

Report on the Workshops for the EPSRC Review of Doctoral Support

Summary

EPSRC held 4 workshops as part of the evidence collection for the Review of EPSRC Doctoral Support. The workshops were an opportunity to introduce the purpose and scope of the review. The participants then provided input to the review on the following themes:

- The value of doctoral education: to the individual and their career, to the research landscape and to employers
- Skills and Experiences: What skills and experiences should be provided by a doctorate
- Student Population: how to enable a more diverse student population, including increased mobility between academia and industry
- How the doctorate is provided: including different qualifications, ways of providing the doctoral experience and how support is provided.

The outputs of these sessions form the main body of the review. The workshops are just one part of the engagement EPSRC is planning to have with the community over the course of the review until the end of 2020. In order to allow all members of the community to engage with the workshops there is an opportunity to provide comment on the outputs of the review available in the final section – Have your say.

This report shares the outputs of the discussions. No analysis is provided at this stage as the outputs of the workshop will be combined with the outputs of the other evidence gathering activities. Evidence gathered from all the engagement activities will be used in discussion with our advisory group which includes members from our Council and Strategic Advisory Network, to inform recommendations made as phase one of the review.

Contents

Summary	1
Important	Error! Bookmark not defined.
Introduction	2

Opening address/Webinar.....	3
Value of a Doctorate	3
Outputs	4
Skills Development during a Doctorate	6
Outputs	6
Professional Development opportunities.....	9
Outputs:	9
Additional Questions.....	28
Outputs:	28
Have your say.....	31

Introduction

EPSRC held 4 workshops as part of the evidence collection for the Review of EPSRC Doctoral Support. One workshop was held in Cardiff on the 12th of March and the other 3 workshops (25/03/20, 08/04/20, 21/04/20) were held Virtually.

The review is considering what outcomes in terms of knowledge, experience and skills should be supported through EPSRC doctoral training investments. The changing nature of research means that EPSRC wants to check that the experiences provided by the doctoral education it supports, enables the recipient to acquire the skills for the career they choose now and in the future. EPSRC also wants to ensure that the landscape is adaptable to changes in future skills needs.

The review is covering the following five areas:

- The value of doctoral education: to the individual and their career, to the research landscape and to employers
- Skills and Experiences: What skills and experiences should be provided by a doctorate
- Student Population: how to enable a more diverse student population, including increased mobility between academia and industry
- How the doctorate is provided: including different qualifications, ways of providing the doctoral experience and how support is provided.
- Ways of identifying, developing and responding to strategic priorities: how can the landscape respond to changing directions and needs.

The workshop is one of the methods that EPSRC is using to gather evidence to help us develop recommendations for what outcomes in terms of knowledge, experience and skills should be supported through EPSRC doctoral training investments regardless of investment mechanism or topic area. Other methods include, a community survey, data analysis, literature survey and strategic conversations. The recommendations will be developed in consultation with members of EPSRC's Strategic Advisory Network and Council. The engagement is occurring until the end of 2020 and the recommendations will be developed in early 2021.

The workshops were attended by a variety of stakeholders including:

- Those involved in the delivery of doctoral education including training grant holders
- Those involved with the funding of doctoral students
- Those involved with the employment of postgraduates
- Supervisors of doctoral students
- Doctoral students

During the workshop the following three topics were discussed:

- The value of doctoral education
- Skills development during a doctorate
- Professional development opportunities

Input was also sought on additional questions to help guide the review in the next steps. While the topics being discussed were the same, there was a slight variation in the questions asked between the in person and virtual workshops.

This report shares the outputs of the discussions. No analysis is provided at this stage as the outputs of the workshop will be combined with the outputs of the other evidence gathering activities. The combined evidence will be used as the basis to develop the recommendations on what outcomes in terms of knowledge, experience and skills should be supported through EPSRC doctoral training investments.

Opening address/Webinar

The meeting began with EPSRC welcoming all participants. Alison Wall, Deputy Director, EDI & People then gave an opening address and provided an overview of:

- UKRI's Talent Strategy
- EPSRC's Vision and Priority Framework, including the focus on Realising excellence in people
- The purpose of the review of EPSRC's doctoral support
- The scope and proposed timeline for the Review

This was followed by a question and answer session.

