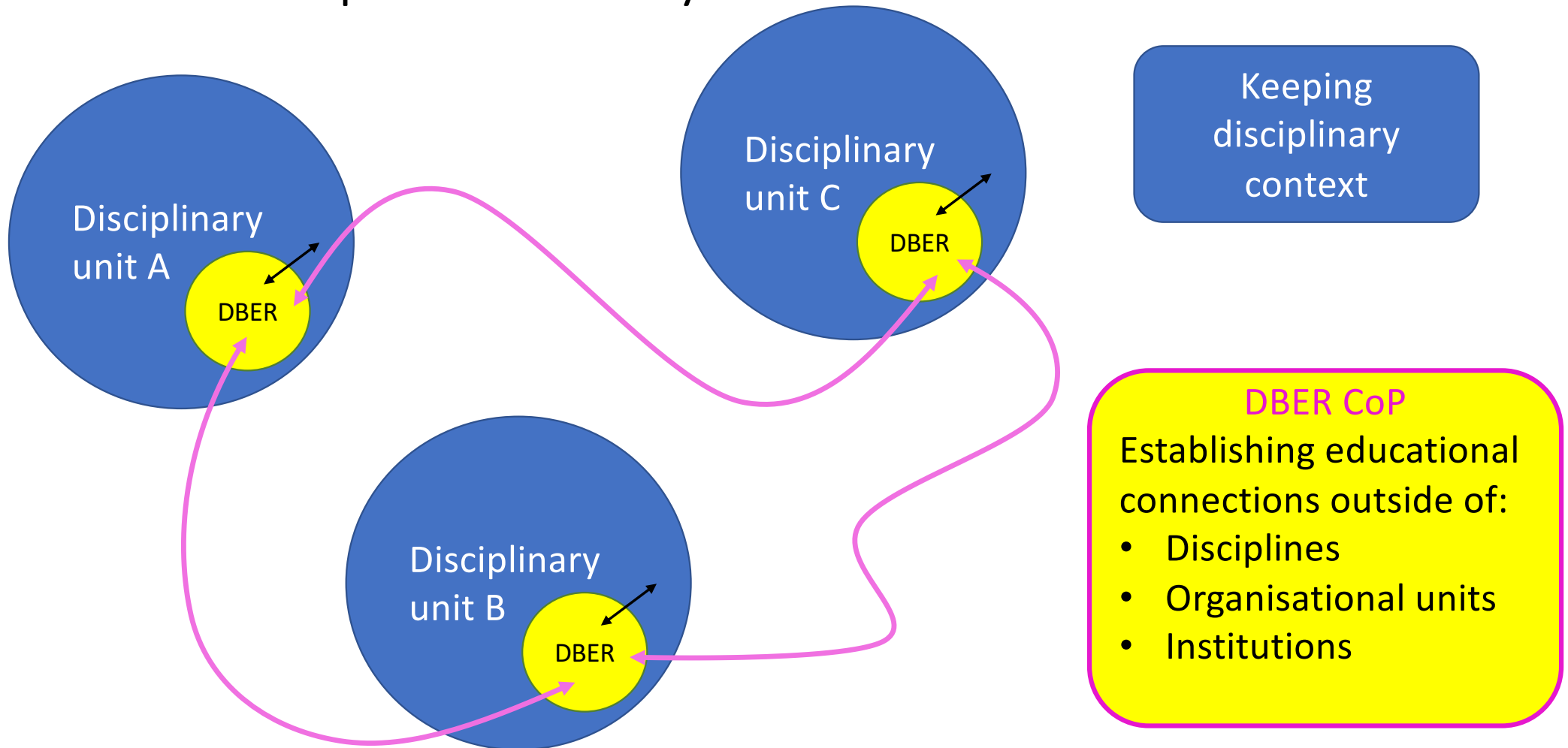
- Manathunga, C., Tomas, L., Sellar, S., Dooley, K., Smith, L., McIlwain, L., Gannon, S., Fraser, S., & Mason, J. (2025). *cADRE national report on the state of Australian education research*. Canberra: Australian Council of Deans of Education.
- Australasian Science Education Research Association (ASERA) project: Wang, X., Driel, J.V. & Treagust, D.F. *The Changing Landscape of Science Education Research in Australia and New Zealand*. Res Sci Educ 55, 1455–1468 (2025):
 - Research capacity issues: new teaching-focused appointments with low research fractions
 - Persistent structural barriers
 - Burnout and sustainability concerns
 - Isolated pockets of growth

What can be done to empower Australian DBER

National level

- Advocacy
 - Advocacy for funding
 - Advocacy for a FoR code (and where would it fit: Science or Education?)
- Formalising DBER Community of Practice
 - ACDS & ACSME are an excellent base from which to develop (but is a wider community than just DBER)

