THE ROYAL SOCIETY

Royal Society response to UKRI's New Deal for Postgraduate Research consultation

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This document contains the Society's submission to the New Deal for Postgraduate Research (PGR) consultation. The response was shaped by conversations with Fellows with experience of supervising STEM PhD students. Previously, the Society led a project on PGR career expectations[1] to develop overarching principles and responsibilities in consultation with students, supervisors, and university research and careers professionals.

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The goals for contemporary PGR training

To make effective use of promised increases in public and private R&D investment, the UK needs a workforce with the necessary skills to operate at scale in an increasingly competitive global environment. Maintaining a strong pipeline of PGR students is essential not just for the sustainability of the research base but the UK's future as a knowledge economy striving for high skill, high productivity employment and inward investment.

Research at the core of PGR training

At its core, PGR training is (and should be defined as) the application of original thinking to solve difficult research problems. This provides significant value both to society and to the individual student, and must remain the central tenet of PGR provision. PhD students are a vital component of the research workforce, making critical contributions to research and to the generation of knowledge[2]. Outcomes of postgraduate research often advance scientific fields and industries, and sometimes create new ones. From the student perspective, PGR training offers essential skills in research, communication, project management, time management, and in organising and presenting work in a coherent manner. These skills are necessary for a research career but are also highly transferable and relevant in other professional contexts.

Training for careers within and outside academia

PhD studentships are valuable for training in critical thinking and in the process of research, which are useful skills both within and outside academia. Still, while survey data suggest PhD

[1] Royal Society. 2014. Doctoral students' career expectations: principles and responsibilities. https://royalsociety.org/topics-policy/projects/doctoral-students/

[2] Casey, Bernard. 2009. The economic contribution of PhDs. https://www.tandfonline.com/doi/abs/10.1080/13600800902974294

students consider themselves well trained in analytical and technical skills, there is lesser confidence in skills like people management, applying for funding, or budget management[3].

By design, programme components within UKRI's Centres for Doctoral Training (CDTs) and Doctoral Training Partnerships (DTPs) should be well suited to individuals who do not pursue academic careers, either through choice or because of bottlenecks in the supply of qualified individuals to jobs in academia. The interdisciplinarity and professional development training at the centre of these programmes stem from the belief that a PhD goes beyond research. A broader training is important for developing researchers for work in industry, at the interface with academia, or in government and the public or non-profit sectors[4]. Such broad training also benefits PhD students who choose careers in academia, by better preparing them for leadership positions. Good management and leadership training will positively impact research culture more generally.

Recommendations:

- PhD research training naturally equips students with a range of transferable skills. Additional training should be facilitated to equip students with other relevant 'soft' skills that can aid them in careers in academia or other sectors.

Current models for supervision

While the traditional model for PhD training was based on the student-supervisor relationship, this is now supplemented by additional training offered by the university or research institute through structured doctoral training programmes. PhD students are typically part of graduate schools that offer taught courses and professional development training with the aim of enhancing employability within or outside academia.

Student informed provision

Cutting-edge original research is at the heart of the PhD and institutions should ensure that students have meaningful research experiences. There is however a perception that PhD studentships are mostly shaped by the research interests of supervisors. Many students do not think comprehensively about their futures before starting their training and few conversations about careers are held up to this point[5].

Consideration should be given to ways of shaping PGR professional training according to student preferences and desired skills for future careers. The requirements for a successful PhD would remain unchanged (i.e. producing and defending a high quality doctoral thesis), yet students would play a more active role in choosing the type and quantity of training additional to the research. Encouraging partnerships with organisations that provide support for career development, such as the Careers Research and Advisory Centre[6] (CRAC), may be helpful in

[3] HEPI. New report shows 67% of PhD students want a career in academic research but only 30% stay in academia three years on. 2020. https://www.hepi.ac.uk/2020/07/16/new-report-shows-67-of-phd-students-want-a-career-in-academic-research-but-only-30-stay-in-academia-three-years-on/

[4] Auriol, Laudeline. 2010. Careers of doctorate holders: employment and mobility patterns. https://www.oecd-ilibrary.org/science-and-technology/careers-of-doctorate-holders_5kmh8phxvvf5-en

[5] *Ibid.*

[6] The Careers Research and Advisory Centre (CRAC). https://www.crac.org.uk/home

providing PhD students with advice and support for career development, or skills that enhance their employability.

