



**Natural
Environment
Research Council**

Cohort Training Review

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Executive Summary

The Natural Environment Research Council (NERC), a non-departmental public body and one of the component councils of UK Research and Innovation (UKRI), is the driving force of investment in environmental science. Aside from NERC's research responsibilities in environmental science, technology, and new ideas, it supports the provision of postgraduate training and facilitates, and encourages and supports environmental research in these areas.

NERC invests in studentships via a cohort training model in the form of Doctoral Training Partnerships (DTPs) and Centres for Doctoral Training (CDTs). The intent behind the cohort training model is to increase postgraduate research opportunities across the NERC science remit as well as to encourage the development of a diverse range of skills appropriate to a variety of careers.

The DTPs were launched in 2013 through a first cohort (DTP1) resulting in funding for 240 notional PhD studentships per annum. NERC further invested in a second phase of NERC DTPs (DTP2) which resulted in 17 DTPs supporting 235 notional PhD studentships per annum across five annual cohort intakes from October 2019. NERC awards one CDT per annum typically funding three annual intakes of between eight and ten students. The focus areas of NERC CDTs are decided as a result of an evidence-gathering process examining new evidence of skills gaps and training needs in addition to NERC's priorities.

This research report examines the cohort training being supported to inform future commissioning of postgraduate training. The overall aim of the review is to assist NERC in understanding if the current cohort training awards are being delivered against NERC's success criteria.

Specific objectives of the review were to:

- explore and identify the successes of the cohort training model for DTPs and CDTs against NERC's six core success criteria, and
- consider what changes/improvements could be made to future investments and commissioning of postgraduate training.

NERC's six success criteria for training¹ are as follows.

- Training excellence
- Research excellence
- Multidisciplinary training environments
- Excellent students
- Quality assurance
- Produces success stories

Pye Tait Consulting was commissioned to undertake the review in Spring 2022 and conducted this via three main strands of study:

- desk research of secondary sources,
- an online survey (live from 25 May to 13 June 2022) of DTP and CDT stakeholders (205 responses), and
- six virtual roundtable discussion forums – recruited from those who registered interest - consisting of 31 participants in total.

Questions and topic areas were aligned to the six success criteria listed above.

¹ <https://nerc.ukri.org/skills/postgrad/policy/successcriteria/>

Respondent profile

Of the 205 survey respondents, four in five (80%) have taken part in DTPs, while around two in five (38%) have taken part in CDTs. Just over one fifth (22%) have taken part in both, while 4% have taken part in neither. Most common roles of respondents in DTPs/CDTs are:

- DTP PhD students (32%),
- DTP Supervisors (20%),
- DTP Lead organisations (11%), and
- CDT PhD students (12%).

Broad job roles of respondents are professors (38%), lecturers or senior lecturers (17%), and middle management (11%). Around 62% of respondents self-categorised themselves as a university with 14% choosing research institute, and a similar number stating they are students. Research areas of respondents are ecology, biodiversity and systematics (46%) followed by geosciences (39%) then climate and climate change (38%). Just over a quarter work in terrestrial and freshwater environments (28%), or in marine environments (26%).

The 31 roundtable attendees hold the following roles.

DTP Director	7
DTP Deputy Director	4
DTP Administrator	8
DTP Student	6
CDT Administrator	4
CDT Student	2

Key Findings

DTP and CDT respondents were asked similar questions but in context to their experience of either a DTP or a CDT. Rating questions used a 1 to 10 scale whereby 1 was negative and 10 positive depending on the question.

Research excellence and training excellence

As part of the “Research excellence” priority success criterion, training and the training environment must include scientifically excellent and original research with NERC’s remit.

The extent to which the training environment incorporates scientifically excellent and original research is rated as 7.8 for DTP and 8.1 for CDT. The cohort training approach is praised for the range, inclusivity, and quality of different training available. Other aspects singled out include having access to world leaders in their associated fields, facilitating and designing projects at the forefront of research.

The training environment is conducive to PhD students developing independent thinking, increasing their access to resources and facilities, and enhances their networking. A few expressed a dissatisfaction due to the uniqueness of students’ research or issues relating to travel leading to a perception that some students are being unfairly offered training opportunities. The Covid-19 pandemic has not helped in this regard.

A recommendation from students for academic researchers to be more heavily involved with training to help PhD students develop more effectively relates to training such as:

- grant writing,
- how to publish and write research papers,
- how to navigate research,
- specific coding languages,

- statistics skills,
- job application processes,
- multidisciplinary skills, and
- networking support.

Multidisciplinary training

The “Multidisciplinary training environment” priority success criterion outlines how training is embedded in multidisciplinary training environments to enrich the student experience and to encourage knowledge-sharing and interconnectivity, which benefits research within the environmental sciences.

Around 94% agree or strongly agree that a multidisciplinary training approach benefits environmental sciences as a whole. Other benefits with which respondents agree or strongly agree include students’ knowledge-sharing and interconnectivity (92%) or the strengthening of links between research and industry (88%). It is supportive of Diversity, Equity, and Inclusion (DEI) according to 78% although some comments suggest a multidisciplinary approach does not inherently promote diversity and can instead exclude certain groups, for instance those studying part-time due to caring responsibilities who have more restricted time to travel to other facilities away from their ‘home’ institution.

Awareness levels of CASE (formerly known as Collaborative Awards in Science and Engineering) studentships is mixed – split between a great deal (28%), a fair amount (26%) or just a little (28%). Awareness levels are highest among DTP Academic partners and DTP Lead organisations, and lowest among DTP and CDT PhD students. Clearly defining roles and responsibilities of all parties involved would be of benefit.

Internships and placements – a topic discussed at the roundtables – are popular but in need of greater funding. There is a suggestion there is too much variability, with, for example, length of placements ranging from 10 days to a year.

Excellent students

The “Excellent students” priority success criterion outlines how NERC funding should go to right or ‘best-fit’ students – an individual whose previous training, experience and skills best suit the type of training being undertaken.

According to 72% of respondents, DTPs are attracting the most appropriate student candidates² using existing promotion and engagement approaches, with 73% agreeing for CDTs. Just over two thirds (68%) agree or strongly agree that DTPs are recruiting the most appropriate student candidates based on their previous training, experience and skills – this is slightly higher for CDTs (74%).

Very few suggestions are made on how to improve on recruitment and attraction rates but include implementing different promotion campaigns to increase accessibility such as targeting talented students and introducing NERC-centralised advertising. Roundtable attendees talk about their support and work to nurture students and their belief that further action could be taken, for example, to promote opportunities, particularly to schools and colleges to promote environmental sciences and PhDs.

For recruitment purposes, measuring student excellence is key and respondents select student’s potential (95%) and student’s interest in a subject (93%) as the top measures.

² A definition of ‘most appropriate student candidates’ was provided to survey respondents as follows. This refers to the broad ‘excellence’ of applicants across a range of factors, for example incorporating criteria based on candidate potential and suitability for PhD study. Student recruitment is designed to enable wide participation and to prioritise potential for excellence in studentship outcomes (i.e. what an individual can bring to a project and the graduate they will be as a result of DTP/CDT training).

Student attitude figures highly (85%) followed by technical skills (69%), academic grades (68%), or soft skills (66%).

It is academic grades that are most commonly used (88% say these are used 'all' or 'most' of the time) as the measure but 72% take into account student's potential when measuring student excellence 'all' or 'most' of the time – a notable contrast to the 95% who say it *should* be borne in mind.

Quality assurance

The "Quality assurance" priority success criterion outlines how NERC will be assured, ahead of allocation and delivery of training, that providers will deliver excellent training in line with the agreed criteria, and that it will be possible to evaluate the outcomes of the training.

Engagement across roles does not appear to be a significant problem, with some variability across groups. For example, over nine in ten say that DTP or CDT Students or Supervisors are 'very' or 'quite' easy to engage with, while over four in five say likewise for DTP or CDT Lead organisations or Academic partners. This is not quite the case for DTP and CDT Advisory Boards and Non-academic partners although over two thirds still say this is easy.

Respondents demonstrate mixed views in relation to the level of funding provided to cover the costs of operation and management. Just over a third of DTP respondents score a 7 out of 10 or higher (i.e. believe it to be sufficient), 30% score the level of funding as a 3 or lower (i.e. insufficient), and the remainder (35%) score between 4 and 6. A similar trend is seen for CDTs, with 24% scoring a 7 or higher, 34% scoring a 3 or below, and others (38%) scoring between 4 and 6.

Success stories

The "Success stories" priority success criterion outlines how training produces tangible outcomes and impacts in the broadest sense, to demonstrate the impact of NERC's investment. Without doubt respondents reviewing the statements provided for DTPs see these success stories being enacted with 98% agreeing or strongly agreeing that students' are gaining transferable skills, with 98% agreeing or strongly agreeing that involvement provides them with long-term career value, followed by students obtaining research skills (96%). For CDTs there are good to high levels of agreement, with the top four statements receiving identical highest levels of agreement as for DTPs, albeit in a slightly different order.

For DTPs it is the cohort training approach that has worked particularly well matching reactions by CDTs who outline that and the connections with industry (including co-designing research).

In terms of what is working less well: most of 111 comments from DTPs with suggestions for improvement focus on levels of financial support and suggest that stipends could be increased or raised to be proportional to costs of living and inflation. Some comment on diversity and inclusion saying it is restricted, and others mention the burden of recruitment and how administration processes are insufficiently supported financially. CDTs have similar comment but also suggest that training and communication between students and industry partners could be improved.

Emerging themes

Based on the findings of the research, several key themes have emerged which are summarised below. Further details (including specific actions that NERC could take) are set out in Chapter 7.

1. Ensuring training continues to meet needs and is fit-for-purpose
2. Increasing accessibility and promotional campaigns to widen DEI
3. Reviewing financial support provided
4. Facilitating end-user engagement

1. Introduction

1.1 Background

The Natural Environment Research Council (NERC) is the driving force of investment in environmental science. Its vision is to place environmental science at the heart of responsible management of our planet.

NERC is a non-departmental public body and one of the component councils of UK Research and Innovation (UKRI), which was established in April 2018 and brings together the seven research councils, Innovate UK, and Research England. Every year, NERC invests £330m in cutting-edge research, postgraduate training and innovation in universities and research centres.

As set out in the Higher Education & Research Act 2017, some of NERC's responsibilities are to:

- carry out research into environmental science, technology, and new ideas,
- encourage and support the provision of postgraduate training in environmental science, technology, and new ideas, and
- facilitate, encourage, and support environmental research, technology and new ideas.

Part of fulfilling these responsibilities includes the funding of PhD studentships. Undertaking a PhD can take many forms with different funding routes, from university scholarships and doctoral loans to self-funding and options for international students.

NERC invests in studentships delivered through a cohort training model in the form of Doctoral Training Partnerships (DTPs) and Centres for Doctoral Training (CDTs). These cohort training programmes provide postgraduate research opportunities across the NERC science remit as well as supporting the development of a diverse range of skills that are appropriate for a variety of careers. DTPs support responsive postgraduate training where the topic is chosen by the student or supervisor and can be within any area of NERC's remit. CDTs provide postgraduates with specialist skills that are linked to NERC's strategic priorities or to priority skills needs.

In 2013 NERC awarded funding through a competitive process to 15 DTPs (known as DTP1). These awards provided funding for 240 notional PhD studentships per annum across five annual cohort intakes from October 2014. Following a mid-term evaluation in 2017, NERC invested in the second phase of NERC DTPs (DTP2). In 2018 NERC awarded funding through a competitive process to 17 DTP2s to support 235 notional PhD studentships per annum across five annual cohort intakes from October 2019.

NERC awards one CDT per annum and a CDT award typically consists of funding to support three annual intakes of between eight and ten students as well as additional funding to assist in the development and delivery of the CDT training programme. The focus areas of NERC CDTs are informed through an evidence-gathering process that examines new evidence of skills gaps and training needs in addition to NERC's priorities.

As the end of the first DTP awards approaches and with three DTP2 cohorts now recruited, it is timely to review the cohort training being supported to inform future commissioning of postgraduate training. Furthermore, the review will help NERC to ensure the current cohort training awards have delivered against NERC's success criteria. Therefore, in Spring 2022, NERC commissioned Pye Tait Consulting to undertake a cohort training review.

1.2 Research aims and objectives

The overarching aim of this research was to explore the success of NERC's cohort training model. Specific objectives were to:

- explore and identify the successes of the cohort training model for DTPs and CDTs against NERC's six core success criteria, and
- consider what changes/improvements could be made to future investments and commissioning of postgraduate training.

The structure of the review and of this report focuses on, and is aligned to, NERC's six success criteria for training.³

- Training excellence
- Research excellence
- Multidisciplinary training environments
- Excellent students
- Quality assurance
- Produces success stories

1.3 Methodology

1.3.1 Approach

The cohort training review was undertaken via three main strands of study:

- desk research of secondary sources,
- an online survey of DTP and CDT stakeholders (205 responses), and
- six virtual roundtable discussion forums consisting of 31 participants in total.

NERC supplied Pye Tait with various secondary data sources including HESA data, information on leverage students, remit classification data, and ResearchFish data. These evidence and data were collated and interrogated and supplemented with additional desk work. Findings were mapped to the research objectives and NERC's six success criteria.

The online survey questions were co-designed between NERC and Pye Tait Consulting. Questions were aligned to NERC's six success criteria.

Pye Tait hosted the online survey and NERC distributed the survey link to DTP and CDT leads, asking them to share the link with all partners and students. It was also promoted on NERC's social media channels. The survey was live from 25 May to 13 June 2022.

A separate sign-up page was created for the roundtables. Pye Tait hosted this, and NERC distributed the link to DTP and CDT leads and administrators, asking them to share the link with student representatives. At a later stage, the online survey was amended so that individuals in scope were invited to register their interest in attending one of the roundtable discussions.

Pye Tait stratified potential participants according to DTP or CDT involvement and role. Pye Tait then contacted all those who had registered interest, to recruit for two groups with DTP/CDT students, and four with directors, deputy directors, and administrators. Pye Tait facilitated all virtual roundtable discussions independently and impartially on behalf of NERC in early June 2022. The topic guides used were co-developed between Pye Tait and NERC.

Pye Tait undertook analysis and reporting of the results and evidence from all aspects of the study. This ensured an impartial approach to analysis and stakeholders' anonymity was

³ <https://nerc.ukri.org/skills/postgrad/policy/successcriteria/>

preserved in line with the Data Protection Act 2018 and Market Research Society (MRS) Code of Conduct.

1.3.2 Interpretation and limitations

The survey's online methodology means it was self-selecting and quotas were not set on ensuring a particular number and percentage mix of responses per respondent group.

While the survey link was promoted on social media, the methodology was also reliant, to an extent, on DTP and CDT leads distributing the survey link to partners in a timely manner. The relatively short fieldwork window (just under three weeks) may also have potentially limited responses.

Response volumes mean that findings should be treated with some degree of caution, particularly in cases where base numbers are low, as they are less likely to be representative of the wider population of these organisations.

The qualitative evidence gathered through this research (i.e. from open-ended survey questions and roundtable discussions) is not designed to provide statistically reliable data on what participants as a whole are thinking. Such evidence is illustrative, exploratory, and based on perceptions, to provide more in-depth insight.

Note that, due to rounding, some charts and tables may not add up to 100%.

Further note that, due to small sample sizes resulting from cross-tabulation analysis, some numbers are suppressed in certain tables and figures in cases where there are five or fewer responses per category. Such instances are denoted with an asterisk (*).

1.4 Respondent profile

Of the 205 survey respondents, four in five (80%) have taken part in DTPs, while around two in five (38%) have taken part in CDTs. Just over one fifth (22%) have taken part in both, while 4% have taken part in neither.

Respondents were asked which role they hold within the DTP/CDT. Just under a third (32%) are DTP PhD students, one in five (20%) are DTP Supervisors, and one in nine (11%) are DTP Lead organisations. Around one in eight (12%) are CDT PhD students. Of the ten 'other' responses, three are involved in both DTPs and CDTs, five are managers or other staff roles, one is a PhD student not successfully funded through a DTP, and one is unsure.

