



Executive Summary

The expectations on our graduates are beginning to shift, with a greater emphasis on developing the graduates both personally and professionally to support their individual academic to work-life transition, whether the profession of choice is going to be in the private sector, the public sector, or not-for-profit sectors.¹

The doctorate attained its modern classification as an advanced research degree in the 19th century when most PhD graduates were destined for employment in academe. Today, data from the USA and Australia suggests that private sector employment of PhD graduates is between 45 and 50%². Evaluation of the Australian research training system is required to determine whether it remains “fit for purpose” given the transformation of the “purpose” over the past 50 years.

Although higher research degrees vary in their structure across the globe, Australian programs have a number of unique aspects that are perceived as strengths. These include:

- A rich variety of pathways, skills development and industry engagement opportunities on offer in institutions across Australia
- High quality programs with “contained” durations defined by the AQF and driven by
- Flexibility of entry requirements supported by academic equivalence assessment
- A core focus on high quality disciplinary research and development of associated research skills, which is strengthened by definitions within the AQF
- An independent, high quality examination process

Despite these strengths, there are challenges that must be addressed to further strengthen and add global relevance to the outcomes of Australian higher research degrees. These include:

- Broader skills development is inconsistent and most programs do not incorporate opportunities for development or assess attainment of these skills
- Metrics used may not drive high quality institutional outcomes since they are focussed on quantity, measured by completion numbers
- Candidates are not routinely encouraged to engage with end-users and to develop skills in knowledge exchange and understanding of translation of research findings to real-world benefits

¹ Professional skills development for graduate students, CAGS, Nov 2008.

<http://www.cags.ca/documents/publications/working/Prof%20Skills%20Dev%20for%20Grad%20Stud%20%20Final%2008%201%2005.pdf>

²See <http://www.nsf.gov/statistics/sed/2013/digest/theme4.cfm> and Edwards, Daniel; Radloff, Ali; and Coates, Hamish, "Supply, Demand and Characteristics of the HDR Population in Australia" (2009). *Higher Education Research*. http://research.acer.edu.au/higher_education/10

Responses to Consultation Questions

PRODUCING HIGH QUALITY RESEARCHERS

1. What are the research skills and experiences needed to be an effective researcher?

There exist a number of well-developed frameworks elaborating in some detail the skills required of the effective researcher, including specific research skills. These frameworks take different approaches to framing and developing research skills, either based on broad domains of knowledge, skills and abilities or focussing only on specific research skills attained incrementally throughout an education lifecycle. An example of the broad domain approach is the Vitae Researcher Development Framework (RDF)³ which categorises the skills required into four broad domains:

- Knowledge and Intellectual Abilities
- Research Governance and Organisation
- Personal Effectiveness
- Engagement, Influence and Impact

The skills encompassed by these broad domains are not exclusive to the development research skills. Reference to development of specific research skills is incorporated under the *knowledge and intellectual abilities* and the *research governance and organisation* domains. The key research skills encompassed by these domains are specific to the conduct of the research according to disciplinary norms and include theoretical and practical application of research methods, critical thinking, analytical skills and ethics. The framework is intended for those who are:

*....doing a doctorate, are a member of research staff, pursuing an academic career or thinking about applying the skills developed during your PhD in another career.*³

A specific research skills framework is illustrated by the framework at the University of Adelaide⁴. Adelaide's framework is an example of a more specific approach that proposes embedding research education from primary school to the PhD and beyond. Six facets of the research process are described, based on the research literature⁵:

- Embark on inquiry and so determine a need for knowledge/understanding
- Find/generate needed information/data using appropriate methodology
- Critically evaluate information/data and the process to find/generate this information/data.
- Organise information collected/generated

³ <https://www.vitae.ac.uk/researchers-professional-development/about-the-vitae-researcher-development-framework>

⁴ <http://www.adelaide.edu.au/rsd/framework/>

⁵ <http://www.adelaide.edu.au/rsd/evidence/research-skills/>



ACOLA REVIEW RESPONSE

AUGUST 2015

- Synthesise and analyse and apply new knowledge, and
- Communicate knowledge and the processes used to generate it, with an awareness of ethical, social and cultural issues.