Value of a Doctorate

The purpose of this session was to consider the value of doctoral education to various stakeholders. The outputs of this session will provide a way of framing the benefits of doctoral education and build the arguments for the wide range of reasons that funding doctoral education has a positive impact.

The participants were asked the following questions:

- What is the benefit of doing research as a doctorate?
- What is the value of having a doctorate to the individual?
- What is the value of having doctoral graduates as employees?

The discussion was held in a round table style, with participants writing comments on a poster/whiteboard.

Outputs

The outputs have been grouped where the same opportunity was discussed at multiple workshops. The number in brackets indicates how many times the comment was made.

What is the benefit of doing research as a doctorate?

- The student is trained in carrying out research and other transferrable skills (52)
- Fresh thinking from the student (31)
- Allows exploration of new (riskier) ideas - less outcome driven research (29)
- Longer term thinking on a single idea (25)
- Independent research driven by the student (24)
- Doctoral research is more flexible and can change to explore new avenues if needed rather than focussed on original aims (21)
- Start new collaborations (17)
- Provides a qualification (15)
- Cohort working allows ideas to be shared; encourages multidisciplinary working (13)
- Addresses skills shortage and provides knowledge transfer (12)
- Can carry out research that crosses traditional disciplinary boundaries (10)
- Student is able to focus only on research with minimal other work (9)
- Brings in diversity of knowledge (9)
- Focus on core idea rather than a smaller sized result (for a paper) (8)
- Cheaper than other funding mechanisms (7)
- Allows engagement with industry collaborators (7)
- Training opportunities are readily available (7)
- Engagement with wider community to provide greater context of the research area (7)
- Fundamental research that could never be carried out in industry can occur (6)
- The student has a range of support services available via student support (4)
- Allows a focus on communication and engaging with the public (3)
- Allows access to valuable instrument time/facilities/institutes (3)
- Freedom to try things and fail (2)
- Allows growth of the individual and development of a team approach (1)
- Student more able to travel (2)
- Provides additional learning about topics like RRI and ethics
- Doctorate by publication causes a step up in the number of research outputs
- New techniques and methods can be tested

What is the value of a having a doctorate to the individual?

- Provides many transferrable skills (69)
- Access to employment opportunities (56)
- Have 3/4 years to focus on a topic of interest (30)
- Provides a network for the future career (30)
- Satisfaction of contributing to scientific discovery, and real world challenges (29)

- Qualification is recognised and respected (27)
- Develops independence thinking (27)
- Specific technical skills (22)
- Higher salary when employed (22)
- Increased confidence in their abilities (21)
- Exposure to state of the art / cutting edge research (21)
- have opportunity to experience working in industry or internationally (19)
- Experience of academia (15)
- Gives ability to think critically and analyse problems (15)
- Gain resilience (14)
- Freedom to work on your own project (12)
- Access to training opportunities (12)
- Industry based students have an understanding of academic and industry research (10)
- Develop leadership skills (8)
- Freedom to fail (8)
- Experience of team working (5)
- experience of working on interdisciplinary problems (3)
- Access to a dynamic environment (2)
- Generate IP they wholly own and can exploit (1)

What is the value of having doctoral graduates as employees?

- Person has state of the art knowledge and practical skills (53)
- Person is resilient (37)
- Person is able to work independently (31)
- Communication skills - making complex issues understandable (31)
- Doctoral employee brings a ready-made network (20)
- Problem solving capability (19)
- Capability for long term planning and development (15)
- Person has a analytical mindset and skillset (16)
- Person has developed individual thought process (15)
- Leadership skills have been developed (15)
- Person is well versed in carrying out research (13)
- Able to learn and take on new information (13)
- Person able to generate new ideas (12)
- Able to work with others (10)
- Have experience of both academia and Industry and can work in both environments (9)
- Increased links between the employer and university (8)
- Less training required to bring the person up to speed (8)
- Enhances reputation of the company (6)
- Able to work across interfaces (5)
- Having teaching skills (3)
- Have a good understanding of the area they are working in (2)
- Person is more visionary/creative (3)
- Person who is able to carry out research responsibly and ethically (1)
- Able to understand the big picture (1)
- Person more able to deal with innovation needs

- Aware of the funding landscape and UKRI priorities
- Driven less by monetary rewards and more by benefit to society
- Person is clearer about career objectives
- Adaptability (1)
- Have a knowledge of IP/Patenting etc.