Table 1 Survey respondents' role within the DTP/CDT

Role within DTP/CDT	No. respondents	% respondents
DTP Lead organisation	22	11%
DTP Academic partner	12	6%
DTP Non-academic partner	13	7%
DTP Supervisor	40	20%
DTP PhD student	63	32%
CDT Lead organisation	2	1%
CDT Academic partner	1	1%
CDT Non-academic partner	7	4%
CDT Supervisor	3	2%
CDT PhD student	24	12%
Other	10	5%

Base: 197 respondents. Source: Pye Tait Consulting 2022.

Non-students were asked about their broad job role. Around two in five (38%) are professors, one in six (17%) are lecturers or senior lecturers, and one in nine (11%) are middle management. Of the 11 'other' respondents, seven are research scientists, two are specialists/consultants, one is a training facilitator, and one a knowledge exchange manager.

Table 2 Broad job role of survey respondents

Broad job role	No. respondents	% respondents
Professor	38	38%
Lecturer or Senior Lecturer	17	17%
Middle management	11	11%
Senior Executive/Board level	7	7%
Administrator	6	6%
Reader	5	5%
Fellow	5	5%
Other	11	11%

Base: 100 respondents. Source: Pye Tait Consulting 2022.

Most respondents (62%) self-categorise that they or their organisation is best described as a university. Around one in seven (14%) self-categorise as a research institute, and a similar number state likewise that they are students. Three 'other' respondents state they work for non-executive agencies or government departments.

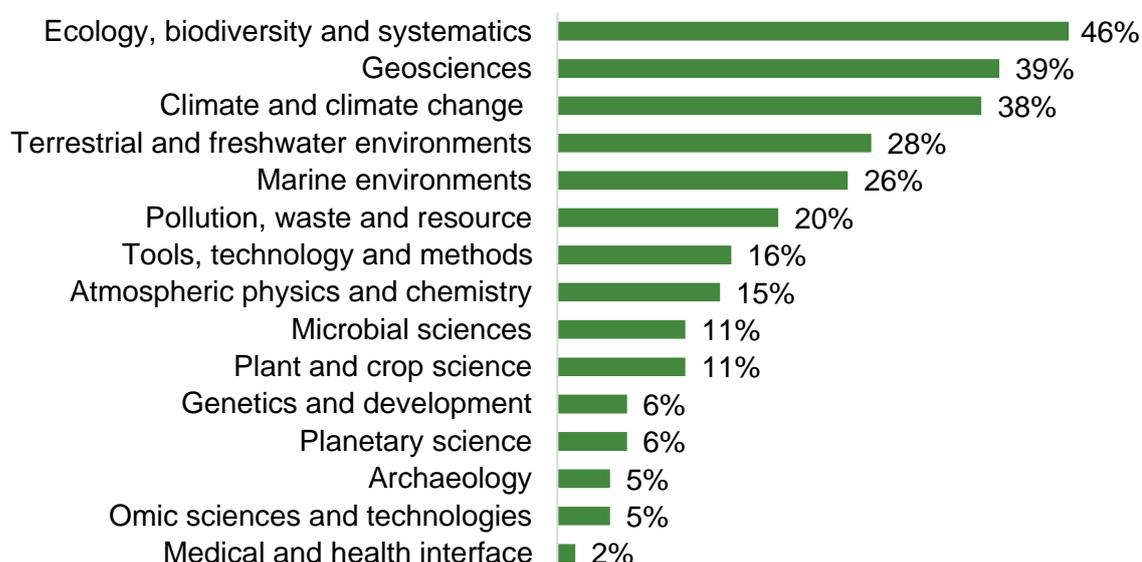
Table 3 Organisation type – survey respondents' self-categorisation

Self-categorisation	No. respondents	% respondents
University	128	62%
Research institute	29	14%
Student	29	14%
Non-departmental public body	6	3%
Charity	5	2%
Private sector business	5	2%
Other	3	2%

Base: 205 respondents. Source: Pye Tait Consulting 2022.

Respondents were presented with a list of research areas in which NERC specialises and asked in which research area (if any) they work. Around half (46%) work in the area of ecology, biodiversity and systematics, while just under two in five work in geosciences (39%) or in climate and climate change (38%). Just over a quarter work in terrestrial and freshwater environments (28%), or in marine environments (26%).

Figure 1 Respondents’ research areas aligned to NERC’s research specialisms



Base: 193 respondents (multiple responses permitted). Source: Pye Tait Consulting 2022.

For comparison and context, this trend in respondents’ research areas mirrors the fields in which most DTP2 studentships are undertaken, with the field of ecology, biodiversity and systematics having most funded students from 2019 to 2021.

Table 4 Total numbers of DTP2 and CDT studentships⁴

Research area	No. DTP2 students	% DTP2 students	No. CDT students	% CDT students
Archaeology	13	4%	0	0%
Atmospheric physics and chemistry	30	10%	6	3%
Climate and climate change	35	11%	6	3%
Ecology, biodiversity, and systematics	72	23%	20	9%
Genetics and development	14	5%	2	1%
Geosciences	47	15%	70	32%
Medical and health interface	6	2%	6	3%
Microbial sciences	10	3%	7	3%
Omic sciences and technologies	6	2%	3	1%
Plant and crop science	9	3%	10	5%
Pollution, waste, and resource	11	4%	3	1%
Marine, terrestrial, and freshwater environments	41	13%	36	16%
Tools, technology and methods	12	4%	48	22%
Other	4	1%	2	1%
Total	310	100%	219	100%

⁴ NERC Remit Classification data

A breakdown of individuals participating in the roundtable discussions by DTP/CDT involvement is shown below.

Table 5 Roundtable participants' role within the DTP/CDT

Role	No. participants
DTP Director	7
DTP Deputy Director	4
DTP Administrator	8
DTP Student	6
CDT Administrator	4
CDT Student	2

Base: 31 respondents. Source: Pye Tait Consulting 2022.

2. Research excellence and training excellence

2.1 Training environment

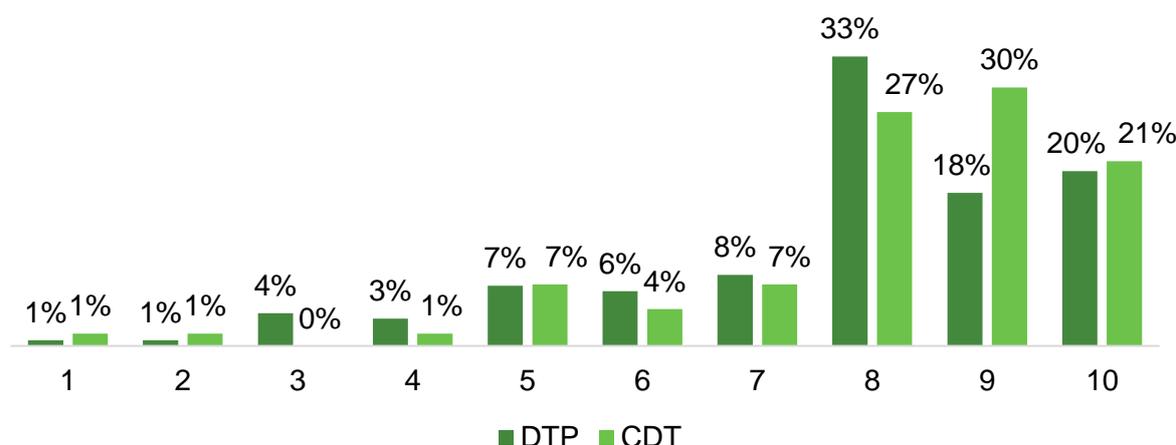
The research excellence criterion is commended for its output. DTPs and CDTs regularly prove themselves to be more successful at producing in-depth doctoral research papers in niche, valuable topic areas, than the conventional PhD funding counterparts. In the years 2011-2022, over 3,250 doctoral research papers arising from NERC-funded research were published (89 via CDTs and 1,465 via DTPs), and these have been cited almost 84,000 times to date. Papers published in partnership with DTPs have had a larger impact than CDTs, with Category Normalized Citation Impact (CNCI) ratings of 1.9 and 1.3, respectively, which indicate their influence, reach and excellence.⁵

It is recommended that for innovative research to continue within DTP and CDT funding schemes, core research skills training keeps up to date with cutting-edge methods, particularly in relation to data management, digital data collection and analysis (including big data) and dissemination. Skills in these areas are increasingly required for academic and non-academic research careers and institutes working with industry and other training providers.⁶

As part of the “Research excellence” priority success criterion, training and the training environment must include scientifically excellent and original research with NERC’s remit. Based on their knowledge and experience as part of a DTP, respondents were asked to rate the extent to which the training environment incorporates scientifically excellent and original research on a scale from 1 (not at all) to 10 (completely). Respondents with experience of a CDT were asked a similar question about CDTs.

The majority of respondents give a high score of eight or above. Over seven in ten (71%) score DTPs an eight or higher. Over three quarters (77%) score CDTs an eight or higher.

Figure 2 Extent to which excellent and original research is incorporated in DTP/CDT training environments



Base: 160 DTP and 71 CDT respondents. Source: Pye Tait Consulting 2022.

⁵ ResearchFish data for CTR (supplied via NERC)

⁶ UKRI: ESRC, *Review of the PhD in the Social Sciences*, October 2021

The overall mean rating is 7.8 for DTP, and 8.1 for CDT. The most common response (mode average) is 8 for DTP, and 9 for CDT.

The mean rating for DTPs is higher among Lead organisations (9.1) and Non-academic partners (9.0) and lower among PhD students (7.2) and Supervisors (7.4). In contrast, CDT PhD students score higher than CDT Non-academic partners (8.5 vs 7.9).

Table 6 Extent to which excellent and original research is incorporated in DTP/CDT training environments by job role

DTP role (base)	Mean	Mode	CDT role (base)	Mean	Mode
Lead organisation (22)	9.1	10	Lead organisation	*	*
Academic partner (12)	7.8	10	Academic partner	*	*
Non-academic partner (13)	9.0	8	Non-academic partner (7)	7.9	9
Supervisor (40)	7.4	8	Supervisor	*	*
PhD student (62)	7.2	8	PhD student (24)	8.5	9

Source: Pye Tait Consulting 2022.

Respondents scoring an eight or higher were asked to justify their answer, and 117 comments were received. The majority of DTP respondents praise the cohort training approach for the range, inclusivity, and quality of different training available. They feel it is conducive to PhD students developing independent thinking, increases their access to resources and facilities, and enhances their networking with other institutes.

Both DTP and CDT respondents note how supervisors are often world leaders in their associated fields, facilitating and designing projects at the forefront of research. Several also comment on the rigorous, competitive evaluation stages and assessments conducted by panels to ensure CDT and DTP excellence through funding of innovative, high-quality research.

I recently attended the NERC training " Innovating for sustainable development " and it was probably the most interesting, inspiring, and pleasant activity I have been part of since starting my PhD. We were really encouraged to "think outside the box" and given many tools and examples of how to do so. – DTP PhD student

CDT are run often by leaders in the specific field who have the networks and links to organise highly relevant training and mentoring provided by expert contributors. – CDT Academic partner

Some refer to the large number of available engagement activities as examples of excellence within the training environment, including:

- community events,
- workshops,
- guest talks,
- seminars,
- conferences,
- inter- and multidisciplinary collaboration, and
- placements.

A few also comment that CDTs involve excellent project and research-specific training that link across multiple disciplines and organisations.

Those scoring a seven or below were also asked to justify their rating, and 47 comments were received. Most commonly, DTP and CDT respondents provide a lower rating as

training offered has frequently not been relevant to their PhD, and focused too heavily on transferable, generic skills rather than specific, innovative research training in unique fields.

The cohort of PhDs are from different disciplines undertaking unrelated research in different disciplines. Ergo, a one-size-fits all approach is impossible. DTP training should focus on holistic skills like coding, statistics, and job applications. Each department or school hosting a student should provide specialist training. – DTP Academic partner

Some DTP PhD students believe the mandatory nature of some training is detrimental to their doctorate experience as it removes them from their specialised research environment and is often too broad or diverse to be utilised within their projects.

Some students suggest that academic researchers should be more heavily involved with training to help PhD students develop more effectively. Suggested ideas for training include:

- grant writing,
- how to publish and write research papers,
- how to navigate research,
- specific coding languages,
- statistics skills,
- job application processes,
- multidisciplinary skills, and
- networking support.

Respondents involved in neither DTPs nor CDTs were asked to rate the extent to which the training environment incorporates scientifically excellent and original research at DTPs and CDTs based on their current awareness and understanding on a similar scale. Only one response was received (score of 1 to both DTP and to CDT), with the training on offer not perceived to be unique or innovative.

2.2 Quality and effectiveness of cohort training

The quality, range and effectiveness of the training provided by DTPs and CDTs has previously been praised by several institutes across the country, especially in direct comparison to conventional doctorate funding schemes. This success is put down to the additional training provision that goes beyond the remit of non-cohort PhD requirements and encourages a cross-cohort, multi- or interdisciplinary collaboration that accelerates the students' training.

As an example, one CDT – Soils Training and Research Studentships (STARS), funded jointly by NERC and BBSRC – delivers training for soil scientists, incorporating a diverse skills programme with holistic training in soils, promotion of collegiality and joint working, strategies to promote science and generate impact, internships with end users (e.g., policymakers, industry), personal wellbeing, and ways to generate a lasting soils training legacy. STARS has enabled its CDT students to attend multiple, additional training opportunities outside of the classic remit of their PhD degree.⁷ This has included the ability to convene, and present in a session. Such training opportunities have not only improved students' capabilities and proficiencies in soil science but have also expanded horizons and inspired wider interest in the subject.

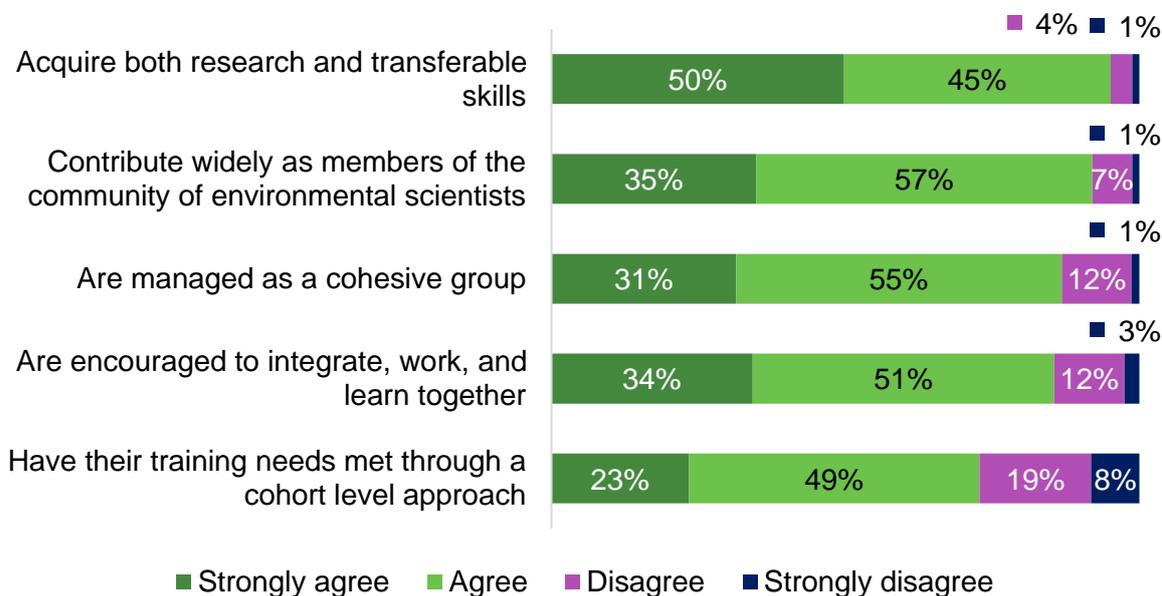
⁷ Philip M. Haygarth et al. (European Journal of Soil Science), *On pedagogy of a Soil Science Centre for Doctoral Training*, 7 October 2021

Feedback from EPSRC’s review of DTPs and CDTs⁸ has noted some areas for improvement such as a potential lack of visibility of additional training opportunities within DTPs and CDTs. There is also suggestion of a need for a greater set of choices for students, ranging from masterclasses and summer schools, through collaborative projects (including student-led projects) to internships and placements. The NERC CDT in Oil and Gas addresses these issues via a training academy, which includes a training programme of 20 weeks spread over students’ three-year course. Initially, training is mandatory in year one to build a solid foundation of skills. After this point optionality is introduced in years two and three to ensure that students can access a range of topics and disciplines to complement and inform their studies.⁹

As part of NERC’s “Training excellence” priority success criterion, students are managed as a cohesive group and acquire both research and transferable skills. There is a strong and active community of students that are able – and encouraged – to integrate, work and learn together.