These components of the research process are stated generically so that they can be applied to development of researchers in most disciplines. The assumption that is implicit in the Australian admission process for research higher degree programs is that applicants have attained these research skills in a cognate discipline at a level appropriate to honours undergraduate education as outlined in the Australian Qualifications Framework⁶. The major problem with this assumption is the increasingly diverse educational attainment of applicants to Australian postgraduate research degrees. With the purpose of honours degrees moving away from preparation for a higher research degree and the increasing proportion of international candidates from 19.7% to 31.6% between 2007 and 2014, there is now enormous diversity of entry qualifications.

The diversity of entry qualifications puts pressure on research programs to incorporate consistent development of research skills across cohorts. Many institutions in the United Kingdom have addressed this by introducing a needs analysis approach to assess research (and other) skills in each candidate at the commencement of their research program. This however, does not address assessment of attainment of these skills at the completion of the program.

Explicit evaluation of attainment of research skills is not a feature of many Australian higher degree research (HDR) programs. Australian research degrees are primarily or even exclusively awarded on the basis of examination of a thesis. The experience of research leading to the production of the thesis necessarily involves the development of a range of research skills such as those outlined above. Edwards *et al*⁷ found that a clear majority of Australian HDR students believe they are well prepared to do academic/scholarly research, to write academic journal articles/books, and to present at academic conferences. Furthermore, in at least 28 of the 40 Australian institutions awarding higher research degrees, the thesis may be formatted as a series of papers. This format, which is more prevalent in the STEM⁸ disciplines, can demonstrate that their student authors have achieved the skills necessary to execute (often collaborative) research programs and communicate these to an academic audience.

The success of the Australian *Three Minute Thesis*TM competition, developed by the University of Queensland and the model for similar formats now used all over the world, demonstrates that Australian HDR students are being well prepared to disseminate the

⁶ <http://www.aqf.edu.au/>

⁷ Regenerating the academic workforce: the careers, intentions and motivations of higher degree research students in Australia: findings of the National Research Student Survey http://research.acer.edu.au/higher_education/23

⁸ Science, technology, engineering and mathematics



results of their research to wider public audiences. Nevertheless, while students have opportunities to present at conferences and to engage in the 3MT competition, there is no formal requirement to do so. An oral presentation of the near or complete thesis would further encourage the nurturing of presentational skills for all candidates.

A study conducted by Allen Consulting 2010⁹ addressed the question on the researcher skills employers seek across a range of employers from different sectors. The findings clearly showed that:

Employers engage researchers with high levels of technical skill and experience (i.e. Doctor of Philosophy (PhD) qualification and Post-Doctoral (Post-Doc) experience) and believe that the majority of newly employed researchers have the skills necessary to be productive.

While the Australian PhD appears to be providing good training in disciplinary research skills, it is not clear that there is consistency across cohorts given that attainment of these skills is only assessed indirectly through examination of the thesis. In addition, the context of research skills development is narrow in focus being reliant on the student-supervisor model of research training in most Australian programs. Thus development of interdisciplinary research skills and a broader understanding of problem solving across disciplines is largely ignored. Requirements for training needs analysis and individualised development programs and compulsory oral presentation could address some of these inconsistencies.

2. What broader transferable qualities do HDR graduates need to develop to succeed in a wide range of career pathways? Should these skills be assessed, and if so, how?

As outlined in the response to Question 1, Vitae in the UK identified 4 broad domains that encompass research and transferrable skills. Among these, the *personal effectiveness and engagement, influence and impact* domains encompass many of the transferrable skills they consider necessary for success in different career pathways. The study conducted by Allen Consulting⁹ also noted that:

...the skills that researchers most frequently need to improve are 'soft skills', such as communication, rather than technical skills⁹

The Australian research degree, while incorporating many opportunities for development of these "soft skills" does not explicitly require engagement in their development nor does it assess their attainment. While the production of a research thesis and the experiences involved in the research projects culminating in that production develop a depth of knowledge and range of skills generalisable to a wide range of careers, there are inevitable limitations. The question that needs to be addressed is to what extent these limitations should be addressed as a principal focus of higher degree research training. It is clear that

⁹<http://www.industry.gov.au/research/ResearchWorkforceIssues/Documents/EmployerDemandforResearchersinAustraliareport.pdf>



gaps exist in our current system, however what is more difficult is how these might these best be addressed in our future system.