Skills Development during a Doctorate

The purpose of this session was to consider what skills are and aren't developed by completing a doctorate. This was then used to consider what opportunities are available to help an individual develop these skills. The participants were encouraged to think broadly about the kinds of transferrable skills that are developed by completing a doctorate. They were then encouraged to think of both formal and informal opportunities that are available during a doctorate as well as those that aren't currently available but would help develop the identified skills.

The participants of the virtual workshops were asked the following questions:

- What skills are developed by completing a doctorate of today?
- What skills are harder to develop by completing a doctorate of today?
- What experiences allow someone to develop these skills?

The discussion was held in a round table style, with participants writing comments on a poster/whiteboard.

Outputs

The outputs have been grouped where the same opportunity was discussed at multiple workshops. The number in brackets indicates how many times the comment was made.

What skills are developed by completing a doctorate of today?

- Verbal communication skills (51)
- Self motivation/Independence (39)
- Working with others (36)
- Critical Thinking (30)
- Organisation (30)
- Written communication skills (29)
- In depth subject specific knowledge (25)
- Project Management (23)
- Analytical Skills (22)
- Problem solving (20)
- Innovation and Entrepreneurship (19)
- Building a network (15)
- Research Ethics and Responsible research and innovation (12)
- Ability to carry out evidence-based research (10)
- Resilience/ability to fail (9)
- Ability to learn (8)
- Leadership (8)
- Creativity (7)
- Digital Skills (7)

- Public Engagement and outreach (6)
- Interdisciplinary working (7)
- Teaching/Mentoring (5)
- Managing Others (5)
- Ability to understand complex information (6)
- Confidence (5)
- Coding (3)
- Adaptability (2)
- Ability to focus
- Ability to handle and respond to constructive criticism (1)
- Funding research
- Non discipline specific technical skills

What skills are harder to develop by completing a doctorate of today?

- Collaborative working (24)
- Commercial Awareness (22)
- Independence (19)
- Ability to internalise information and critically apply it to a relevant field (18)
- Budgeting/Financial Management (15)
- awareness of alternative careers (15)
- Awareness of broader context (13)
- Leadership (12)
- Confidence (12)
- Communicating to a general audience (10)
- Presenting (9)
- Entrepreneurship (10)
- Project management (8)
- Management of others (7)
- Scientific writing (8)
- cross disciplinary working (5)
- creativity (5)
- Resilience (3)
- transferrable skills (3)
- Ability to consider alternative viewpoints (3)
- Organisation (2)
- Confidence (2)
- Engaging with policy makers (4)
- Freedom to fail (1)
- Ability to influence (1)
- Adaptability (1)
- Practical technical skills (1)
- Networking skills (1)
- Teaching and mentoring (1)
- Self-care (1)
- Pragmatism - knowing what is good enough (1)
- Working to deadlines (1)

- Ability to innovate at pace
- Bid/Proposal Writing
- Intellectual Property Awareness (1)
- Self-motivation
- Research ethics and integrity

What experiences allow someone to develop these skills?

- Being part of a cohort (34)
- Networking with others; including those outside of academia (29)
- Public engagement (26)
- Opportunity to work with others (23)
- Time spent working in an employer environment (23)
- Writing up research for papers etc (21)
- Cross disciplinary projects (19)
- Bespoke relevant Transferrable skills courses (17)
- Carrying out research (17)
- Bidding for funding (13)
- Supportive environment (11)
- Career Guidance (10)
- Teaching opportunities (10)
- Entrepreneurship/Commercialisation training (9)
- Having industrial collaborators (8)
- Flexibility in the Doctorate structure (8)
- Training in bid writing (6)
- Placements with other academic research groups (6)
- Having a mentor (5)
- Business focused project work (5)
- International travel (4)
- Failing with confidence (4)
- Creativity@home events (4)
- Experience of peer review (2)
- Presenting research (3)
- Access to Institutes/Infrastructure/world class labs/facilities (2)
- Clear expectations about the skills should be gained during the doctorate (1)
- Learning from experts in their fields (2)
- Literature review (2)
- A challenging project (1)
- Formalised milestones set by the University (1)
- Informal networking opportunities
- Training in ED&I
- Having explicit team management meetings (1)

Professional Development opportunities

The purpose of this session was to identify opportunities that would provide a benefit to the individual and/or their project and consider how EPSRC can facilitate these opportunities being available to all students.