Respondents involved with DTPs were asked to provide their views in this regard, by indicating their level of agreement with a series of statements about DTP PhD students. Almost all (95%) agree that PhD students acquire both research and transferable skills, and nine in ten (90%) that they contribute widely as member of the environmental science community. Over seven in ten agree with each statement. Agreement levels tend to be marginally higher among Lead organisations and Non-academic partners compared to Academic partners, Supervisors, and PhD students.

Figure 3 Perceived quality and effectiveness of cohort training



Base: variable 159 to 161 respondents. Source: Pye Tait Consulting 2022.

Those disagreeing with at least one statement were asked to explain their reasoning and 44 comments were received. Of those disagreeing that students are managed as a cohesive group, many affirm this is because DTPs comprise different institutes. DTP PhD students and supervisors comment how it can be difficult for students to be coherently managed or

⁸ UKRI: EPSRC, *Review of EPSRC-funded Doctoral Education*, October 2021

⁹ NERC CDT in Oil and Gas, *Training Academy*, <https://nerc-cdt-oil-and-gas.ac.uk/training-academy/>

work together due to the uniqueness of students’ research disciplines or issues relating to travel, which is perceived to lead to some students being unfairly offered training opportunities that others may not be able to partake in. The Covid-19 pandemic is thought to have exacerbated the opportunity for such face-to-face interaction. This view is also held by those disagreeing that DTP students are encouraged to integrate, work or learn together.

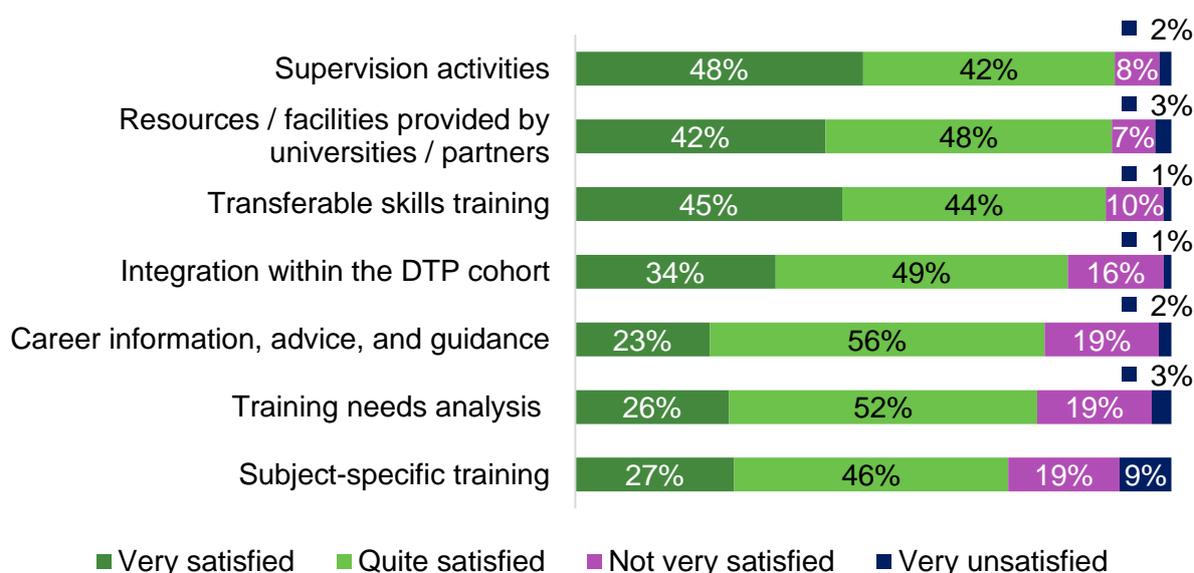
Several DTP students state they lack confidence in themselves or their training to feel they can contribute widely as members of the community of environmental scientists, and some do not feel as if they have been sufficiently encouraged to do so.

DTP PhD supervisors and students who disagree that DTP students acquire both research and transferable skills argue that there is too much discipline variation, and that training is too broad. Specifically, the research skills obtained (unlike CDT models) are not perceived to be sufficiently subject-specific to be useful. This view is also held by those disagreeing that DTP students have their training needs met through a cohort level approach.

I have been lucky to receive CDT training whilst being funded by a DTP. There are research and training gaps in the DTP programme which I have been able to identify due to this situation. Such gaps include subject-specific technical skills and research training, in addition to general “softer” skills training such as presenting and publishing research and working with the media. – DTP PhD Student

Respondents involved in a DTP were asked about their satisfaction with the quality and effectiveness of various training elements. There are high levels of satisfaction across the board, with over seven in ten being ‘very’ or ‘quite’ satisfied with each element. Satisfaction levels are highest for supervision activities (90% state ‘very’ or ‘quite’ satisfied), resources and facilities (90%), and transferable skills training (89%), and lowest for subject-specific training (73%) and training needs analysis (78%).

Figure 4 DTP respondents’ satisfaction with quality and effectiveness of training



Base: variable 146 to 154 respondents. Source: Pye Tait Consulting 2022.

Agreement levels are slightly higher among Lead organisations and Non-academic partners compared to Academic partners, Supervisors, and PhD students. Satisfaction levels among PhD students are noticeably lower in relation to subject-specific training (48% ‘not very

satisfied’ or ‘very unsatisfied’), training needs analysis (30%), career information, advice, and guidance (29%), and integration within the DTP cohort (27%).

Those unsatisfied with at least one statement were asked to explain their reasoning and 63 comments were received. The majority of DTP PhD students commenting perceive there to be sufficient transferable skills training due to the broad training model, but a lack of adequate subject-specific training within the DTP model that aligns with the skills they need for their research. Some additionally comment that they are unaware of supervisors being directly involved in training activities within the DTP environment and believe that supervisors do not necessarily engage with the DTP in this manner.

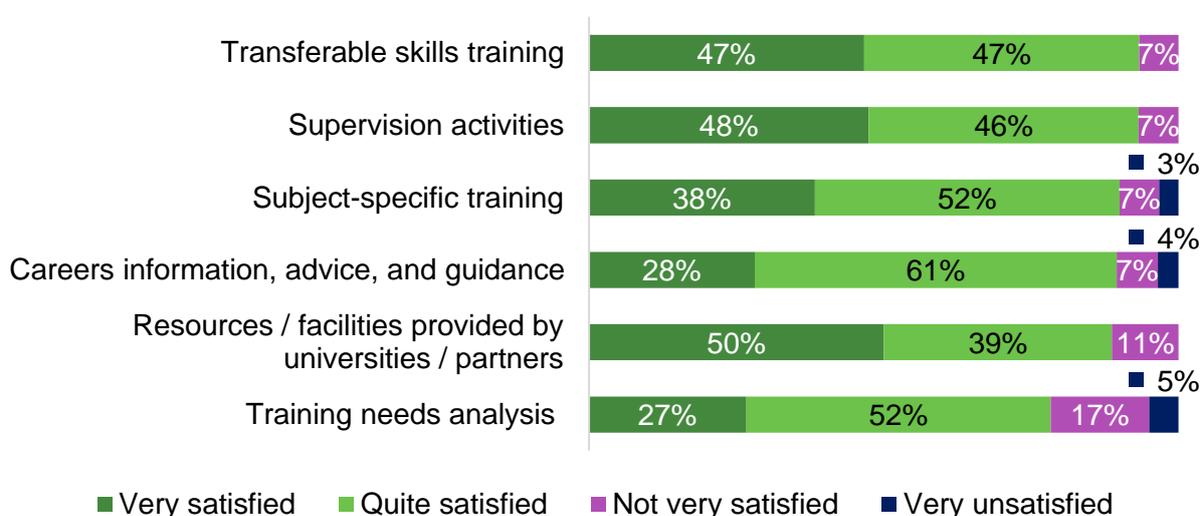
In terms of resources, a handful of respondents feel that access to NERC facilities is too limited or that they are too difficult-to-reach. Some state how the remit of available training does not cover the topic of individual PhDs. A few note that access worsened during the Covid-19 pandemic.

A handful of DTP students and supervisors also comment on a lack of adequate available careers guidance and advice, and several comment that outline career paths are often too narrow or too focused on academia. Training needs analyses are noted to be used too infrequently or are perceived to be too general and not tailored enough to individuals.

Regarding subject-specific training, this is difficult to provide within our DTP which covers a range of research disciplines. It would be inappropriate to develop such training when it is relevant to at most half our cohort, whereas this could be organised in conjunction with other DTPs/CDTs. Perhaps a strength of DTPs and CDTs is their interdisciplinary nature, in which case subject-specific training is a distraction. – DTP Lead organisation

In a similar vein, respondents involved in a CDT were asked about their satisfaction with the quality and effectiveness of various training elements. There are high levels of satisfaction across the board, with nearly nine in ten being ‘very’ or ‘quite’ satisfied with each training element. The only exception is around training needs analysis, although satisfaction is still high at 77%.

Figure 5 CDT respondents’ satisfaction with quality and effectiveness of training



Base: variable 57 to 62 respondents. Source: Pye Tait Consulting 2022.

Those unsatisfied with at least one statement were asked to explain their reasoning and 14 comments were received. A small number of CDT PhD students relate experiencing a lack of available careers guidance, or note that it was held online due to Covid-19. This was perceived to diminish the chance for networking and to undermine the effectiveness of the advice.

Some indicate that subject-specific training available either did not go into enough detail to be relevant to their research, or that certain aspects were missing such as analysis-based training or availability of placements/internships. A small number also comment that more funds are required for equipment and resources.

With regard to Training Needs Analyses, a few respondents state that this did not happen, or that it had no noticeable impact.

The implementation of the training needs analysis at my university doesn't actually impact the training offered or available, and seems to serve more of a "box ticking" function rather than actually helping to develop my personal and professional development. – CDT PhD Student

Roundtable participants were asked which training activities would be most effective or helpful for DTP / CDT students, and whether anything could be done differently.

In terms of specific areas of, and approaches to training, both students and directors suggest that residential training programmes are very popular. DTP students would welcome additional training in welfare support, counselling, and mental health first aid.

The perception of directors and administrators is that students appreciate transferrable skills the most and enjoy activities that broaden their outlook, including activities they are not always keen to undertake at first (for example, media and outreach, impact and innovation). In contrast, students state they appreciate transferrable skills training but particularly value training in technical and more general research skills (e.g. literature reviews). Overall, students seem to have more diverse views about their training needs, which is marked by directors.

Some [students] want writing, but there's thesis writing compared to journal writing. Some want Python and R etc. We try and base our training on the larger things that they'll need – the impact, translating research. We do a lot of [training] like innovating, policy, businesses, future careers. It's quite hard to work out exactly what training is best, and we analyse it constantly to make sure we're meeting students' needs for their future careers, as well as making sure they're getting the careers workshops. – DTP Administrator

One DTP director sees the need to anticipate students' needs and suggests NERC could facilitate this by providing guidance on new/upcoming areas where training will be required. This could be through collaborative events among DTPs/CDTs, or by including foresight for upcoming training needs in applications for funding.

Directors and administrators mark that it is challenging to develop shared activities for each cohort because training needs to be broad enough to fit the whole cohort yet narrow enough to maintain specialism and focus. For the same reason, organising shared training across DTPs/CDTs is challenging.

For CDTs, both students and leaders find cohort training harder to arrange and/or less relevant because of the very specific research focus of CDTs compared to DTPs. Despite this, CDT students say they find the available training helpful overall.

2.3 Inclusivity of cohort training

Prior research has uncovered some concern that just under half of doctoral education institutions across the UK have diversity as key metric. Typically, top five priorities instead tend to focus on: health and wellbeing of doctoral candidates, student satisfaction, career development of doctoral candidates, improving quality of supervision, and funding of doctoral education.¹⁰

There are, however, some positive signs in recent statistics which show increases in doctorate training and research applications by disadvantaged and/or minority groups. For example, UKRI-wide data show that, over the last six years, the proportion of ethnic minority applicants for principal investigators (PIs) has increased from 11% to 16%, and likewise from 12% to 19% for fellows and from 12% to 23% for co-investigators.¹¹

However, UKRI-wide data show that white applicants have had higher award rates in all three roles, and that white PIs and fellows applied for and received higher award values, relative to ethnic minority applicants, in 2019-20.¹²

Overall, representation of ethnic minority groups tends to decrease between master's degree and PhD level, and this is even more so for research council funded students. However, ethnic diversity is higher as a percentage of the PhD student population at universities outside of the Russell Group as opposed to those within, potentially due to socioeconomic and financial barriers for those from disadvantaged backgrounds.^{13,14} To encourage greater diversity, and as stated in NERC's best practice principles in recruitment and training at doctoral level, there are ring-fenced funding schemes available for recruiting initiatives where there is evidence of under-representation or disadvantage.¹⁵ Additionally, CDTs such as SENSE directly promote to ethnic minority groups and specifically to more ethnically diverse universities to enable a more diverse recruitment reach.¹⁶

Survey respondents were asked for their views on the inclusivity of DTP / CDT training, depending on which model they had taken part in.

Over four in five respondents believe that the DTP model supports the needs of private, public, or third sector organisations. Meanwhile, around three in five (63%) agree the model supports students from diverse backgrounds and with a range of experiences.

A similar trend in agreement levels is seen in relation to the CDT model.