In a study conducted by the Canadian Association of Graduate Schools (CAGS), nine areas for professional skills development were identified¹:

1. Communication and interpersonal skills
2. Critical and creative thinking
3. Personal effectiveness
4. Integrity and ethical conduct
5. Teaching competence
6. Leadership
7. Research management
8. Knowledge mobilization and knowledge translation
9. Societal/civic responsibilities.

Interestingly, only four of these, communication, management, ethics and teaching were considered to have a *high likelihood of success in implementation in the university context*¹. Given that the Doctor of Philosophy remains the globally recognised qualification for the academy, skills in academic learning and teaching are clearly important. Edwards *et al*⁷ reported that the greater majority of students surveyed aspired to a career in the Academy but felt that they were not adequately prepared to give lectures, coordinate undergraduate subjects or supervise research students. Similarly, very few believed they had been well prepared for a non-academic job either within or outside their field. While most universities provide teaching opportunities and associated development for HDR candidates, there is no expectation that all candidates be given such opportunities.

Higher Degrees by Research should not become vocationally driven but should equip graduates with appropriate and relevant skills to assist with finding employment. Australian universities provide an excellent cross section of face to face and online programs focused on development of professional skills. An example is the Australian Technology Network which operates the e-Grad School Australia (eGSA)¹⁰. Online training modules in employability, professional and career skills are provided to HDR candidates through eGSA. To date, over 8000 HDR candidates have completed eGSA training courses. A recent study of almost 300 candidates who had undertaken LEAP (PD courses) and MORE (research skills) modules found that over half of all students cited:

*“wanting more than research skills from my higher research degree” as the top reason for taking an eGSA modules. Other top reasons were to address a skills gap, to improve CV/career prospects and to learn about a specific skill*¹¹.

¹⁰ See <http://www.egradschool.edu.au/>

¹¹ McGuire, P.(2015). Unpublished study of eGSA outcomes. Available on request for eGSA.



While development of research skills is implicit in Australian research programs, development of transferrable skills is reliant on candidates being proactive and mentoring and engagement of individual supervisors. There is an issue of equity here where not all candidates have the same support and access to development opportunities. The challenge also remains that completion, especially of on-line courses, does not necessarily equate to competence in the workforce. This requires practical assessment and / or more applied experience in a variety of contexts. Employability and career progression depends on transforming knowledge to the right type of actions and behaviours. Introduction of practical programs and assessment requires careful design and trialling and programs should be tailorable and expected for all candidates. Development of a nationally recognised framework for research and transferrable skills would provide more consistency in the career development of HDR candidates across the sector. This could also provide a mechanism for employers to understand the kinds of skills and attributes Australian trained PhD graduates would bring to their organisation.

3. What other broader capabilities should HDR graduates develop during their research training?

Research skills, defined broadly as those required to conduct and communicate high quality research, and transferrable skills, defined as those required to be an effective communicator and collaborator may reasonably be developed in all graduates within existing university HDR programs. Broader capabilities, which are certainly feasible to develop within research programs, include those attributes that value-add to graduate attributes such as:

- Leadership
- Strategic planning
- Knowledge exchange and translation
- Interdisciplinary thinking

While it is reasonable to provide opportunities for the development of these skills within HDR programs, these may not be applicable to all candidates. In addition, universities may not be the ideal environment for developing such capabilities. Opportunities are currently provided within Australian HDR programs through a variety of arrangements including internships, leadership programs, global networking experiences and interdisciplinary conferences, to name a few examples.

Research internships in both Australian and international businesses and not-for-profit organisations are available across a range of fields in both STEM and non-STEM areas. These include the AMSI Intern¹² program, originally providing internships in maths, but now with a broader offering and co-op type programs such as the UNSW Australia-3M partnership offering internships for research candidates¹³. The five Western Australian universities

¹² See <http://amsiintern.org.au/>

¹³ See https://scholarships.online.unsw.edu.au/scholarship/phd_login.login



(Curtin, Edith Cowan, Murdoch, Notre Dame, UWA) have developed as part of their Advancing Western Australian Research Education (AWARE) collaboration¹⁴, a specific industry engagement program, *iPrepWA*¹⁵, that embeds interdisciplinary teams of students with an industry partner during the thesis examination period. The Queensland Government is supporting a similar PhD Employment Experience Program¹⁶, piloted with Griffith and UQ in 2014 and now being broadened to include all Queensland universities and industries. As well as seeking to extend cross-sectoral awareness and enhance the career-readiness of students, these programs have been developed in recognition of the need to raise the profile of the transferability of skills gained through PhD training to employers in industry and government.