In all workshops the most common professional development opportunities from the outputs of session 2 (Skills development) were identified. The participants were then asked the following questions of each opportunity:

- How does participating in this activity benefit the doctoral project
- How does participating in this activity benefit the individual
- What are the barriers to providing this opportunity?
- How can these barriers be overcome?

This session was held as a facilitated marketplace session on the 12/03 and as a survey where participants could add comments on the 25/03, 08/04 and 21/04.

This means that a higher proportion of comments come from the virtual workshops as participants couldn't see what else had already been contributed.

Outputs:

The following professional development opportunities were covered in this session:

- Time spent working in an Employer environment
- Student Cohort Opportunities
- Career Guidance
- Public engagement
- Working in an interdisciplinary team (for doctorate or a short project)
- Working with others on a research project (Team working)
- Scientific/ Technical writing
- Training in Grant/ bid Writing
- Presenting to an Audience
- Designing/Planning/Executing experiments
- Networking with Others
- Commercialisation of research / Entrepreneurship activities or training
- Working Internationally

The outputs have been grouped where the same opportunity was discussed at multiple workshops. The number in brackets indicates how many times the comment was made.

Time spent working in an Employer environment (12 th March, 8 th April; 25 th March; 21 st April)	
How is participating in this experience beneficial for the doctorate project?	How is participating in this experience beneficial for the individual?
<ul style="list-style-type: none"> • Provides context for the research; Wider understanding of the problem/limitations/requirements of the project (26) • Alignment with real life problems –builds knowledge of commercialisation or social impact (21) • Provides access to specialist equipment/environments/data/knowledge (16) • Create and maintain links with companies leading to future funding (13) • Application of cutting-edge research in practice (9) • alignment with real life problems – can be more motivating (4) • Learn from the good practices across industry (4) • Can develop new avenues of research <p>Contra: Only beneficial to project if there's is a meaningful link between project and industry/employer environment (5)</p>	<ul style="list-style-type: none"> • Develop knowledge of different working environments and ways of working (31) • Opportunities for develop new skills outside of what is available at home institution (mentioned: communicating, relevance of KPIs, technical, business development; project management) (28) • Develops awareness of career opportunities (22) • Development of understanding of commercial settings in which a research is conducted and the differences to academia (18) • Better employment prospects (16) • Allows candidate to build their network (16) • Awareness of the wider context of their research (10) • Alignment with real life problems – can be more motivating (4) • Contact with potential future employer (2) • Creates a bridge between academia and Industry (1)
What are the barriers to providing this experience?	How might these barriers be overcome?

<ul style="list-style-type: none"> • Requires an existing link to Industry (12) • Extends the length of the doctorate (16) • Concerns about time away from the main doctoral project (11) • Students confidence to go to a new environment (1) • Funding not always available (funding from company, HEI, or from training grant) (16) • Cost of placement to the student (Participating often incurs additional costs, e.g. relocation) (5) • Not every company has the financial to host a placement or the time and resources to train and supervise the student (16) • Finding the right kind of project that adequately satisfies both academic and industrial criteria. (34) • Has a high administrative cost (Ip, Security access, T&S) (22) • Supervisors do not see the benefit (11) • Lack of awareness that the opportunities are available to the student (5) • Student not able to participate in an activity that requires working in a different location (4) 	<ul style="list-style-type: none"> • Working more closely with industry partners and increasing their awareness of short and long-term benefits (14) • Clear expectations made from start of doctorate to both students and supervisors (academic and Industrial) so no restrictions/barriers are found (12) • Additional funding (10) • Provide funding to the placement provider (10) • Ring fenced funds for placements (9) • Placement funding available to all students (option can be bid for by student) * (8) • Official scheme to pair companies/Institutions to help foster relationships (7) • Better advertising of the benefits of participating in placements, for student, supervisor and companies (7) • Time extensions available for students* (5) • Keeping a pool of potential placements /employers (6) • Dedicated staff member to find placements and undertake the administration (4) • UKRI guidance around the legal issues with unpaid placements etc, making it clear to University teams what the limitations are and how to navigate them (4) • Placements which are not a single block of time, but engagement spread-out over the doctorate e.g. one day a week (2) • Best practice guidance from EPSRC (2) • Costed extensions to fund placements* (2) • Having a requirement for students to participate in a set amount of non-project activity over the course of the doctorate (2) • Ability to participate in non-related placements* (1) • Having longer placements – 1year + to allow focus on a relevant project (1) • Clear framework for what a placement should entail • Allow placements after thesis submission <p>Contra:</p> <ul style="list-style-type: none"> • Should not be mandatory (3) • Most benefit when the student wants to participate in the placement (4)
--	---