¹⁰ UK Council for Graduate Education, Structures and Strategy in Doctoral Education in the UK and Ireland, 2022

¹¹ UKRI, Diversity results for UKRI funding data 2014-15 to 2019-20, 2021

¹² UKRI, Diversity results for UKRI funding data 2014-15 to 2019-20, 2021

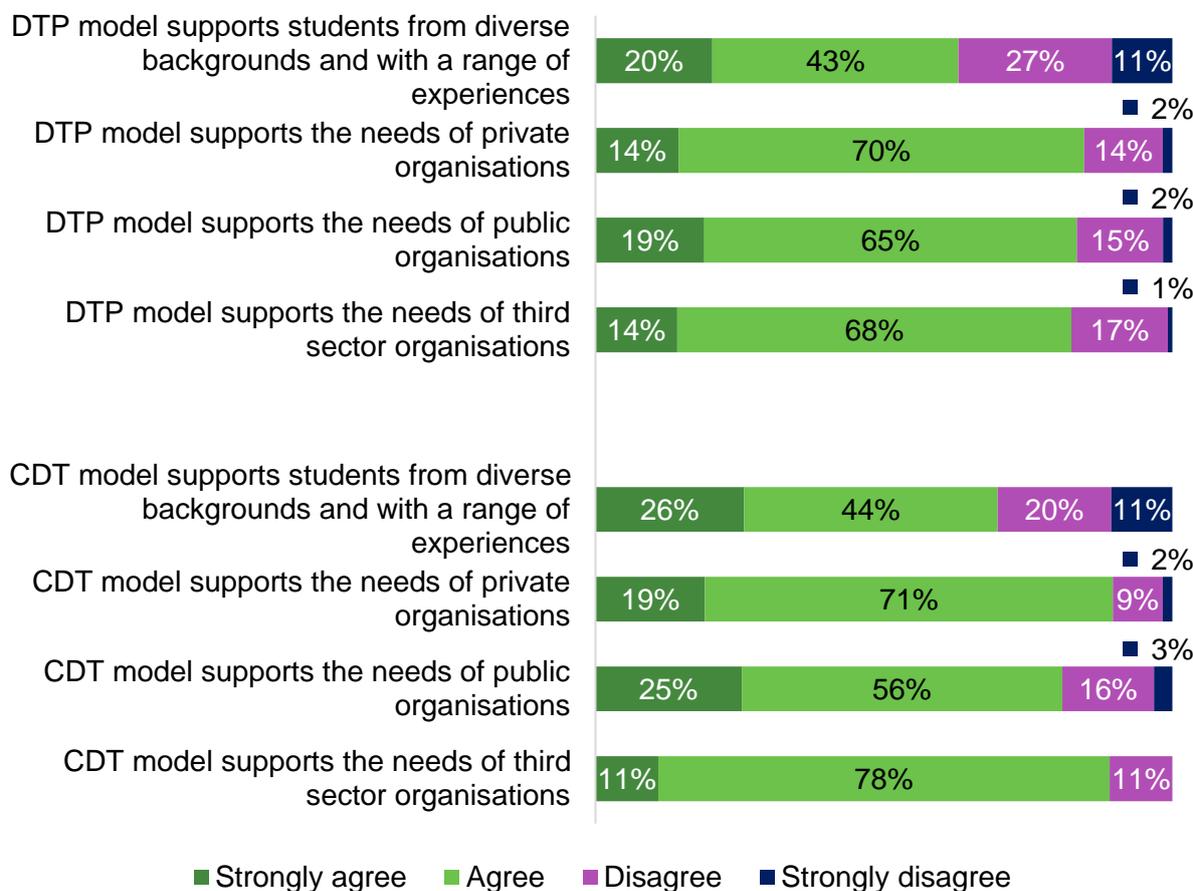
¹³ UK Council for Graduate Education, Structures and Strategy in Doctoral Education in the UK and Ireland, 2022

¹⁴ UKRI: EPSRC, Review of EPSRC-funded Doctoral Education, 2021

¹⁵ NERC Best Practice Principles in Recruitment & Training at Doctoral Level, 2021

¹⁶ Earth Observation Centre for Doctoral Training, NERC SENSE CDT Recruitment: EDI Best Practices, 2021

Figure 6 Inclusivity of cohort training



Base: variable 118 to 143 (DTP) and 55 to 66 (CDT) respondents. Source: Pye Tait Consulting 2022.

Those agreeing that the DTP or CDT model supports the needs of one or more organisation types refer to the myriad opportunities available for these organisations to co-design PhD research projects aligning to business needs. Several cite CASE studentships (formerly known as Collaborative Awards in Science and Engineering) which enable them to communicate industry needs via advisory boards. Others reference internships and placements that enable students to gain experience, while also providing opportunity for cross-sector collaboration and to gain more transferable skills.

CASE studentships are an excellent example. When done well this provides an excellent means for students to experience working in other organisations. I am aware of several cases from our DTP where students have ended up in permanent employment at their Non-academic case partner. – DTP Supervisor

Those disagreeing commonly state that PhD timeframes can be too long or inflexible to meet business needs. Others note that initial contact and relationship-building between industry and academia can be difficult – these respondents would welcome NERC facilitating networking opportunities in this regard.

Those agreeing that the DTP or CDT model supports students from diverse backgrounds state how lead organisations take a fully inclusive and transparent approach to diversity, equity, and inclusion (DEI). Some note that applications from ethnic minority backgrounds are ringfenced via scholarship funding and open to those with non-traditional CVs. Most

state they are actively aiming to wider the reach of their cohort diversity, with strong policies in place, but that in practice recruitment can be challenging if the existing talent pool lacks diversity. Several respondents state that support networks exist for students, and that a cohort approach is inherently more diverse than other models due to its collaborative, interdisciplinary nature.

DTPs at the moment are putting in a lot of effort to widen participation. The approach has involved recognising that excellence in research can be based on a range of skills that don't necessarily relate to first degree or master's performance, or access to placement opportunities. – DTP Lead organisation

Those disagreeing perceive a lack of high-quality candidates from Black and Asian backgrounds in particular. There is also a perception of systemic bias in selection processes that negatively impacts those from more disadvantaged backgrounds by excluding those unable to fund a master's degree. Others comment that student stipends are too low (particularly in the South East and with the rising cost of living), meaning that those from more deprived socio-economic backgrounds can struggle to support themselves. A small number suggest greater support could be provided for LGBTQ+ students, and those with learning disabilities, and that staff should be trained to have an understanding of their needs.

One of the comments we get is that people from minority backgrounds are less likely to have masters because of cost involved. We have taken our master's out of evaluation of the quality of students for this reason. Another way of levelling up would be support targeted master's programmes for those groups. – DTP Lead organisation

Roundtable participants were asked for their views about diversity too, and these followed similar lines to survey respondents. Many state that cohort training supports inclusion, however, there is concern that there is naturally a more limited pool of applicants as doctorate qualifications follow on from many years prior study and/or work. For example, HESA data from 2017/18 show that Black, Asian and ethnic minority representation was markedly lower among postgraduate students (17%) compared to undergraduates (25%).¹⁷ As such, greater promotion to, and funding for, individuals with protected characteristics to study is suggested. In this regard, students at roundtables believe that both CDTs and DTPs have increasingly improved outreach among people with different backgrounds, in particular welcoming the introduction of anonymised application processes. Two students suggest greater support is required for the LGBTQ+ community, and those with learning disabilities.

Directors further note that the current stipend is close to the minimum wage, which may restrict studentships to those from less deprived backgrounds, or to those without caring responsibilities. For context, shortly after this research had concluded, UKRI announced that it would be consulting with the sector on the financial support for UKRI postgraduate students.¹⁸

Participants also mention that NERC-funded students are unable to take shared parental leave or a longer period of leave. These issues, it is argued, are crucial for students in general and especially in the context of DEI. For context, this is a UKRI-wide issue relating to the Terms and Conditions of Training Grants. The rights and conditions for postgraduate

¹⁷ UKRI website, 31 October 2019, Access and success for BAME groups in postgraduate research study <https://www.ukri.org/blog/access-and-success-for-bame-groups-in-postgraduate-research-study/>

¹⁸ UKRI website, 14 June 2022, UKRI considering financial support for research students, www.ukri.org/news/ukri-considering-financial-support-for-research-students/

researchers and funding and financial support are two focus areas of the New Deal for Postgraduate Research.¹⁹

Finally, one director suggests reporting mechanisms could be improved, to enhance the data NERC holds to enable more effective action to be undertaken.

2.4 Cohort vs non-cohort studentship training

Based on their knowledge and experience, all respondents were asked how cohort training compares to non-cohort studentship training, and 160 comments were received.

The large majority of respondents favour cohort training in comparison to non-cohort. Most note that the support networks, communities, team building skills, collaboration and relationships formed are unique to the cohort model and are highly valuable to PhD students, both in terms of academic progression and mental wellbeing. The ability to train alongside peers, to share experiences, and to create connections creates a positive environment allowing students to excel.

If a student is from a university where there are no other students doing similar work, it can be difficult to network, although there are opportunities through societies. With cohort training, these students would automatically feel part of a larger group and through regular group training and other events keep in touch with each other. – CDT Non-academic partner

Cohort training provides PhDs with a better understanding of the environmental landscape and allows them to consider their research whilst considering the wider picture, allowing for better understanding of impact. Non-cohort training either means very specific training, which is narrow, or cross-university training which is too broad. – DTP Lead organisation

Additionally, many respondents comment that the cohort model creates networking links via conferences and careers events, which provide opportunities for students upon graduation.

Many describe cohort training as broad, structured and excellent for developing transferable skills. While some respondents comment that it can lack specificity in specialist discipline areas, especially with regard to DTPs, many others note that it offers a range of useful activities and events, such as talks and seminars.

Several refer to the multi- and interdisciplinary interaction and work that takes place within the cohort model and note this is beneficial to students' academic development as they will work alongside those from different backgrounds.

Roundtable participants note that cohort training makes DTPs and CDTs stand out, with students acquiring a broader understanding through a shared training approach. Directors and administrators argue that cohort training provides students with more ideas, more transferable skills, and creates a sense of community among students. However, from a practical perspective, two CDT Directors state that cohort training can be challenging to organise with students' wider commitments.

The cohort approach forces people to do training they may not have otherwise done, and helps introverts do things they may not have done. Interpersonal skills are essential. Students gain both transferable and research skills. – CDT Director

¹⁹ UKRI, 2022, New deal for postgraduate research <https://www.ukri.org/what-we-offer/developing-people-and-skills/new-deal-for-postgraduate-research/>

3. Multidisciplinary training environment

3.1 Multidisciplinary training approach

The “Multidisciplinary training environment” priority success criterion outlines how training is embedded in multidisciplinary training environments to enrich the student experience and to encourage the knowledge-sharing and interconnectivity, which benefits research within the environmental sciences.

DTP postgraduate training is delivered in collaboration with partners from a wide range of backgrounds including industry, specialist research organisations, charities, non-governmental organisations, and government bodies and by its nature should encourage interdisciplinarity. Whilst CDTs are more heavily focused on a singular discipline and are not often subject to multidisciplinary environments, interdisciplinary collaboration is still highly encouraged. Inter- and cross-institutional partnerships are evident within the NERC-funded SENSE CDT, for example, where it is a requirement for every PhD project to have at least two members from different institutions on the supervisory team. This facilitates working at both sites as well as providing access to more resources and academic support.

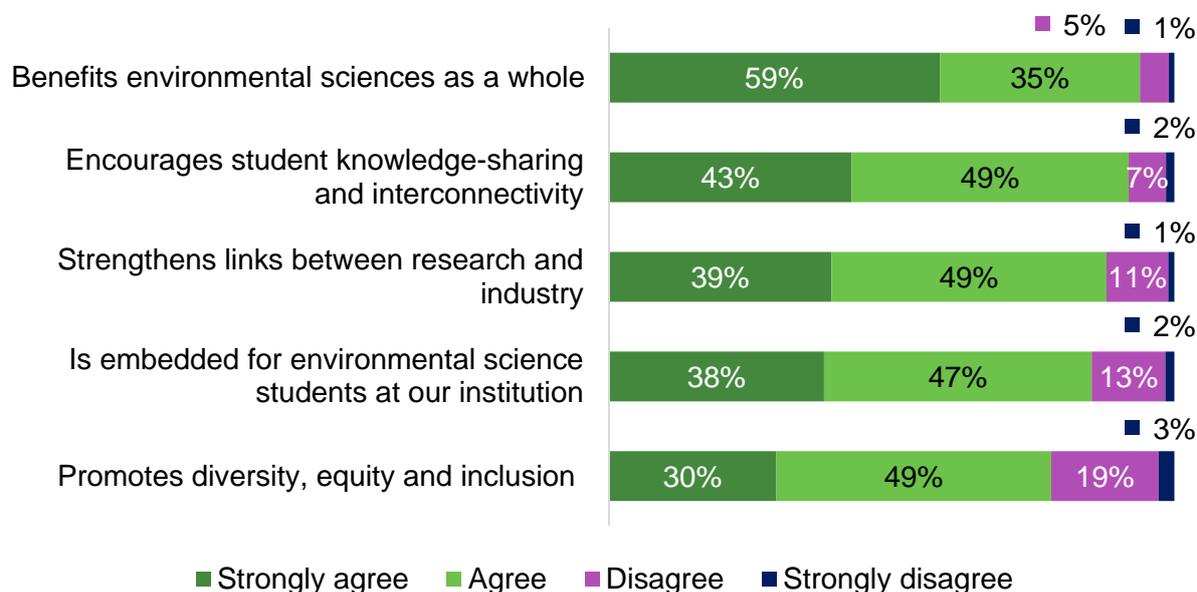
NERC-funded CDTs and DTPs provide various interdisciplinary opportunities for students across their partnerships, with compulsory modules integrated into programmes such as CDT SuMMeR, where students will develop a clear understanding of what it means to be an interdisciplinary scientist. As part of requirements for future CDTs, student research projects must include multi- and interdisciplinary components to expose students to techniques, perspectives and context from all the relevant disciplines.²⁰ Meanwhile, the Economic and Social Research Council (ESRC) reports that more funding and support is needed to expand current partnerships and establish new networks, and recommends that DTPs should utilise funds to increase and diversify the opportunities for social science doctoral students to work collaboratively, across disciplines both within and beyond the remit of their PhDs.

In relation to this success criterion, survey respondents were presented with a series of statements to indicate their level of agreement. There is near consensus (94% agree or strongly agree) that a multidisciplinary training approach benefits environmental sciences as a whole. Around nine in ten agree or strongly it encourages students’ knowledge-sharing and interconnectivity (92%) or that it strengthens links between research and industry (88%).

Just under four in five (78%) agree or strongly such an approach promotes DEI, although 22% disagree or strongly disagree. Disagreement levels are noticeably higher among DTP supervisors (46%) and DTP academic partners (33%) in this regard.

²⁰ UKRI: funding opportunity, Centre for Doctoral Training: environmental solutions to zoonoses, 23 July 2022, <https://www.ukri.org/opportunity/centre-for-doctoral-training-environmental-solutions-to-zoonoses/>

Figure 7 Respondents' views on a multidisciplinary training approach



Base: variable 179 to 196 respondents. Source: Pye Tait Consulting 2022.

Those agreeing with at least one statement were asked to provide a rationale for their answer and 122 comments were received. A large number explain how a multidisciplinary training approach fosters collaboration and cooperative problem solving, as well as the sharing of training methods and techniques, while allowing students to directly benefit from others' background and experiences. Several note this approach benefits environmental sciences by increasing student mobility across subject areas to create well-rounded scientists by contextualising research with a broader perspective. A small number mention DEI, commenting that this approach intrinsically promotes inclusion.

Multidisciplinary training allows students to see beyond their own research discipline, facilitating knowledge exchange and cross-fertilisation of ideas.
– DTP Lead organisation

Likewise, those disagreeing with at least one statement were asked to provide their thoughts. In total 45 comments were received, with most commenting in relation to DEI, arguing that a multidisciplinary approach does not inherently promote diversity and can instead exclude certain groups, for instance those studying part-time due to caring responsibilities who have more restricted time to travel to other facilities away from their 'home' institution. A small number note that links between research and industry do not necessarily arise naturally through a multidisciplinary approach, especially in instances with minimal input from non-academic partners. In addition, a few are unsure whether a multidisciplinary training approach is embedded at their institution and that further work is required in some specific DTP scenarios.

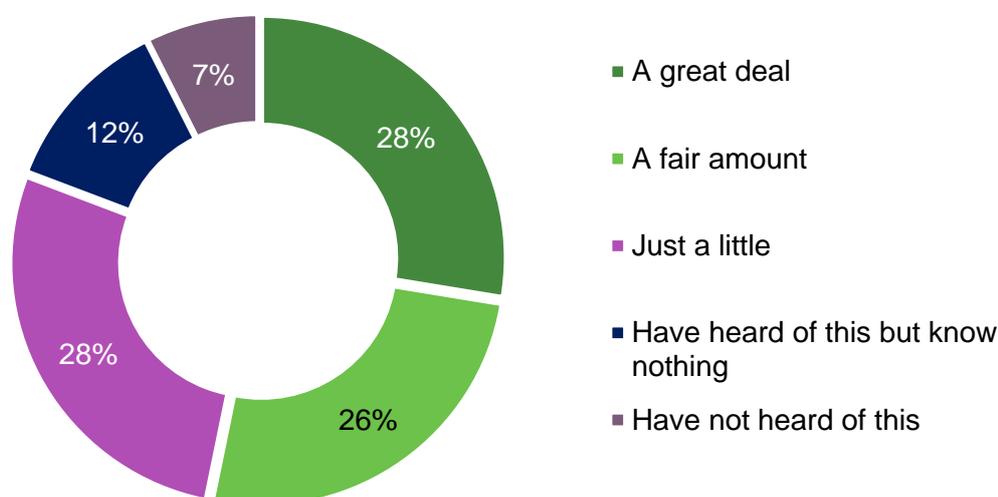
There is nothing intrinsic in multidisciplinary training that automatically links to industry, links with end users need to be nurtured, they don't automatically follow from providing a multidisciplinary training approach. –
DTP Non-academic partner

3.2 CASE studentships

CASE studentships (formerly known as Collaborative Awards in Science and Engineering) provide doctoral students with research training experience as part of a research collaboration between Academic and Non-academic partner organisations. These can include organisations from industry, business, the public sector, or the ‘third’ or civil sector. Placements last anywhere from three to 18 months, and provide students with access to training, facilities and expertise not available in an academic setting.