For the most part programs of this kind, or the internships and career pathway programs within PhD courses, are incorporated into the research experience and not assessed. Those that do require a separate course enrolment (often due to be undertaken post submission) may require an assessment regime but this serves no role in determining the course result which is based on the thesis or other examinable output being of an appropriate standard.

The two approaches that could be taken to such assessment are informal, self-assessment by researchers and employers or more formally through traditional coursework structures.

THE CONTRIBUTION OF RESEARCH TRAINING TO AUSTRALIA'S FUTURE PROSPERITY AND WELLBEING

4. What skills and capabilities do employers in Australia need from HDR graduates?

Deloitte's recent *Positioning for Prosperity? Catching the next wave*, suggests that the 'Fantastic Five' sectors of gas, agribusiness, tourism, international education and wealth management could provide an additional \$250 billion to the Australian economy over the next 20 years¹⁷. These relatively new business areas will add revenues to those generated through traditional export strengths in food and fibre production, mineral extraction and processing, medical biotechnology and regional finance, and to the domestic economic job drivers of healthcare, professional and business services and construction¹⁸.

Beyond the fundamental and important contributions research and research training make to the basic research (discussed elsewhere), research training has a separate contribution to make to "Australia's Research System" that will enable Australia to continue to compete in these traditional and growth areas to earn export income and to sustain domestic

¹⁴ <http://www.waresearch.com/>

¹⁵ <http://www.waresearch.com/-!iprepwa/mainPage>

¹⁶ <https://www.qld.gov.au/jobs/education/volunteering/pages/phd-program.html>

¹⁷ <http://www2.deloitte.com/au/en/pages/media-releases/articles/25-reasons-confident-about-growth-240314.html>

¹⁸ <http://www.industry.gov.au/Office-of-the-Chief-Economist/Publications/Pages/Australian-Industry-Report.aspx>



employment. It is taken as a given that good research training requires an excellent research environment and, as revealed by the ERA exercise, Australia's universities currently offer very rich and comprehensive research environments that provide training in most of the ~150 Fields of Research codes. This suggests that the challenge in meeting the demands of new research domains lies in targeted expansion, rather than *de novo* building, of research capacity. The research training environments within universities and research institutes should be expanded to include "industry", defined in the broadest sense as those organisations more directly servicing financial prosperity. By embedding a percentage of HDR candidates within these organisations, broader industry relevant skills can be developed. These HDRs will need effective supervision and the completion rates for these embedded candidates will need to be monitored closely to ensure that progress through the research training degree are equal to those of research institutions.

The PhD is an international qualification demonstrating research training. The Australian PhD must retain the core deep, sustained research activity that is central to this training. It can be argued that the STEM HDR in Australia intrinsically provides excellent fundamental skills in problem or question definition, resource accrual, technical development, experimentation, data collection and analysis, and reporting. Similar but different skills may be acquired during a HDR in the non-STEM disciplines, but with an emphasis on qualitative research, argument development and advanced writing skills.

These skills can be expanded to enable the more rapid transition from the academy to non-academic roles. The types of specific new skills required will very much depend on the industry that will be supported through research training. An HDR entering the medical technology sector may require a deeper understanding of the regulatory processes for medical devices whereas an HDR servicing wealth management may need quantitative, financial and compliance-based training. The provision of a rich palate of allied training from which HDR candidates can select training packages will be more effective than attempting to provide all HDRs with similar skills.

More training in some generic skills though is warranted. Communication, formal project management, and leadership are key personal skills that should be acquired by most if not all HDR graduates. A deeper understanding of organisations, their systems and behaviors, and the value of interdisciplinary approaches to problem solving through immersion or group activity, teachings that were provided through the now disbanded Commercialisation Training Scheme (CTS)¹⁹. The CTS should be restored as a key element of expanding research training engagement with "industry".