DBER positionality



What can be done to empower Australian DBER

Institutional level

- Collaborations between Faculties of Science and Faculties of Education

Faculty/School/Department level

That's where the real (cultural) change can make most difference

- DBER integration into research activities, e.g. DBER seminars opened to all researchers
- DBER-specific training & disciplinary descriptions for HDR students

DBER Training Modules

(output from our ACDS project)

1. Planning stages of a DBER project
 - 1.1. Theoretical frameworks
 - 1.2. Generating research questions
 - 1.3. Considering ethical implications
 2. Research methods
 - 2.1. Qualitative research
 - 2.2. Mixed-methods research designs
 3. Data collection methods and research instrument design
 - 3.1. Surveys
 - 3.2. Interviews
 - 3.3. Concept inventories
 - 3.4. Observations
- Currently, in the process of depositing with ACDS LTC
 - Will be presented at an ACSME Discipline day workshop

Module structure

- Overview of purpose and scope
- Curated resource list (videos, reading, other)
- Lecture (1 hr, 15-20 slides with narration text)
- Activities
 - Workshop
 - Assignment (individual)
 - Assessment or self-assessment (MCQ quiz)

What can be done to empower Australian DBER

What about education-focused departments within faculties?

- visibility and legitimacy
- dedicated recruitment and funding processes
- requires a local critical mass (bottom-up) and supportive leadership (top-down)
- potential threat is a loss of disciplinary connection; it needs to be deliberately maintained

Example of education-focused department embedded within a discipline



- 2013: First 5 Education Focused Academic Staff
- 2019: First Honours Student enrolled
- 2020: First PhD student enrolled
- 2021: Pharmacy and Pharmaceutical Sciences Education (PPS-Ed) Theme created
- 2026:
 - 25+ Education Focused Academic Staff + cohort of 'Practice Academics'
 - 16 PhD students in the Theme: thesis submissions, graduations, awards

Example of education-focused department embedded within a discipline

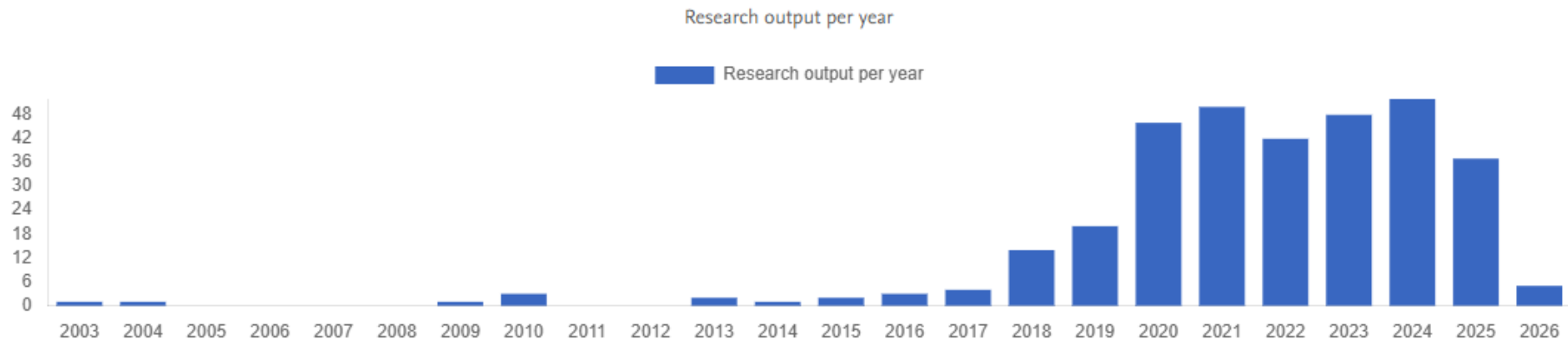
- Support strategies for researchers
 - Education Research Grants
 - Educational Innovation Grants
 - Conference travel
 - Funded training courses
- Cohort experience for students
 - Research meetings
 - Journal club
 - Writing meetings



Example of education-focused department embedded within a discipline



- 70% of publications are in Q1 journals (CiteScore, 2022-2204)



- Other impact via: invited talks, editorial roles in Q1 journals, adoption of innovations, impact on policy / scope of practice

Final thoughts

- We do it (i.e., education and education research) not because it is easy...
- Network building for DBER researchers and students
 - Breaking disciplinary silos
 - Enhancing visibility and legitimacy
 - Opportunities for knowledge exchange
 - Scope for a national event (conference, training bootcamp,...)?
- Two approaches to DBER capacity building (not mutually exclusive)
 - Intra-institutional – requires critical mass and visionary leadership
 - Inter-institutional – requires collaboration among DBER researchers (this is not a revelation, but it is still very much a work-in-progress)