Survey respondents were asked how much, if anything, they knew about CASE studentships prior to completing the survey. Around a quarter (28%) say they know ‘a great deal’, while similar proportions know ‘a fair amount’ (26%) or ‘just a little’ (28%). The remaining fifth either have not heard of this, or have heard but know nothing.

Figure 8 Prior knowledge of CASE studentships



Base: 203 respondents. Source: Pye Tait Consulting 2022.

Awareness levels are highest among DTP Academic partners and DTP Lead organisations, and lowest among DTP and CDT PhD students.

Table 7 Prior knowledge of CASE studentships by respondent job role

Respondent type	Base	A great deal	A fair amount	Just a little	Have heard of this but know nothing	Have not heard of this
DTP Lead organisation	22	55%	32%	14%	0%	0%
DTP Academic partner	12	75%	25%	0%	0%	0%
DTP Non-academic partner	13	46%	39%	8%	8%	0%
DTP Supervisor	40	33%	38%	25%	3%	3%
DTP PhD student	62	15%	13%	36%	26%	11%
CDT Lead organisation	*	-	-	-	-	-
CDT Academic partner	*	-	-	-	-	-
CDT Non-academic partner	7	14%	71%	14%	0%	0%
CDT Supervisor	*	-	-	-	-	-
CDT PhD student	24	8%	17%	29%	21%	25%

Those with some awareness of CASE studentships were asked to rate various aspects of the initiative on a scale from 1 (very poor) to 10 (excellent). Most statements receive a fair to middling average (mean) score of between 6.1 and 7.7, with the most common (mode) score 7 or 8. The benefit of the CASE studentships to students, and to the CASE partner receive the highest average scores (7.7 and 7.2, respectively) while ease of engagement between academia and industry (6.1) and the frequency of interaction between students and Non-academic partners (6.3) receive the lowest average scores.

Table 8 Average ratings of elements of CASE studentships

Aspect of CASE studentship	Mean	Mode
Benefit of CASE studentships to students	7.7	8
Benefit of CASE studentships to the CASE partner	7.2	8
Quality of interaction between students and Non-academic partners	6.8	7
Accessibility of CASE studentships to students of any/all background	6.7	8
Ease for students to enrol in a CASE studentship	6.7	8
Support received by students from Non-academic partners	6.7	8
Frequency of interaction between students and Non-academic partners	6.3	7
Ease of engagement between academia and industry	6.1	7

Base: variable 102 to 123 respondents. Source: Pye Tait Consulting 2022.

Those who provided a score of 10 or below to at least one statement were asked how CASE studentships could be improved, and 102 comments were received. The majority suggest that relationships between CASE partners, students, and supervisors could be better managed, be clearer, and more structured. Some further suggest that roles and responsibilities of all parties involved in CASE studentships should be more clearly defined to promote effective collaboration and successful projects.

Perhaps some structured approach to interactions with CASE partners via the DTP would be useful. At the moment this works fine, driven mostly by students and supervisors (in my experience) with input from CASE partners as and when required, but more could be done with CASE partners if they plan this further in advance (e.g. include students in in-house training events). – DTP Supervisor

Several respondents suggest that more overall support could be made available to CASE partners, including developing project opportunities suitable for industry, and greater financial incentives and flexibility for non-academic partners to get involved. A small number say they only know a little and are unable to comment how CASE studentships might be improved.

Those with some awareness of CASE studentships were then asked, based on their knowledge and experience, what has worked particularly well to-date. Of the 106 comments received, the majority comment on the opportunities which CASE studentships provide to students. They note that students, through these placements, gain experience of working in industry and potential employment opportunities, as well as access to advice and expertise of those in a non-academic environment. Many also comment that both industry partners and academic partners benefit from CASE studentships through sharing of knowledge, experience, facilities, and equipment.

Generates long-lasting and productive links outside academia, enabling involvement in research training with sectors outside universities, and demonstrating the diversity of employment pathways. A low financial

barrier to involvement works well, valuing the in-kind contribution that is made by the partner. – DTP Non-academic partner

A small minority state that nothing has stood out as working particularly well, or that this varies depending on individuals and situations. A small number say they are unsure what has worked well, as they lack sufficient knowledge to be able to comment.

3.3 Industry placements

Roundtable participants discussed opportunities for DTP / CDT students to be involved in placements and/or internships. There is broad agreement from both students and Directors / Administrators that placement and internship programmes organised through the cohort model are very popular.

Directors outline how the organisation of internships and placements varies across universities in terms of their duration, lasting anything from 10 days to 3 months through to a year. Differences in the way these are funded are also noted, with sources including DTP-funds, POST/policy fellowships, and industry.

There is also variation in how these are organised. Some DTPs/CDTs organise placements for students, while others ask students to do this themselves.

Approaches towards placements also vary: some Academic partners try to align the placement's study topic with the research focus of their students, while others ask students to choose something not related to the focus of their PhD.

This is something that we have as an option for our students – a three-month placement. They find the organisation they're going to work with, and we ask them to do something that is not a direct continuation of their PhD. So they're getting a meaningful experience and a different experience, and that is very popular. They almost all take it up. When they finish, they often cite it as one of the highlights of their PhD. – DTP Director.

Administratively, internships can pose challenges as students are not allowed to take time off their PhD during internship, and not all students are eligible to interrupt their studies. One CDT Administrator noted that the Covid-19 pandemic has negatively affected placements, with these having to be undertaken online meaning that students missed out on a fuller experience. Two roundtable participants also suggest that companies do not always have the time and resource to invest in students.

Students request greater clarity and guidance around placements and CASE partnerships from DTPs/CDTs and suggest that NERC could assist in this regard. Examples include outlining the benefits of placements, defining expectations around roles, relationships, and responsibilities of all involved parties.

Roundtable participants were also asked about the relative benefits of placements to students and to industry partners, as well as any broader benefits. There is broad consensus that placements benefit all participating parties. This collaboration with industry is seen to help academia better understand future needs and to prepare to meet those needs, and to strengthen links between academia and industry. Many note that placements introduce students to the "real world", giving them experience of working beyond academia and providing potential job opportunities. DTP/CDT Directors outlines that feedback from partners regarding the quality of students is extremely positive which also helps to promote DTPs/CDTs more widely.

We let them go on funded placements and we support the funding for placements. The flip side of it is that it's also really good advertising for the DTP. We get lots of great feedback from end-users about the quality of the students that have gone on to work with them. – DTP Director

4. Excellent students

4.1 Attraction and recruitment

The “Excellent students” priority success criterion outlines how NERC funding should go to right or ‘best-fit’ students – an individual whose previous training, experience and skills best suit the type of training being undertaken.

Students who progress through their doctorate via DTPs or CDTs have been reported to be far more successful in employment, publishing papers and overall satisfaction than students who are associated with conventional PhD programmes. Between August 2017 and July 2020, HESA data of graduate outcomes specifically for NERC-funded students indicate that 91% of graduates on these programmes move onto employment. This contrasts to census data (i.e. the wider studentship population) which show that 57% of all PhD students became employed after their degrees in the years 2017-19.^{21,22}

Prior research has outlined how NERC-funded DTP/CDT students have greater employability skills, and overall have greater understanding of industry and business, due to the networking, industrial links provided to them throughout their PhD research, and the additional training and research opportunities that extend past the remit of their requirements.²³

As an example, the STARS CDT offers links to research infrastructure across partner institutions, and the students are exposed to industry, policy, and regulatory organisations via invited speaker sessions at STARS conferences, work placements and dedicated funding support. Students are also given opportunities to take part in international research placements to work in labs outside the UK (e.g., Brazil, Germany), enabling them to perform research that would otherwise not have been possible within their PhDs, and to forge links with the wider scientific community.

The excellence of the students produced by such a CDT is evident in the outcome of the graduates. Between 2015 and October 2021, STARS has trained 19 new soil science doctorates (with a further 18 expected to graduate in the next 18 months). Ten have gone on to research posts, two have taken policy posts and one has entered industry. Furthermore, 36 first author publications have been accepted into peer-reviewed journals as written by STARS students and alumni.²⁴

DTPs offer a range of provision to increase exposure to different career pathways, develop transferable skills and undertake interdisciplinary working, and before undertaking studies, individual students complete a Training Needs Analysis (TNA) to assess what support they require.

Recent research with ESRC stakeholders has suggested that greater emphasis is placed on student wellbeing to help maintain student excellence, and that there is reported scope to influence practice within funded DTPs by setting minimum expectations for supervision and support.²⁵ In this regard, one NERC-funded CDT, SENSE, recently held a wellbeing

²¹ HESA Graduate Outcomes of NERC-funded students 2017-20 (via NERC)

²² HESA *Graduate outcomes by activity and domicile*, Academic years 2017/18 to 2018/19, <https://www.hesa.ac.uk/data-and-analysis/graduates/activities>

²³ Philip M. Haygarth et al. (European Journal of Soil Science), *On pedagogy of a Soil Science Centre for Doctoral Training*, 7 October 2021

²⁴ Ibid

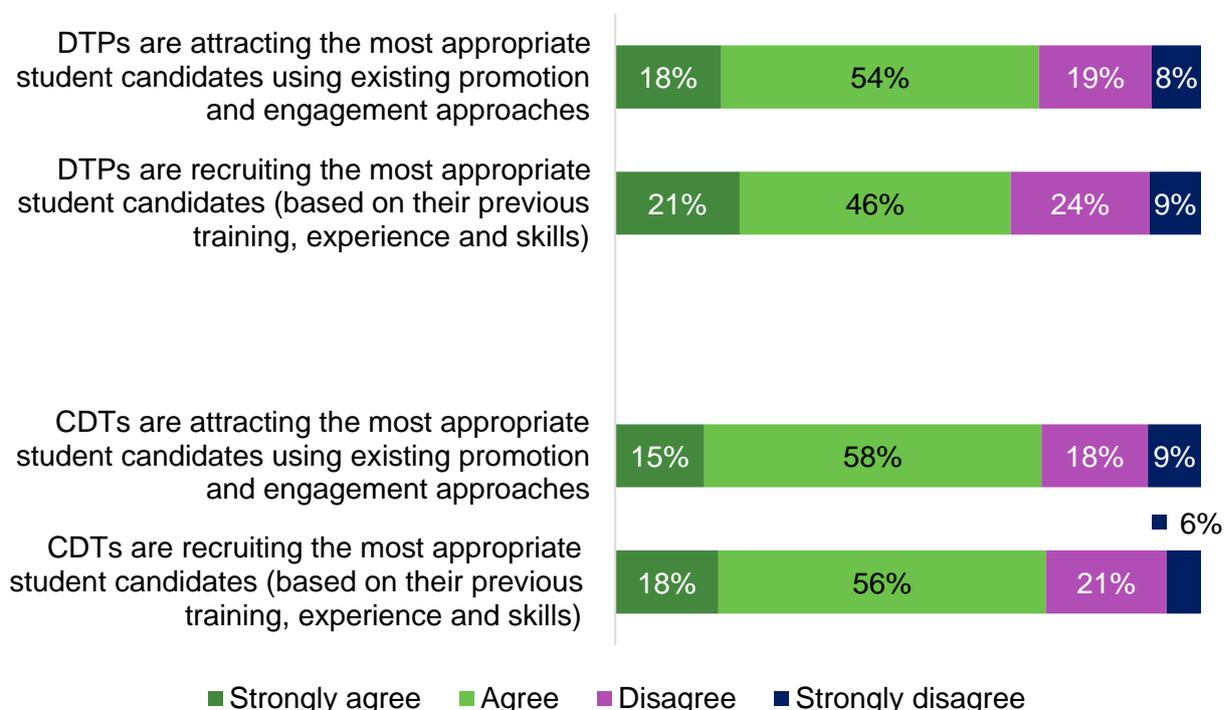
²⁵ UKRI: ESRC, Review of the PhD in the Social Sciences, 2021

workshop specifically organised to assess students’ mental health and found that 90% of attendees had struggled with their mental health.²⁶

All survey respondents who had taken part in a DTP or CDT, except students, were presented with a series of statements relating to this success criterion. Only those involved in a DTP were presented with DTP statements, and likewise for CDT.

Around three quarters (72%) of respondents agree or strongly agree that DTPs are attracting the most appropriate student candidates²⁷ using existing promotion and engagement approaches; a similar proportion agree likewise for CDTs (73%). Just over two thirds (68%) agree or strongly agree that DTPs are recruiting the most appropriate student candidates based on their previous training, experience and skills – this is slightly higher for CDTs (74%). Around one in five disagree with each statement.

Figure 9 Respondents’ views on attracting “Excellent” students



Base (top to bottom): 83, 80, 33 and 34 respondents. Source: Pye Tait Consulting 2022.

Those disagreeing that existing approaches attract the most appropriate student candidates were asked what other promotion and engagement could be undertaken to help attract suitable individuals. Most of the 18 comments relate to DTPs, with around half suggesting

²⁶ SENSE – Centre for Satellite Data in Environmental Science, Not Another Wellbeing Workshop: Summary and Feedback, October 2021, <https://eo-cdt.org/not-another-wellbeing-workshop-summary-and-feedback/>

²⁷ A definition of ‘most appropriate student candidates’ was provided to survey respondents as follows. This refers to the broad ‘excellence’ of applicants across a range of factors, for example incorporating criteria based on candidate potential and suitability for PhD study. Student recruitment is designed to enable wide participation and to prioritise potential for excellence in studentship outcomes (i.e. what an individual can bring to a project and the graduate they will be as a result of DTP/CDT training).

that the programme could be made more accessible to a wider range of students by implementing different promotion campaigns. Specific examples cited include: targeting talented students, and introducing NERC-centralised advertising. Others suggest amending the application process to include assessment of students' previous work experience, research projects, and skills outside of academic achievements. For context, it should be noted that, in early 2022, NERC published best practice principles to improve DEI.²⁸

Weight needs to be given to alternative routes into a PhD e.g. transferable work experience skills (inc. technical). The current DTP ranking system doesn't allow for this. We should be testing for candidates' aptitude to conduct research in addition to the university they attended, their degree class and 'summer jobs'. – DTP Academic Partner

Those disagreeing that the most appropriate students are being recruited were asked what could be done differently in this regard, and 24 comments were received. Similar to the themes in the preceding question, respondents largely suggest changing the selection criteria so that applicants' broader skills are assessed. Additionally, several propose a reduced focus on academic grades. Others highlight the importance of student diversity to ensure that the most appropriate individuals are recruited.

The strict criteria with regards to academic grades (e.g. 2:1 for undergraduate degrees) to meet the entry requirement postgraduate level means that students who have an unusual background/path might be put off applying and/or may be dismissed at early stages of applications. While academic criteria may be useful, I believe more emphasis could be put on potential. – DTP Supervisor

All survey respondents who had taken part in a DTP or CDT, except students, were asked for their views on what an "excellent" student look like (based on their previous training, experience, and skills), and 91 comments were received. Most believe that academic grades and qualifications are equally as important as students' potential. This latter is suggested to include motivation, intellectual curiosity, enthusiasm, life experience, and communication skills. Many highlight the importance of having a variety of softer skills, e.g. time management, leadership, and technical writing. Strong subject understanding, previous work or volunteering experience, resilience and publications are also valued.

An excellent student needs to have the academic ability and drive to take their chosen research area to the cutting edge. This is hard to gauge but more important in the long run than specific experience or skills prior to starting. – DTP Supervisor

Several respondents discuss the complexity of word "excellent" and whether it should be used in recruitment at all, suggesting that it might limit the diversity and inclusion of students and enhance bias in application assessments.