¹⁹ <http://www.gradskills.anu.edu.au/graduate-certificate-commercialisation-university-melbourne>

5. What research skills and capabilities are needed to ensure Australia's research system remains internationally competitive?

Industry's own analysis²⁰ suggests that Australia's research and development performance (R&D as %GDP) is internationally competitive through the lens of government investment, either directly or indirectly through higher education, but there is a growing disparity between "business" investment in R&D in Australia with that of competitor countries like Germany and the US. Such data argues that the key input into growth of capacity will likely be financial, though any increased investment by industry though any increased investment through e.g. diverting money made available through the R&D tax credit into research training, would require an increase in personnel and then capability development. HDRs more directly funded by "business" will need to satisfy the academic demands of research training (i.e. a thesis to retain the value of an Australian PhD), and those of the "business" supporting the training. Experience with ARC Linkage, CRCs and other industry-facing research programs suggest that any tensions arising from meeting these additional demands can be met. The specific requirements will depend on the "business". It is therefore necessary to provide a flexible training environment which can sample from learnings from a variety of sources including from the different areas of the University's didactic offerings (e.g. Business Schools, Communications units, Entrepreneurial areas, Legal services including IP training), from industry through immersive or communicated activities and from external including international sources. This flexibility must include an extension to the scholarship component of research training (i.e. to 4 years) and in providing more support for candidatures that provide an expanded industry engagement to fund the additional training requirements e.g. through a reintroduced CTS.

6. What research skills and capabilities are needed from HDR graduates to ensure Australia is ready to meet current and future social, economic and environmental challenges?

One important value of the deep, sustained research activity conducted during research training is to facilitate exploration of the leading edge solutions to the problems that are core to the research question(s). The HDR candidates must be able to identify, read and critique the relevant research literature and attend international meetings where new technologies are discussed to assist in this ideation. Access to the best available online resources is a given. Research and hence research training is no longer a domestic activity; graduate researchers must be able to access the international talent pool to mediate the generation and testing of ideas, to explore commercialisation funding beyond Australia's limited reach, to engage with peers in the developed and rapidly developing world. Beyond attending conferences, HDRs must be able to undertake some component of their research training in an international institution if the institution can add value to the candidates program.

²⁰ <http://www.industry.gov.au/Office-of-the-Chief-Economist/Publications/IndustryMonitor/section2.html>



The innovative specific research skills are typically generated outside of Australia – this is to be expected in Australia only accounts for <2% of the global research outputs²¹. Australia currently has approximately 8 researchers per 1000 people explored, a number that compares poorly with Japan and Sweden (10/1000), Korea (12/1000), Denmark (14/1000) and Finland (15/1000). These researcher numbers are reflected in the percentage of GDP spent on research and development. Clearly, if Australia is to successfully compete at the innovation end of the wealth creation chain, then it will need to increase the numbers of researchers. The question should therefore be both about quality and quantity of researchers. Unquestionably, the skills of Australian researchers could be improved and would be with the addition of training support but attention must also be paid to the numbers of researchers, which must be increased if Australia is to compete for innovative solutions.

RESEARCH TRAINING SYSTEM

Question 7 - What features of the research training system should be retained to ensure our graduates are internationally competitive?

High Quality Research

The Australian PhD has at its core deep, sustained research activity that is central to research training. The focus of the Australian research training system should remain on completion of research that makes a valuable contribution to new knowledge in a candidates' discipline. Implicit in this is the critical role of doctoral candidates as part of the Australian research "workforce". Research candidates outnumber academic staff involved in research in many universities and across a sample of Australian universities the proportion of the total publications with a research candidate as an author was up to 40%.

Sector wide Agreement on Principles of Good Practice

Through the Australian Council of Graduate Research (formerly the Deans and Directors of Graduate Research) all Australian universities have collaboratively defined and committed to a series of good practice principles that are considered to be essential for the development of graduate research programs. These principles cover admission, support, skill development, resources, supervision and examination and have been adopted by all institutions and recognized nationally in the proposed new Higher Education Standards Framework and internationally by peak bodies including the UK Council of Graduate Education. These principles not only set a high and consistent standard for research training delivery across Australia but also help to attract high quality international candidates seeking a first class research training experience.