A one-size-fits-all approach to PGR supervision and training is likely to be counterproductive. For some students, the rotations in the first year of programmes in CDTs and DTPs may seem repetitive to those who have recently completed Masters' degrees, or superfluous to those who have already decided on a research project. There are also situations where, after completing rotations, students cannot join their preferred host lab. This can sometimes lead to mismatches in interests with the research group which can negatively impact the individual's PhD experience.

Supervision models also differ by subject and discipline. PhD students in biosciences or chemistry for example may find themselves working predominantly independently during their studentships within a wider group or team. In mathematics, the supervisor-student relationship is closer to a partnership, working together 1-1 to solve problems.

Recommendations:

- PhD students should be informed of careers guidance and skills training available at their institution.
- Reasonable time should be allowed for PhD students for personal and professional development and exploration of careers options.
- PhD students should be encouraged and supported by their supervisory teams or university careers services to seek mentoring outside their faculty or institution for impartial advice and guidance throughout the PhD
- Cutting-edge research should remain the core of a PhD, but PhD students should be given a more active role in tailoring their training according to professional goals.

Support for PGR students entering careers in sectors/organisations outside academia

Owing to an expansion of career opportunities outside the higher education sector, the majority of PhD students will pursue careers outside academia. This highlights the value of providing students with well-rounded training and transferable skills for entering sectors across the economy, without compromising on the core research aspects of the PhD training.

Supervision and guidance

Supervisors not only guide the research but can also act as a mentor supporting students in identifying their ideal career path. More than half of respondents in a 2017 survey by Nature indicated 'learning what career possibilities exist' as one of the most difficult tasks for students in their discipline. The importance of clear guidance for PhD students on the breadth of careers available to them after graduation has been highlighted by a Royal Society project on career expectations[7]. Careers services at higher education institutions are well equipped to aid PhD students in identifying and preparing for careers. Consideration must also be given to the role of learned societies in providing guidance and information on careers options.

[7] Royal Society. 2014. Doctoral students' career expectations: principles and responsibilities. https://royalsociety.org/topics-policy/projects/doctoral-students/

A 2019 report by the Research on Research Institute proposed changes to the PGR model so that doctoral degrees are recognised and advertised as training for a broad range of careers, without compromising on the high quality research. The report also flags the shortage of data on career pathways after PhDs and recommends the design of a longitudinal survey that captures variation in PhD provision, experience, and outcomes across a range of UK universities[8].

Placements

Additional training provided to PhD students is variable as some programmes have extensive skills training, while others offer more technical training. Placements in industry as internships during the PhD (e.g. the Professional Internships for PhD Students, or PIPS) have been shown to prepare students better for future careers[9], help them contextualise their research, and understand the breadth of career opportunities available after graduation[10]. In general, placements provide new learning experiences and support identity construction in the work context[11].

BBSRC studentships require all PhD students to undertake a three-month PIPS placement in a sector that is not directly related to the PhD project. For NERC studentships, PIPS are not mandatory, but can take place by students' choice. The EPSRC CDT studentships often include a six-month industry placement, and the EPSRC DTP offers the option of non-mandatory placements. Flexible arrangements, such as undertaking placements on a part-time basis are sometimes possible to suit personal or academic circumstances. Additionally, a set funding amount can be offered by the research council to assist with travel and accommodation costs.

CASE studentships allow joint supervision by academic and industrial partners. Benefits of PhD students spending at least six months working directly with the industry partner include: publications, acquired skills for industry careers, and for a small number of CASE studentships, generation of new intellectual property or commercialisation of research findings[12]. The CASE scheme is also valued by universities for the support provided by industrial partners to research departments and academic supervisors. Additionally, students are valued by industry partners for their work in advancing projects. Incentives could be

[8] Hancock, Sally et. Al. 2019. 21st Century PhDs: Why we need better methods of tracking doctoral access, experiences and outcomes. https://figshare.com/articles/report/21st_Century_PhDs_Why_we_need_better_methods_of_tracking_doctoral_access_experiences_and_outcomes/9917813

[9] Vitae. 2016. C2: 'Work wisdom' and the PhD: exploring the benefits of doctoral internships. https://www.vitae.ac.uk/vitae-publications/reports/C2%20-%20Professional%20internships%20for%20PhD%20researchers

[10] Jones, Hilary and Warnock, Lorna. 2015. When a PhD is not enough: A case study of a UK internship programme to enhance the employability of doctoral researchers. https://www.emerald.com/insight/content/doi/10.1108/HESWBL-05-2014-0013/full/html

[11] Inceoglu, Ilke et al. 2019. (How) Do work placements work? Scrutinising the quantitative evidence for a theory-driven future research agenda. https://www.sciencedirect.com/science/article/pii/S0001879118301039#f0005

[12] BBSRC. 2013. Evaluation of BBSRC's Industrial CASE scheme. https://si-per.eu/siper-wAssets/repository/2013-82.pdf

investigated for creating more partnerships between industry and academia and involving smaller partners (SMEs) in studentships.