4.1.1 Addressing historical imbalances in recruitment

Roundtable participants were asked how DTP/CDT partnerships are proactively seeking to address historical imbalances in recruitment and developing/working on policies to do so. Roundtables also explored how potential student candidates not currently participating in CDTs or DTPs might be better engaged.

²⁸ NERC best practice principles in doctoral recruitment, 11 January 2022, <https://www.ukri.org/publications/nerc-best-practice-principles-in-doctoral-recruitment/>

Students remark how their programmes have been continuously improving in terms of gender balance and with the introduction of anonymised application process. However, they believe further action could be taken, for example to promote opportunities, particularly to younger audiences. DTP and CDT Directors' views mirror students', with many noting how they have put substantial effort into developing best practice to nurture and support students.

An overwhelming sentiment [among the roundtable group] has been the desire for more integrated approaches to DEI, to admin, to training and a recognition of the glorious diversity of our own institutions and our collective expertise in different areas. – DTP Director

Directors and Administrators remark how each university has a different approach towards widening participation, and how some departments may not even have a policy or mechanism in place. This, it is argued, can make coordinating DEI efforts within a DTP or CDT difficult and can lead to delays in project timelines.

Some DTPs outline their use of studentships to widen participation through specific schemes, in particular noting CENTA Science Opportunity Scholarships (CSOS) and the Research Experience Placements (REP) scheme. However, some do find REPs administratively burdensome and complicated to combine both training (quantitative skills) and DEI remits.

Roundtable participants discuss how DTPs and CDTs also use ring-fencing and adjust their assessment process by using contextual information about students (free school meals, postcode, bank scoring, etc.). To increase participation, DTPs and CDTs provide top tips on how to apply, offer a phone call with their team and arrange events with potential applicants. DTPs and CDTs also run summer schools and would welcome more support from NERC to provide a coordinated national approach to promote and fund these.

Participants further suggest that NERC could facilitate the bringing together of DTP and CDT Directors and students on a more regular basis to collect best practice and evidence. They also suggest that NERC could explore best practice across other research councils. More broadly, it is felt that wider promotion of NERC's DEI initiatives (or raising the profile of existing initiatives) is required at master's or undergraduate level to raise awareness of opportunities among this audience.

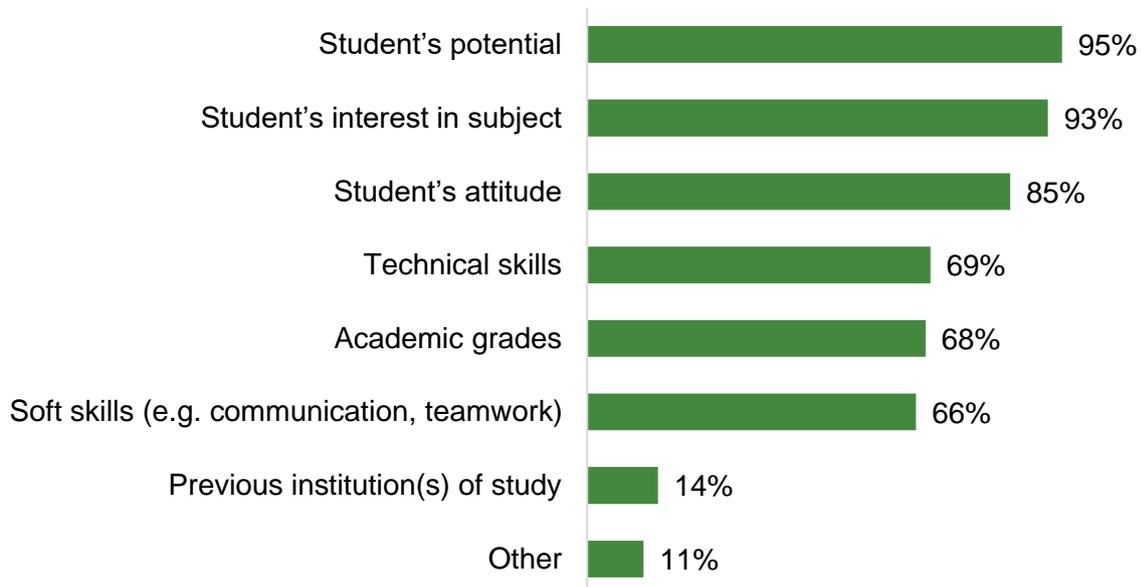
4.2 Measuring student excellence

All survey respondents who had taken part in a DTP or CDT, except students, were asked how student 'excellence' should be measured when recruiting and shown a list of pre-defined options from which to select.

There is near consensus that student's potential (95%) and student's interest in a subject (93%) should be used in this regard. Over five in six (85%) believe student attitude should be taken into account, while around two thirds believe technical skills (69%), academic grades (68%), or soft skills (66%) should be borne in mind. Meanwhile, only a small minority (14%) believe student's previous institution of study is important.

'Other' criteria are highlighted by 12 respondents, with these falling into three categories: prior research experience, critical/lateral thinking, and achievements in light of personal situation/opportunities.

Figure 10 How student excellence should be measured



Base: 106 respondents (multiple responses permitted). Source: Pye Tait Consulting 2022.

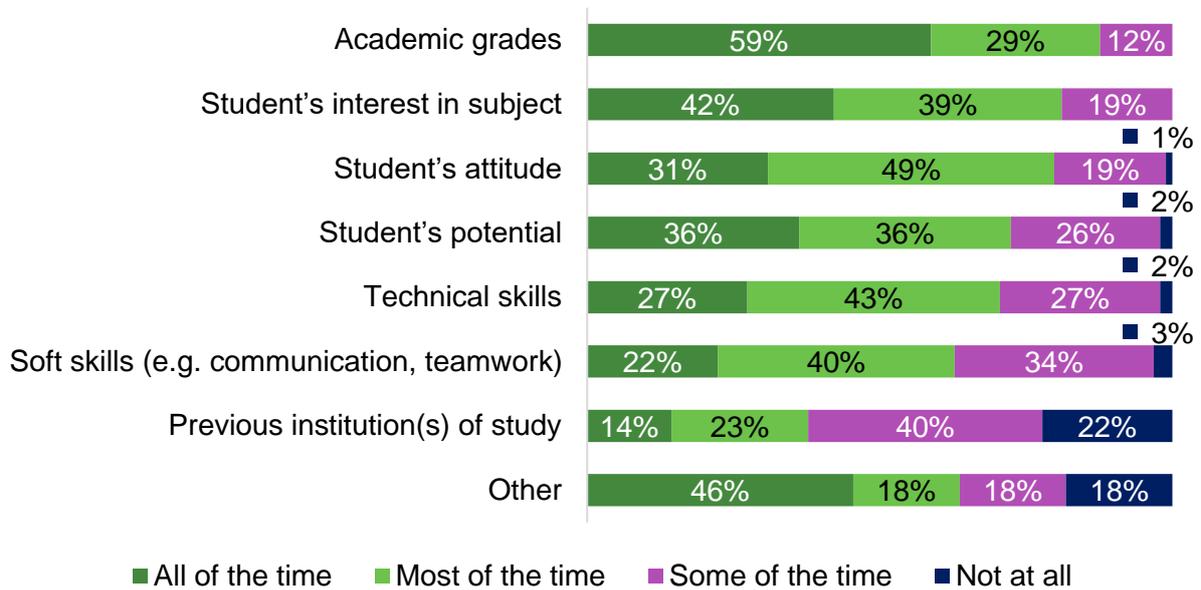
The same respondents were then asked to what extent these pre-defined criteria are being used at their institution to measure student excellence. Academic grades are most commonly used (88% say these are used 'all' or 'most' of the time).

Just under three quarters (72%) take into account student's potential when measuring student excellence 'all' or 'most' of the time – a notable contrast to the 95% who say it *should* be borne in mind.

Meanwhile, around four in five say they take into account student's interest in a subject (81%) 'all' or 'most' of the time, compared to the 93% who earlier said this should be taken into account.

Furthermore, while just 14% said previous institutions of study should be used to measure student excellence, in practice around two in five (38%) use this factor 'all' or 'most' of the time.

Figure 11 How student excellence is typically measured in practice



Base: variable 90 to 97 respondents (other – 11). Source: Pye Tait Consulting 2022.

Eight respondents note additional measures they use. Most refer to previous research experience or to other skills that show an individual has the ability to complete a doctorate. Others take into account students' financial situation.

5. Quality assurance

5.1 Ease of engagement

The “Quality assurance” priority success criterion outlines how NERC will be assured, ahead of allocation and delivery of training, that providers will deliver excellent training in line with the agreed success criteria, and that it will be possible to evaluate the outcomes of the training.

To ensure quality is maintained across all research organisations, there are measures in place before DTPs and CDTs receive funding. Before funding is awarded to DTPs or CDTs, research councils undertake assurance activities, to ensure an institute is appropriate and can guarantee high quality outputs. In terms of CDTs, these are funded through competitive bids, in which institutes are required to indicate that their proposed research speciality targets particular areas or research challenges, and also demonstrates that a cohort-based approach is the most beneficial. Proposals for centres undergo peer review to ensure they are providing an excellent training and research environment with multidisciplinary pathways, are in areas that require a significant quantity of trained individuals and additional training programmes, demonstrate exemplary partnership operational management, and meet the research council or funding body’s expectations of a CDT.²⁹ These approaches are in place to ensure that research undertaken by DTPs and CDTs will be meaningful and of a high calibre.

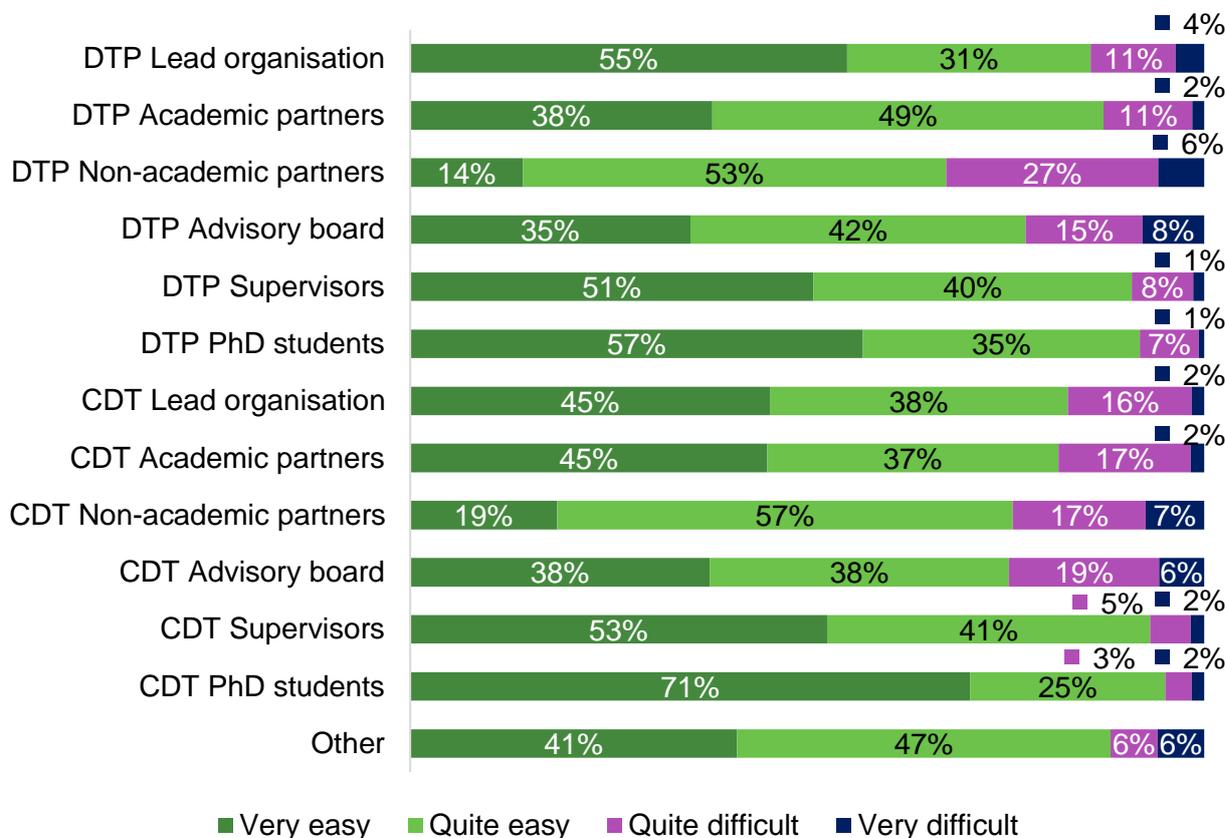
To ensure Quality Assurance can occur, it is vital that all parties involved are able to communicate easily with each other. Survey respondents were therefore asked for their views on the ease or difficulty of engaging with certain groups of people at DTPs / CDTs, depending on which model they had taken part in.

Broadly, engagement appears to be straightforward for most respondents, although some groups of people can be easier to communicate with than others. Over nine in ten say that DTP or CDT Students or Supervisors are ‘very’ or ‘quite’ easy to engage with, while over four in five say likewise for DTP or CDT Lead organisations or Academic partners. DTP and CDT Advisory Boards and Non-academic partners are slightly more difficult to engage with, although most (over two thirds) still say this is easy.

‘Other’ groups of people mentioned in relation to this question include finance staff, tutors, and industry sponsors.

²⁹ For example see UKRI: EPSRC, *Review of EPSRC-funded Doctoral Education*, 2021

Figure 12 Ease of engagement with different groups of DTP/CDT roles



Base: variable 116 to 149 (DTP) and 53 to 64 (CDT) respondents (other – 17). Source: Pye Tait Consulting 2022.

There is some variability by respondent type. In particular, a higher proportion of DTP Academic partners (46%) and DTP Supervisors (41%) say it is ‘very’ or ‘quite’ difficult to engage with DTP Non-academic partners. Meanwhile, nearly half of DTP Academic partners (46%) and DTP Supervisors (48%) say they find it ‘very’ or ‘quite’ difficult to engage with DTP Advisory boards. In addition, nearly a third (30%) of DTP Supervisors find it difficult to engage with DTP Lead organisations.

This was explored further in roundtables, where Directors and Administrators were asked for their views on the ease of engagement with other groups of people within their DTP/CDT. Many commented that initially establishing collaborations within DTPs and CDTs can be challenging, and the ease of doing so varies by institution. Directors outline how engagement is easier with Advisory boards and Academic partners as these are typically large institutions familiar with academic collaborations and with established networks.

However, engagement with Non-academic partners is perceived to be more difficult. Directors point out that the low success rate of funding applications for collaborative projects between industry and academia may act to demotivate Non-academic partners from being interested in co-designing projects and proposals. Some also note that collaborations tend to be based on personal, rather than institutional, links, meaning that staff turnover can result in loss of contact. This problem is particularly pronounced for CDTs who can struggle with a limited pool of partners to contact.

To resolve this, one Director suggests the introduction of incentives for industry to engage with DTPs, rather than DTPs having to reach industry. Others suggest that NERC could act

as a facilitator to promote DTPs/CDTs through its own network. Directors would also welcome regular conferences to share best practice among DTPs and CDTs around successful engagement.

It would be helpful to meet other CDT and DTP people as a point of reference for best practice going forward. NERC needs to support this and to facilitate that kind of conversation and collaboration. – CDT Director

All roundtable participants were also asked for their views on the ease of engagement with all involved DTP/CDT parties, thinking specifically from the perspective of students. DTP and CDT Directors perceive that the nature and extent of student engagement depends on the level of support within each university. Directors do, however, note that students are good at networking with each other (e.g. via student conferences organised as part of DTPs/CDTs) and their supervisors, although this networking is largely confined to their university. One DTP Director notes that external partners who have the greatest engagement with students tend to be those who are already involved in public engagement.

Students themselves confirm this view by stressing that their connectivity and engagement depends on whether their universities have multiple DTPs/CDTs. They also note that interdisciplinary events are usually organised by universities rather than by DTPs/CDTs.