²¹ Australian Benchmark Report 2015, Australian Trade Commission



Flexibility of Entry Requirements

Our candidates enter with a range of qualifications and experience so it is important that our entry pathways are flexible enough to recognise this diversity. The average age of Australian PhD candidates is 37 years and around 45% were engaged in full- or part-time employment in the year prior to enrolling. 30% of our research candidates are international with varied types of preparation for research. Research experience and capacity can be developed and demonstrated in a number of ways and it is recommended that the equivalence evaluation conducted by institutions be maintained, including the recognition of relevant industry experience.

Timeframe

The current timeframe of 3-4 years for PhDs and research Professional Doctorates and 1-2 years for Masters as detailed in the AQF is appropriate and should be retained. However it is critical that universities have the flexibility to offer commonwealth supported scholarships for up to 4 years as the average completion times for research degrees globally often exceed the maximum expected completion times. USA data for median completion times for PhD degrees with a Masters entry requirement have been reducing since early 2000 but are still high (6.5 years for Physical Sciences, 7 years for Life Sciences, 7.5 years for Social Sciences and 9 years for Humanities). In Australia, a national cohort study for the period 2003-2008 found that average completion time for those completing within the six-year period was 4.9 years.

Independent Examination Procedures

The current Australian process of examination by independent experts as articulated in the final proposed Draft Higher Education Standards²², which were produced after extensive consultation across the sector, should remain. While there is no clear evidence that a requirement for an oral examination or defence would be of universal value to all candidates in all disciplines, the skills and experience gained through preparing and making an oral presentation of the process and outcomes of a research project have been discussed in earlier sections. Universities should retain the capacity to offer oral examination where they deem it appropriate, however any perceived benefits of an oral defense of the thesis need to be offset against the practical and resource constraints in the Australian context.

Funding and Support

The principle of targeted funding for research training to be provided to Universities on the basis of research related performance as drives the Research Training Scheme (RTS) is now well entrenched and should continue. Hard metrics that can be audited and that drive quality improvement need to be the basis for distribution of block funds and consideration should be given to inclusion of metrics not simply quantifying number of completions. Other metrics that could be considered are those that promote good practice and include the proportion of completions within maximum time, attrition within the first two years (as

²² <https://education.gov.au/final-proposed-higher-education-standards-framework>



opposed to the final 2 years of the PhD) and cohort completion. Despite the variety of student systems and hence availability of comparable data on the rates of completion of commencing cohorts, most institutions are developing year on year metrics and have evidence of performance improvement, often driven by internal funding incentives.

Question 8 - How should the research training system be structured to produce high quality researchers who can contribute to Australia's future prosperity and wellbeing?

Importance of Professional Development Skills

As discussed in Questions 1-3, the Australian PhD must involve more than completing a research-based program. It is important to raise the expectation on institutions and individual supervisors that professional development skills and programs that increase employability are critical to research training programs. Given that HDRs learn from their role models, the standard of supervision, role modelling by supervisors, not to mention the alignment of performance reward systems to reinforce expectations has a critical role to play.

While there are many programs offered within universities across Australia, with industry partners (for example the ARC Industrial Transformation Training Centres (ITTC)²³ and the ATN Industry Doctoral Training Centre²⁴, there is a lack of consistency in access and support of programs. It is also important to consider universities themselves as an end-user and ensure that the academic career development pathway is included in programs. Graduates and employers highly rate the importance of such skills development (see response to Questions 1-3), however uptake of opportunities during candidatures is often dependent on support from individual supervisors.

Adoption of a nationally recognised framework would provide more consistency in the career development of HDR candidates across the sector as well as a mechanism for employers to understand the kinds of skills and attributes Australian trained PhD graduates would bring to their business.

Funding of Candidates

Funding supporting research training should be focused on supporting the highest quality candidates with the greatest potential contribution to the Australian workforce, both during their candidature and post-graduation. Completion times should be monitored and funding should be contingent on meeting a threshold percentage of the cohort completing within maximum times (for example average of 70% PhD completing within 4 years). Additionally, in line with supporting candidates up to the maximum time allowed, restrictions should be removed from expenditure of APA and IPRS block grants to allow extension to 4 years PhD.