Recommendations:

- PhD students should be informed of the breadth of career opportunities available to them after graduation.
- Short industry placements should be offered to PhD students who wish to gain experience in sectors not directly related to their research project.

PhD rights and conditions

PhD students work an average of 50% more hours per week than undergraduate students[13]. Although some receive non-taxable stipends, they are not always entitled to benefits like a workplace pension, annual leave, statutory sick pay, or parental leave. Some funders, including UKRI, have provisions for sick pay or parental leave as part of their grants[14] which need to be clearly communicated (feedback from Royal Society Fellows suggests that this is not always the case). Greater clarity on how much teaching can or should be done during the PhD to gain additional skills and experience would also be useful.

For individuals who receive funded PhD studentships, the level of stipends is insufficient when considering that the intensity of the research requires working hours beyond the traditional working pattern. Surveys by Wellcome and Nature found that the majority of respondents worked between 31 and 60 hours per week, with 35% working between 41 and 50 hours per week, and 13% working over 60 hours per week[15]. Moreover, a calculation of pay per hour using the UKRI minimum stipend for 2019/20 revealed that the average PGR student earned less than the National Minimum Wage[16]. UKRI stipend levels have wider importance in acting as a guide to other organisations and charities offering stipends.

In other European countries, such as Sweden, Denmark, Norway, the Netherlands, and Germany, PhD students are afforded employee status and receive average salaries between £16,000 and £38,000. The most generous salaries for employed PGR students are seen in Switzerland, at around £44,000[17].

Low stipend levels can negatively impact diversity in research. By receiving income below the National Minimum Wage, PhD students are more reliant on family for support. For potential PhD candidates from lower income backgrounds, this may not be an option. Low prospective incomes can thus act as a deterrent to highly talented individuals from pursuing PhDs, driving them to choose better paid career paths.

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[13] Cornell, Bethan. 2020. PhD Life: the UK student experience. https://www.hepi.ac.uk/wp-content/uploads/2020/06/PhD-Life_The-UK-Student-Experience_HEPI-Report-131.pdf

[14] UKRI. 2022. UKRI Training Grant Guidance. https://www.ukri.org/wp-content/uploads/2022/04/UKRI-050422-TrainingGrantTermsConditionsGuidance-Apr2022.pdf

[15] Cornell, Bethan. 2020. PhD Life: the UK student experience. https://www.hepi.ac.uk/wp-content/uploads/2020/06/PhD-Life_The-UK-Student-Experience_HEPI-Report-131.pdf

[16] *Ibid.*

[17] *Ibid.*

Recommendations:

- PhD students are a vital component of the research workforce and their remuneration should reflect the high number of worked hours. Institutions risk losing highly talented individuals, with knock-on effects of the research system, quality and impact in the UK.
- Analysis should also be undertaken of the costs and benefits of employing PhD students as early career researchers registered for a doctoral degree. That would involve paying a salary commensurate with the skill requirement of the role and offering employee benefits.

Bullying and harassment

Bullying, discrimination and harassment can affect students and staff at all levels of the research system. One in four PhD students in a 2019 Nature survey felt they had been bullied and 21% said they had faced discrimination. When asked whether they felt comfortable speaking out about their experiences of bullying without fear of negative personal consequences, only 24% of respondents answered yes[18]. A 2021 Nature survey on salary and job satisfaction highlighted similar issues of discrimination and bullying among research staff[19]. Institutions must work more to create a safe environment for students and staff to raise concerns about bullying, harassment, and discrimination, and have claims be impartially and thoroughly investigated to identify root causes[20].

PhD fees and funding

Greater diversity in funding models

A large proportion of doctoral training funding in the UK is allocated to CDTs, and this is unevenly allocated to research fields and subjects. Hence, there are concerns about the focus on themes rather than support for individuals with good ideas beyond the areas covered by CDTs. While the cohort model positively supports students and can fulfil the need for skills and interdisciplinarity, more resources should be allocated to individual PGRs to increase the research diversity. By supporting greater diversity in PGR models, the balance between CDT/DTP studentships and other types of studentships could be improved, with benefit to all students.