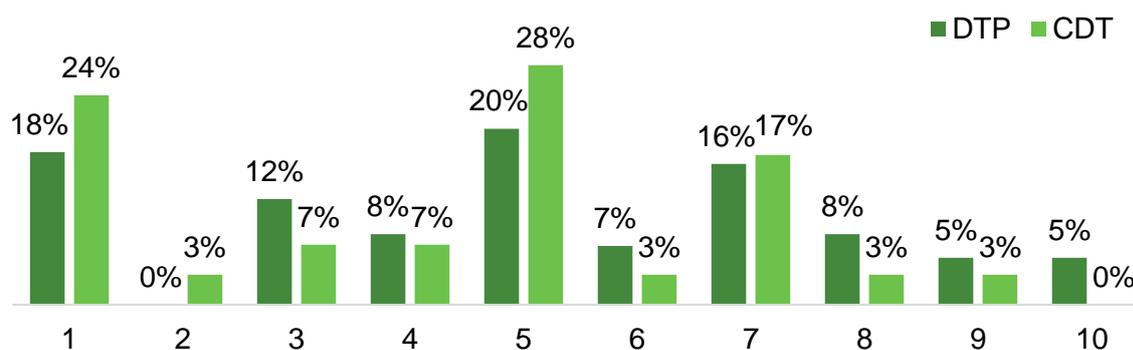
DTP and CDT Directors underline the negative impact of the Covid-19 pandemic in relation to networking and engagement, noting they have had to provide greater support to students in this regard, but welcoming the support provided by NERC. Students themselves have welcomed these efforts, valuing their importance, although they find virtual interactions harder to engage with. Students further note that their engagement tends to decline as they progress through their PhD as they prioritise writing up over extra activities.

5.2 Support provided

All survey respondents who had taken part in a DTP, except students, were asked to rate the level of funding that NERC is providing to DTPs to cover the costs of operation and management on a scale from 1 (not at all sufficient) to 10 (completely sufficient). Non-student respondents with experience of a CDT were asked a similar question about CDTs.

Scores are spread with just over a third (35%) of DTP respondents scoring a 7 or higher, three in ten (30%) scoring a 3 or lower, and the remainder (35%) scoring between 4 and 6. A similar trend is seen for CDTs, with around a quarter (24%) scoring a 7 or higher, just over a third (34%) scoring a 3 or below, and others (38%) scoring between 4 and 6.

Figure 13 Level of funding NERC to DTPs/CDTs to cover the costs of operation and management



Base: 74 DTP and 28 CDT respondents. Source: Pye Tait Consulting 2022.

The overall mean rating is 5.1 for DTP, and 4.3 for CDT. The most common response (mode average) is 5 for both DTP and CDT.

The mean rating for DTPs is higher among Supervisors (5.7) and lower among Academic Partners (4.9) and Lead organisations (3.9).

Table 9 Level of funding NERC to DTPs/CDTs to cover the costs of operation and management by job role

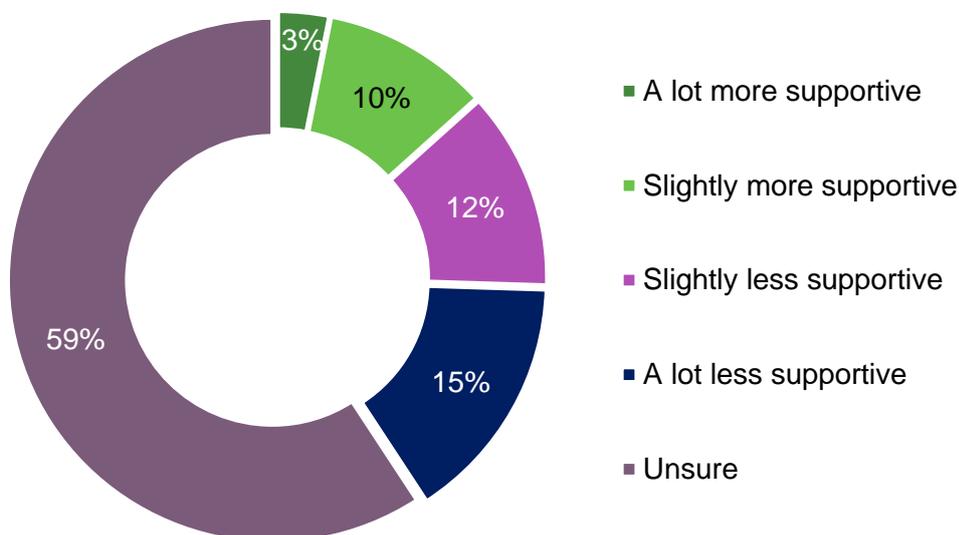
DTP role (base)	Mean	Mode	CDT role (base)	Mean	Mode
Lead organisation (22)	3.9	1	Lead organisation	*	*
Academic partner (11)	4.9	1	Academic partner	*	*
Non-academic partner	*	*	Non-academic partner	*	*
Supervisor (35)	5.7	5	Supervisor	*	*

Source: Pye Tait Consulting 2022.

All survey respondents who had taken part in a DTP or CDT, except students, were asked how the level of funding provided by NERC to DTPs/CDTs to cover the costs of operation and management compares to other research councils and wider sector models.

Most (59%) are unable to provide an informed opinion in this regard. Of remaining respondents, there is a slight lean towards indicating that this level of funding is 'slightly' or 'a lot' less supportive (27%) compared to those saying it is 'slightly' or 'a lot' more supportive (13%).

Figure 14 How NERC funding compares to other research councils and wider sector models



Base: 98 respondents. Source: Pye Tait Consulting 2022.

This was explored in more detail in roundtables with Directors and Administrators. There is consensus that NERC funding is highly competitive, but many believe the level of funding to be insufficient to run a DTP/CDT, especially on the administration side. Administrators point out that NERC documentation requires a substantial amount of work, particularly around recruitment, international students, DEI, and reporting. The work of Administrators and partners in setting-up and launching programmes begins when they receive the grant offer letter, but the actual funding only starts when students arrive, which can be six months later. Two participants explicitly state that, compared to other research councils, NERC provides a lower level of funding support in this regard. Specific examples include Directors being on

30% roles as opposed to 50% compared to colleagues working with other research councils, and Administrators being in an 80% role while de facto working full-time.

It [Running the programme] relies on a lot of goodwill and the incentive of people engaging with the programme because they think it'll help them get a student. If you compare it with undergraduate teaching training provision, there are much greater resources put towards teaching undergraduates. –
DTP Deputy Director

6. Success stories

6.1 Outcomes and impact

The “Success stories” priority success criterion outlines how training produces tangible outcomes and impacts in the broadest sense, to demonstrate the impact of NERC’s investment.

DTP and CDT models have demonstrated success across the sciences in numerous fields, producing excellent, innovative research leading to a large number and diversity of journal papers produced. They provide significant networking and collaboration links, residential training events both in discipline-specific and generic team building fields, increased employability and career prospects, and the success of the students who have been supported by such models is very high.

For example, EPSRC reports that 80% of engineering and physical science doctoral graduates are in some form of employment less than six months after graduation and are overall more likely to be employed in industry (40%) or to have a STEM-related career (77%) than the generic graduate population. For those that continue to a career in academia (35%), EPSRC funded students are also more likely to hold a research or research-related role (65%).^{30,31}

The number of students benefiting from such opportunities is increasing across the sciences. For example, ESRC provides funding for more than 500 studentships through its network of DTPs and CDTs each year. Such an investment is used to leverage additional funding resulting in over 700 individual students receiving ESRC funding annually. In comparison, across its CDTs and DTPs, NERC has notionally funded 2,077 students, while in reality 2,957 students have been able to undertake a PhD with this leverage.³² Additional prospects open to students include professional internships which BBSRC-funded DTPs offer as a three-month integrated placement. These placements help to increase employability and extend the reach of classic PhD remits as students gain greater understand of the interdisciplinary value and wider context of their research through exposure to a range of opportunities.

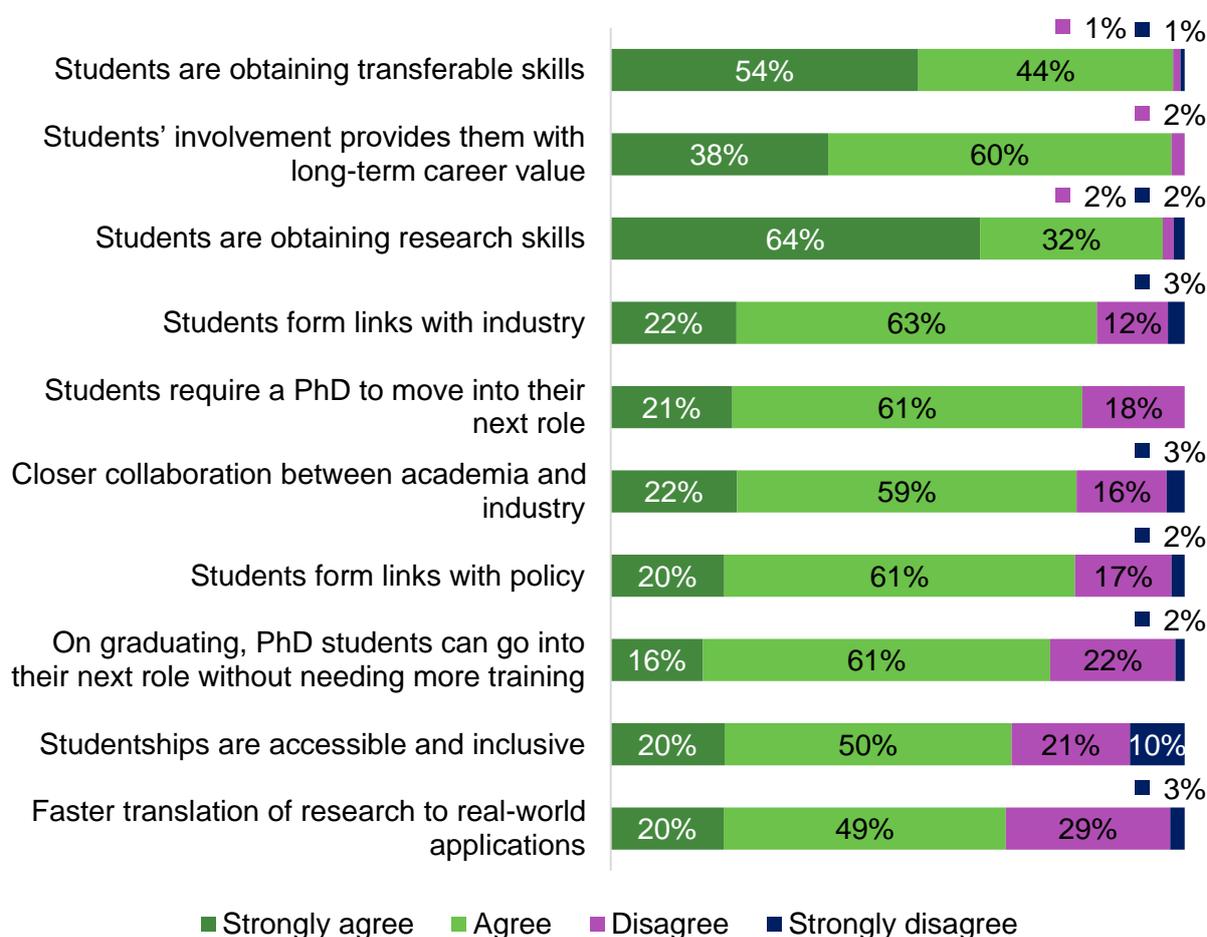
Survey respondents involved in a DTP were presented with a series of statements and asked to what extent they are seeing such outcomes and impacts. There are good to high levels of agreement with all statements. In particular, there is near consensus that students are gaining transferable skills (98% ‘agree’ or ‘strongly agree’), that students’ involvement provides them with long-term career value (98%) and that students are obtaining research skills (96%). Around five in six agree or strongly agree that students form links with industry (85%), require a PhD to move to their next role (82%). Just over four in five (81%) say they are seeing closer collaboration between industry and academia, although a slightly lower proportion (69%) say this is resulting in faster translation of research to real-world applications.

³⁰ UKRI: EPSRC, *Review of EPSRC-funded Doctoral Education*, October 2021

³¹ Philip M. Haygarth et al. (European Journal of Soil Science), *On pedagogy of a Soil Science Centre for Doctoral Training*, 7 October 2021

³² NERC, Leverage data, 2022

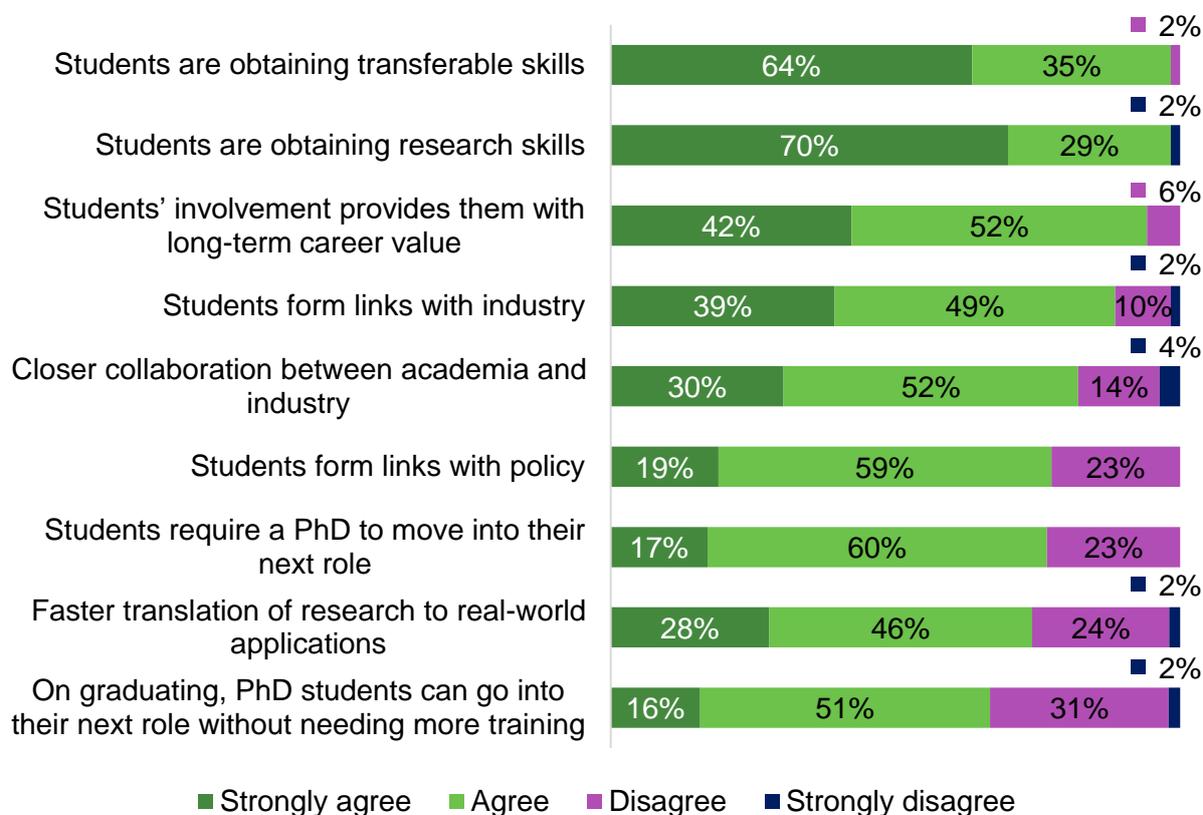
Figure 15 Extent DTP respondents see different outcomes and impacts



Base: variable 118 to 154 respondents. Source: Pye Tait Consulting 2022.

A similar question was asked of survey respondents involved in a CDT. Again, there are good to high levels of agreement, with the top four statements receiving highest levels of agreement being identical to that for DTPs, albeit in a slightly different order. Compared to DTPs, a slightly higher proportion 'agree' or 'strongly agree' that involvement in CDTs results in faster translation of research to real-world applications (74%).