²³ <https://www.atn.edu.au/Partners/idtc/>

²⁴ <https://www.atn.edu.au/Partners/idtc/>



Supporting Links with End-users

Effective and sustainable links and partnerships with industry and other end-users of research must be appropriately supported and funded. Australia could support and fund such partnerships using a component of the block grant to provide research training programs. Other research and development incentives could be tailored to encourage industry participation in research training. Industry based research training should be formed under the principle of joint funding with industry/end-users. As described in Section 1 of this response, professional development, industry internships or equivalent initiatives should be incorporated into programs.

Question 9 - How can entry and exit pathways to and from research training be better structured?

Entry pathways

Ideally, to pursue a doctorate, candidates should have a strong bachelor's degree (minimum 3 years) plus a level 8 or 9 program (1-2 years) in a cognate discipline with sufficient research component to develop research skills.

The Honours degree is still one of a number of a viable pathways for entry to Doctoral programs, despite its declining numbers and lack of overseas recognition. Development and funding of 1 to 2 year Masters with a significant research component (50%) in a cognate discipline similar to the completed undergraduate degree would also provide the required background for admission.

Other mechanisms to determine research capacity are used by universities in recognition of those entering with significant work and prior research or project experience. Given the rich diversity entering HDR courses, prospective candidates need to be assessed in a variety of ways to determine whether they have the necessary skills or the opportunity to develop skills that will lead to a timely successful completion. A potential weakness in our current system is the lack of consistency of evaluation of both research preparedness and assessment of research potential. National benchmarking of the effectiveness of various equivalence and eligibility assessment strategies would help universities improve the effectiveness of their selection processes and the likelihood of improved outcomes.

Having said this, flexibility of the current system is a feature that should be retained, with requirements for academic assessment of research skills and potential being more clearly articulated by institutions.

Exit pathways

The bifurcation of funding and content requirements for coursework and research postgraduate degrees challenges the capacity to provide meaningful exit points from a research degree. There are several examples of exit pathways including those at the Macquarie University and the University's of Wollongong and Melbourne. Macquarie has an entry pathway program that combines Commonwealth Supported Places (CSP) and RTS and



uses the BPhil as an exit for those not continuing with the research component. Wollongong has an “Integrated PhD” program that has a year of coursework up front and a stop go at end of year 1 with a Masters exit qualification. At Melbourne, the PhD in Business and Economics that includes a significant coursework component with a Masters exit for the first year if the candidates do not progress to the research component.

Confirmation and review processes early in PhD candidature have been formalised in most universities and provide opportunities for transfer to Masters by Research when where appropriate. However it is not possible to include enough coursework in a funded research degree to enable a coursework exit point at masters level. As candidates need to meet conditions for award and learning outcomes for the degree (AQF) at the time of exit pathways out of research degrees will need done on a case by case basis until there is a closer connection between CSP and RTS funding.

Question 10 – How can barriers to participation in HDR programs be overcome so that more candidates from non-traditional backgrounds, including indigenous students, undertake research training?

All targeted programs to increase participation by candidates from non-traditional backgrounds should start with strengthening the pipeline into these programs. Supporting HDR admissions will only be successful if participation rates of those groups in prior undergraduate, postgraduate and/or other research training preparation programs have been addressed. This principle holds for all under-represented groups including indigenous, and gender in STEM (particularly engineering).

Only once the pipeline has been strengthened can positive support structures such as targeted scholarships, cohort support networks, mentors and research groups, be effective. There are several good and effective support practices for indigenous candidates nationally including the University of Melbourne Indigenous PhD Programs Framework²⁵ which includes summer and winter workshops, year round cohort support, Graduate Certificate in Indigenous Research and Leadership and stipend packages for all indigenous candidates.

Notice should also be taken of the national and institutional commitments to indigenous participation in New Zealand. At a national level, the university funding scheme promotes supporting indigenous candidates by double weighting Research Degree Completion Income if student is Māori and providing four times the income if thesis is written in te reo Māori. The Education Council of New Zealand also supports a number of programs including the Te Hāpai Ō Programme²⁶ which provides induction and mentoring for teachers and supervisors in Māori-medium settings.

²⁵ <http://www.murrupbarak.unimelb.edu.au/content/pages/graduate-programs-indigenous-research>

²⁶ <http://www.educationcouncil.org.nz/content/te-hāpai-ō—induction-and-mentoring-māori-medium-settings>