	<p>*Funding for placements is an eligible cost on all EPSRC training grants</p>
--	---

Student Cohort Opportunities (12 th March; 8 th April; 25 th March)	
How is participating in this experience beneficial for the doctorate project?	How is participating in this experience beneficial for the individual?
<ul style="list-style-type: none"> • Allows students to have a mentoring opportunity • Benefit from interdisciplinary discussion with friends and colleagues to gain new perspectives and approaches on their work (17) • Peer support and motivation (16) • Peer to peer learning is beneficial (technical and transferable) (11) • Networking enhances collaborative opportunities by increasing "chance encounters/discussions" (6) • It provides another network to solve operational problems (4) • Allows feedback to be collected from the students • Good opportunity to monitor engagement • Builds range of communications skills (5) • gain skills working in teams (3) • The student body is also a strong voice (it works almost like a union) that helps shape the programme since it has a strong influence over academics (1) • Efficiency of training (1) 	<ul style="list-style-type: none"> • Peer support network provides support (benefits mental health, motivation) (32) • Team working and networking skills are developed (13) • Develops an insight into other fields of research; gives a broad perspective outside their own field (10) • Develop a network (10) • Peer to peer learning (formal and informal) improves learning and the research projects (8) • Develops communication skills (2)
What are the barriers to providing this experience?	How might these barriers be overcome?
<ul style="list-style-type: none"> • Tricky to build cohorts when they aren't naturally present (12) • Has an administrative cost of managing the cohort (18) • Cohort activities require funding (10) • Not all students want to participate in cohort activities (12) • Travel is often required – not feasible for all students (3) • Supervisor not on board with participation (6) • Participating in activities takes time away from the project (7) • Lack of activities available outside of the CDT set up (2) • Local student population too small for cohorts 	<ul style="list-style-type: none"> • Additional funding or ring-fenced funding for cohort activities and the administration of the activities (12) • Provide/Share good practice and examples of activities and events (6) • Regular cohort building activities throughout the PhD, with time for social activities as well as training to help them bond (4) • Establish the sense of cohort early on, making students feel they belong in an inclusive group (3) • Ensure the assessment takes into account of the cohort activities provided (3) • Make the provision of a set amount of non-project activity a condition of the funding and/or graduating (4) • EPSRC sponsored activities – e.g. summer schools or training courses (1) • An official structure in the university to encourage activities (3) • Cohorts created in thematic areas (1)

	<ul style="list-style-type: none">• Flexible opportunities to prolong funding for students – allows more involvement in activities not directly related to the research• Less pressure on doctoral students to complete in a fixed time• Students to take ownership of the activities• Mandatory training/networking for training grant holders• Use of digital environments to develop cohorts
--	---

Career Guidance (8 th April)	
How is participating in this experience beneficial for the doctorate project?	How is participating in this experience beneficial for the individual?
<ul style="list-style-type: none"> • Having an idea of where they might be headed at the end of their PhD, and how the skills they are gaining might map on to a future career, is good for motivation, which in turn is good for the project (7) • Learn to think and package their research in different ways to address different audiences which can be useful for thinking about their project in new ways and potentially overcoming challenges differently than they might otherwise do (2) • Develop professional skills such as leadership, time management and innovative thinking, responsibilities for the team, institution and society (1) • Successful outcomes can be useful to attract the next cohort (1) • Learn to think and package their research in different ways to address different audiences which can be useful for thinking about their project in new ways and potentially overcoming challenges differently than they might otherwise do (1) 	<ul style="list-style-type: none"> • They are aware of the range of careers available (6) • The student can prepare for the career they want by identifying and participating in relevant opportunities (10) • Motivated to complete the doctorate (4) • Motivated to participate in beneficial activities (2) • More likely to be employed at the end of the doctorate (1) • Accelerates career development • Gain experience in communicating the skills they have developed during the doctorate
What are the barriers to providing this experience?	How might these barriers be overcome?