Figure 16 Extent CDT respondents see different outcomes and impacts



Base: variable 47 to 63 respondents. Source: Pye Tait Consulting 2022.

Roundtable discussions explored this further, to understand what skills and outcomes students see themselves as gaining through their involvement in a DTP/CDT. Directors and Administrators agree that students gain both research and transferable skills, and that transferrable skills are most popular among students. They describe how students, in addition to gaining research skills, become more adaptable, interdisciplinary and collaborative individuals by developing their communication and critical thinking skills, as well as broader skills such as leadership and resilience.

This is reflected in students' replies, outlining how their involvement has helped to increase their ability to communicate and to present research to wider audiences, in addition to networking and collaboration, and enhancing technical skills.

However, two Directors comment how students are not always fully aware of what skills they are actually gaining, especially when it comes to transferable skills, and are not always capable of articulating those.

Often you need to make students aware of the skills they have acquired. You need to remind them "You can work independently, you're able to communicate, you can do all these other things, manage your time". A lot depends on them having information about what is possible [in career terms], where they might go, but they don't always know what's possible. This is where career sessions are very useful. If employers are able to say what skills and people they are looking for, this could also encourage students to look into different directions. – DTP Director

Roundtables also discussed DTP/CDT students' preparedness for their next role on completing their PhD. There is general agreement that the DTP/CDT experience exposes students to the "real world" and helps them to build necessary skills, including soft or transferrable skills which are necessary for future work in any sector. However, roundtable participants find it difficult to comment on the preparedness of students for their next role. DTP and CDT Directors say they do their best to prepare students but are conscious that they may not be aware of all training that students may need for their future role, particularly as onwards roles can be so varied. One DTP Director suggests running interviews with recent DTP/CDT student alumni to understand better their transition to work.

Students do gain transferable skills that can be used in multiple contexts, regardless of what field they go into. They won't be perfectly qualified as I believe that there should always be areas to learn when you begin a new role. – CDT Director

Students themselves confirm this, noting that their involvement with the DTP/CDT has provided them with a broader skillset and greater confidence that they will be able to transition successfully to their next role, whatever that may be.

6.2 Notable areas of success

Survey respondents were asked, based on their knowledge and experience of DTP, what they believe has worked particularly well to-date, and 99 comments were received. The majority say that the cohort training approach has worked particularly well. Other elements of DTPs which are commonly recognised as working well include:

- networking opportunities for students and with industry partners,
- internships/placements and collaboration with the industry, and
- students specifically comment how they gain new skills through their experience with partners outside of academia and the interdisciplinary nature of DTPs.

Being part of the DTP programme is very important to feel like you are part of a bigger research community and that support is there should you need it. This is especially important in research which can be a lonely place. It's great to hear and learn about others research and to develop new skills through training. – DTP PhD Student

A small number (four) say that not much or nothing has worked particularly well.

Those involved in a CDT were asked a similar question, yielding 48 comments. Similar to DTPs, most reference the cohort training approach and connections with industry (including co-designing research) as elements that are most successful. Some respondents note how CDTs enable students to gain skills and contacts that are not only useful for their PhD, but also in their future employment. Several mention that CDTs' focus on specific topics has worked particularly well.

Fostering of a wider network of contacts for students and external sector participants. Students can compare partner universities, meet representatives from industry, government and professional bodies which benefit both their ongoing research and their future employment prospects. CDT graduates are using the relationships they built with one another during their CDT training to improve communication and collaboration in their post-graduation working lives across the globe. – CDT Lead organisation

Roundtable participants were also asked what particularly aspects of DTP and CDT models are working particularly well. Confirming survey responses, both Directors and students see the cohort approach as the main advantage of the DTP and CDT models. Among the key advantages mentioned are the interdisciplinary connections and networks that teach students to work with a diverse range of people. Cohort training is also seen to create a sense of community among students, helping them be more coordinated and organised.

Students have much more access to policy, practice, and industry than traditional PhD students. It opens career pathways. – DTP Director

The flexibility of DTP/CDT programmes, to allow students' research and training to align to industry needs, is also praised. It is perceived that this helps strengthen collaboration between academia and industry and also help to increase the accessibility and diversity of skills that students can gain (including both transferrable and technical skills). There is a slight variation between DTPs and CDTs in this regard, with the former seen to provide a wider skillset and the latter providing more specific skills.

6.3 Suggested areas of improvement

Survey respondents involved in a DTP were asked what one thing they feel is working least well and could be improved, and 111 comments were received. Most focus on levels of financial support and suggest that stipends could be increased or raised to be proportional to costs of living and inflation. Of this group, five comment that low stipends can cause students additional stress which negatively affects their wellbeing. In addition, a small number of respondents relate how some students are forced to find work outside of their PhD to supplement their income, which impacts on their studies and time they can spend on their research. For context, shortly after this research had concluded, UKRI announced that it would be consulting with the sector on the financial support for UKRI postgraduate students.

Several respondents mention that diversity and inclusion among students can be restricted. Others mention that recruitment and administration processes are burdensome and are not sufficiently supported financially. A small number suggest improvements around training on offer, or around collaboration opportunities with partners.

Those involved in a CDT were asked a similar question, and 52 comments were received. Responses typically fall into three themes. Some think that diversity and inclusion could be improved through a simpler, more inclusive recruitment application process and increased funding. Others comment that student stipends are too low and disproportionate to the increasing cost of living. Meanwhile, several respondents believe that training and communication between students and industry partners could be improved.

Improved diversity and inclusion processes – accommodating those from less privileged backgrounds by testing for aptitude / lateral thinking etc. – DTP Academic partner

Roundtable participants were also asked what aspects of DTP and CDT models could be improved for future cohorts. Directors and Administrators discussed a number of areas for potential improvement.

- Programme timelines could be improved because universities cannot conclude collaboration agreements and process visas for international students on time as these are tied to offer letters.

- There is a high administrative load, particularly on international applications. The paperwork required for NERC funding is perceived to be comparable to work with large corporations.
- NERC's requirements are not always clear, and not all requirements are compatible, e.g. caps on international students compete with CASE quotas. There are perceived contradictions around part-time students and the need for better guidelines on DEI.
- Directors and Administrators emphasise a strong need in developing cross-DTP/CDT collaboration whereby NERC could facilitate a DTP/CDT network to share best practices via regular conferences (once or twice per year) for Directors, Administrators, and students (the Norwegian CHES programme is cited as an example of national networking) and for wider communication with the industry and non-HEIs.
- Some DTPs make attempts at creating shared training for all students across their DTP, but DTP roundtable participants see the potential for wider cross-DTP/CDT shared training under NERC's guidance – based on a portfolio of skills developed individually by a DTP/CDT.

There needs to be a central admin point for all DTPs and CDTs with experts who are efficient and can keep up with all the rule changes. Admin issues could be reduced by providing and organising joint training events shared across DTPs. I would like to see cross-DTP efforts to improve participation, e.g. cross-DTP summer schools, outreach in schools etc. These activities are difficult to fund within one DTP but could be done with others. – DTP Director

Students focus largely on the challenges they have experienced during their studies to-date. Examples include:

- a lack of a centralised approach during the Covid-19 pandemic,
- the need for greater financial support to students due to rising cost of living,
- more guidelines around training as well as improved communication between students and CDTs/DTPs, between administrators and supervisors, between supervisors and funding bodies around the roles and responsibilities of all parties involved in a DTP/CDT,
- greater relevance of subject-specific training to DTP PhD students, and
- better links between courses on transferrable skills and other courses.

Responsibilities should be clearer and made known. I'm aware that a number of people have had problems with their supervisors because the responsibilities or expectations of the supervisors were unclear. – DTP PhD Student

7. Emerging themes

This chapter draws together all the evidence from the cohort training review into a series of themes, including suggestions for how NERC may wish to respond.

This report has provided an overview of perceptions of DTPs and CDTs in terms of NERC's six priority success criteria for training. It has gauged the strengths and merits of the cohort approach and explored the priority concerns of different stakeholders as to how the model could be further improved for future cohorts.

The research has revealed that most respondents are generally very positive about the DTP and CDT cohort training models, acknowledging the excellent and original research incorporated in these training environments. NERC's cohort approach has garnered a strong reputation for fostering collaboration by creating networks and a sense of community among partners and students. There is a strong belief that the multidisciplinary nature of a cohort approach is beneficial to environmental science, providing students not only with research skills, but also a wider range of training and transferable skills and other opportunities (for example industry placements available through partnerships) that provide long-term career value, and which might not be possible via a non-cohort approach.

The remainder of this chapter summarises the emerging themes and suggested actions that NERC could take in response to the research findings.

Theme 1: Ensuring training continues to meet needs and is fit-for-purpose

Respondents advocate the cohort training approach, noting how this provides students with wider support networks and creates a sense of communities. There is praise that cohort training allows peers to train alongside peers, and to have the opportunity to develop transferable skills. From a practical perspective, organising cross-cohort training can be challenging across centres due to timetable clashes or lengthy travel. Furthermore, the Covid-19 pandemic has restricted the volume of in-person training that can occur, as well as access to some facilities and resources. It is therefore paramount that NERC liaises with DTPs and CDTs to ensure that – where feasible – access has returned to a pre-pandemic footing.

While there are broadly high satisfaction levels with the quality and effectiveness of training, particularly relating to transferable skills, there is feedback that some training can be too generic and lack subject specificity, or can in some cases be irrelevant to individual students. The same point is made for Training Needs Analyses being overly broad. Consideration should therefore be given to the balance of project-specific and transferable / interdisciplinary training. With students suggesting that Supervisors could be more directly involved with aspects of training – especially focusing on practical academic learning such as how to write papers – NERC should also consider Supervisors' involvement in DTP/CDT training.

Finally, students would welcome more careers guidance for a diverse range of career paths besides the most common onwards routes. NERC should therefore consider how information and advice to students can best be developed and delivered, particularly as Directors and Lead organisations themselves admit they may not be best placed to prepare students for career paths outside academia.

Theme 2: Increasing accessibility and promotional campaigns to widen DEI

The majority of research participants agree a cohort model supports students from diverse backgrounds and range of experiences, and that such an approach is intrinsically more diverse. Supporting individuals from ethnic minority backgrounds via ringfenced funding is welcomed, however, DTPs and CDTs note that recruitment can be challenging in practice as the talent pool is limited. Concern is raised that systemic bias is arising and negatively

impacting those from more disadvantaged backgrounds who cannot afford a master's degree. It is therefore suggested that the implementation of NERC's best practice principles in doctoral recruitment is reviewed, to ensure that DTPs and CDTs are working to widen participation, and that a consistent approach is taken.

This research has highlighted three focus areas which should be considered as part of any review of the best practice principles. Firstly, to review criteria and application processes to ensure talented individuals from non-traditional backgrounds are included, for example by considering broader, non-academic skills, or by supporting summer schools with under-represented groups.

Second, there is merit in considering more promotion and/or greater visibility of DEI campaigns focused on widening participation. Respondents suggest that existing and new campaigns could be targeted at early career audiences, and pushed more, to ensure opportunities are truly accessible to all. It is worthwhile for NERC to review existing campaigns and how these might be best promoted and/or adapted in this respect. In particular, there is feedback that greater focus could be placed on ensuring LGBTQ+ and individuals with learning disabilities feel supported, and that DTP/CDT staff have a clear understanding of their needs.

Third, careful considering should be given to how students with wider commitments (e.g. part-time students with caring responsibilities) can still benefit from the cohort model and participate fully in available activities.

Finally, to be able to take informed action, it will be important for NERC to hold comprehensive demographic data on students (both successful and unsuccessful applicants). Therefore, it is suggested that NERC, in conjunction with UKRI, reviews DEI data requirements and works with training grant holders to enable targeted action to be undertaken.

Theme 3: Reviewing financial support provided

There is some concern among Lead organisations regarding the current level of funding provided to cover the costs of operation and management. While it may be a normal and natural reaction for organisations to request additional funding, there is notable concern that funding does not begin until students enrol and does not cover the period prior to this when substantial administration work is still required. It is worthwhile for NERC to carefully consider its funding arrangements in this regard, and whether greater levels of support could be timed to enable coverage of funding for this early activity, and whether the administrative burden could be eased for institutions by streamlining or reducing workloads, particularly in relation to international applications.

Amid the rising cost of living there is concern that the current level of stipend is, in some cases and regions, insufficient to meet students' needs. In this respect, shortly after this research had concluded, UKRI announced that it would be consulting with the sector on the financial support for UKRI postgraduate students. This research finding clearly supports the need for UKRI's review.

Theme 4: Facilitating end-user engagement

There is positivity about industry placements and CASE studentships, with respondents citing the benefits these bring to both students and industry. However, there is concern that, due to the low success rates of funding applications from academic and industry partnerships, some non-academic partners are deterred from forming a partnership bid, and some DTPs and CDTs say this acts as a key barrier to collaboration. More flexibility to industry participation is therefore welcomed, and it is worthwhile for NERC to re-evaluate how non-academic partners might be incentivised to participate more readily.

NERC should further consider facilitating regular (once or twice a year) cross-DTP/CDT sessions to enable the sharing of best practice. These sessions could explore how networks can be formed with industry to build relationships. They could also cover other aspects such as best practice in terms of student recruitment and approaches to inclusivity (linking to Theme 2).

Linked to Theme 1, there is also concern that Covid-19 has reduced in-person placements. These are perceived to be hugely valuable in comparison to virtual placements, and therefore NERC should ensure – where feasible – a return to the pre-pandemic approach in this regard.

Finally, there is feedback from all parties involved in placements that their and others' respective roles and responsibilities should be more clearly defined. It is worthwhile for NERC to provide clarity in this regard, by outlining expectations for all involved parties, to ensure the successful delivery of projects. On a related note, there is also feedback that some of NERC's requirements can occasionally be unclear or be incompatible with wider requirements. Therefore, it is important that NERC liaises with DTPs and CDTs to understand where clarity is required to consolidate administrative processes.

Appendix 1: Student respondent profile

To help determine the impact that DTPs and CDTs are having for students from all backgrounds, students were asked to provide key demographic information. These questions were optional to complete.

The student respondent profile is outlined in the following tables.

Table 10 Sex of student respondents

Sex	No. respondents	% respondents
Female	51	59%
Male	30	35%
Other	3	4%
Prefer not to say	2	2%

Base: 86 respondents. Source: Pye Tait Consulting 2022.

Table 11 Age of student respondents

Age	No. respondents	% respondents
24 or under	22	26%
25 to 29	43	51%
30 to 34	12	14%
35 to 39	4	5%
40 to 44	2	2%
45 to 49	0	0%
50 to 59	0	0%
60 or over	0	0%
Prefer not to say	2	2%

Base: 85 respondents. Source: Pye Tait Consulting 2022.

Table 12 Ethnicity of student respondents

Race	No. respondents	% respondents
White	80	93%
Asian	2	2%
Mixed	2	2%
Black	0	0%
Other	0	0%
Prefer not to say	2	2%

Base: 86 respondents. Source: Pye Tait Consulting 2022.

Table 13 Whether a disability was reported by student respondents

Whether have a disability	No. respondents	% respondents
Yes	12	14%
No	69	80%
Prefer not to say	5	6%

Base: 86 respondents. Source: Pye Tait Consulting 2022.

Table 14 Sexual orientation of student respondents

Sexual orientation	No. respondents	% respondents
Heterosexual/Straight	64	74%
Bisexual	10	12%
Gay/Lesbian	1	1%
Other	1	1%
Prefer not to say	10	12%

Base: 86 respondents. Source: Pye Tait Consulting 2022.

Appendix 2: Survey questionnaire and roundtable topic guides

A.2.1 Survey questionnaire



NERC-CTR-questionnaire-vFINAL.docx

A.2.2 Roundtable topic guide – directors and administrators



NERC-CTR-roundtable-TG-directors-vFINAL

A.2.3 Roundtable topic guide – students



NERC-CTR-roundtable-TG-students-vFINAL