Royal Society Fellows who fed into this submission criticised the application process for CDTs for being overly bureaucratic and time-consuming. Concerns were raised about the high volume of research projects covering a diverse range of topics that are assessed by brief interviews over several days; about the lack of an evident objective to associate successful research proposals with where the best research in the field is carried out; and that the process does not properly value the opportunity to work with and learn from the best, which should exist at the heart of a good PhD. Moreover, it was suggested that the advantages of

[18] Woolston, Chris. 2019. PhDs: the tortuous truth. https://www.nature.com/articles/d41586-019-03459-7

[19] Woolston, Chris. 2021. Discrimination still plagues science. https://www.nature.com/articles/d41586-021-03043-y

[20] Cornell, Bethan. 2020. PhD Life: the UK student experience. https://www.hepi.ac.uk/wp-content/uploads/2020/06/PhD-Life_The-UK-Student-Experience_HEPI-Report-131.pdf

CDTs arise predominantly from higher funding per student compared to for example, individual PhDs.

There is often a mismatch between costs of research and funding received by the host labs from PGR studentships, which is accepted by supervisors as a monetary loss. Because of cost recovery, research institutions may be biased towards access of postdoctoral researchers versus PGRs. CASE studentships are preferred by some institutions because of additional financial resource associated with PGR students to aid with research costs. UKRI should consider the case for funding the full lab costs of PhD student research upfront.

In the past, PhD studentships were included within research grants, similarly to how present grants offer funding for research staff. University Research Fellowships funded by the Royal Society still allow PhD support through grants[21]. Allocating PhD studentships to research grants or offering funding to supervisor-student pairs, as is the system in the US, could further diversify options for PGR training.

It is understandable that concerns about allocating PhD students to research grants may stem from uncertainties around student recruitment timing, student progression etc. An alternative option would be increasing flexibility on the use of instrument access costs and consumables on grants, so that PhD students working on the research area supported by the grant can access funds from the grant.

Low stipends and high fees

PGR students make vital contributions to research and represent a cost-effective way for institutions and funders to advance their research missions. However, the level of allocated resources to PhDs is insufficient. Stipends and the resource for individual training should be increased to promote professional development of students and improve the studentship experience and its outputs.

The high level of PhD fees for international students may be a deterrent for talented PhD students, acting either as a physical barrier to entry, or as a push factor to choose another destination to live and study. High fees negatively impact student mobility and international collaboration. The result is a static international offer which is sustained by two factors. First, the UK higher education system is funded in a way that compels institutions to shift resource between different income streams including teaching and research. As fees for non-UK nationals are unregulated, institutions are incentivised to charge significantly more to make up for losses in other parts of the system. Second, UKRI's doctoral funding policy limits opportunities for non-UK PGRs to access support at a level that covers full costs. While some in higher education may consider this to be unreasonable, the funder perspective is that institutions should lower their PGR fees, leading to stalemate

PGR fees are based on the Transparent Approach to Costing (TRAC) methodology, which is considered close to the true costs of academic activity and explains broadly the same fee values across institutions. While a number of institutional scholarships are often in place for recruiting talented PhD students, smaller universities may have more financial challenges in providing these and attracting students. In addition, overseas students face obstacles in

[21] Royal Society. University Research Fellowship, see https://royalsociety.org/grants-schemes-awards/grants/university-research/

receiving funding from their home countries to study at smaller universities, as some international scholarships may only be available for studying at high-ranking institutions.

In the US, some universities can offer tuition waivers and annual stipends to PhD students, or students can be employed from research grants. In other cases, US PhD students typically work as teaching or research assistants for additional income. In another example, Australian universities have dedicated PhD scholarship schemes and there are also scholarships provided by the government.

Recommendations:

- The CDT model should be reviewed and its impact on the wider UK research system should be assessed. Greater diversity in PGR models can be supported to increase options for pursuing PhD training.
- PhD stipends and the resource for individual training should be increased to promote professional development of students and improve the PGR experience and its outputs.
- High PhD fees without adequate financial support may lead to the UK losing talent by deterring overseas students. A system-wide review of UK PhD funding arrangements and competitiveness should be undertaken. The findings of this review could be used to develop an active strategy for maintaining capacity and quality in PhD training and studentship programmes.