<ul style="list-style-type: none"> • Time to participate; student may not see why the experience is valuable/worth the time commitment (5) • Having relevant career advice available – this is a specialist activity that not all academic supervisors are able to provide (4) • Career guidance required by doctoral students is different to that of an undergraduate (3) • The wide range of careers can be overwhelming and not always obvious how it applies to the individuals experience of completing the doctorate (1) 	<ul style="list-style-type: none"> • Raise the profile of working outside academia e.g. version of Doctoral Prize for Industry sector • Utilise project partners, alumni and collaborators to showcase range of careers (4) • Encourage universities to better support career advice for doctoral students and also support supervisors to be able to provide career advice (3) • Raise the profile of working outside academia e.g. version of Doctoral Prize for Industry sector (2) • Time spent outside of academia (2) • Better communication of support available • Utilising specialist resources – allow funding to be used for this (2) • Allow a more flexible length of doctorate (1) • Make the provision of a set amount of non-project activity a condition of the funding and/or graduating
---	---

Public engagement (25 th March; 8 th April; 21 st April)	
<p>How is participating in this experience beneficial for the doctorate project?</p> <ul style="list-style-type: none"> • Raises the visibility of the project/research area (19) • It is helpful for researchers to understand the impacts of their research upon different audiences, and how those impacts differ (17) • Raises the profile of research – shows why it is important and useful (14) • Having to explain the research to people in lay man’s terms and answer their questions really helps get to the essence of what the research is and why it is being done (14) • Helps achieve impact from the research (10) • Develop the vital skill of being able to explain things to other people, at all levels (4) • Can lead to new collaborations (1) • being able to explain project to others may lead to new avenues of research (1) 	<p>How is participating in this experience beneficial for the individual?</p> <ul style="list-style-type: none"> • Develops communication skills (describing a complex idea to a lay person is valuable in many settings) (49) • Puts research in context and shows the impact of the research (15) • Develops confidence (14) • Development of understanding of what is public attitude to science and research (12) • Can inspire individuals when they see the interest/impact their research has (8) • Develops skills in project management; budgeting; leadership (5) • Good for career prospects (5) • Opportunity for creativity (3) • Networking opportunities (2)
<p>What are the barriers to providing this experience?</p> <ul style="list-style-type: none"> • Lack of time available to develop the activity (28) • Lack of opportunities (25) • Lack of funding (14) • Lack of support from supervisor in participation (11) • Lack of confidence/interest of the student to participate in the activity (10) • Lack of training opportunities (8) 	<p>How might these barriers be overcome?</p> <ul style="list-style-type: none"> • Provide training in public engagement skills (communication, media and outreach etc) (9) • Embed time in the doctorate for participating in such activities (8) • Encourage public engagement (8) • Publicise opportunities clearly (8) • Ring fenced funding for public engagement (7) • Make it a formal requirement of the training grant/graduating (7) • Provide guidance and best practice (7) • Better institutional level buy in (6) • Working with outreach and public engagement and also industry partners (6) • Have a competition available for students for their own ideas (2) • ESPRC hosted event for the public

Working in an interdisciplinary team (for doctorate or a short project) (8 th April)	
<p>How is participating in this experience beneficial for the doctorate project?</p> <ul style="list-style-type: none"> • Provides new perspectives, insights and approaches of looking at the same problem from different angles (8) • Brings in novel/unusual techniques to solve a problem from outside the main discipline – benefits the project (4) • Improves communication (2) • Builds links for the students (2) • New collaborations (2) • Opportunities to engage in project management and organisation to plan and implement a series of actions in solving a problem <p>Contra:</p> <ul style="list-style-type: none"> • Not always possible to do well in a short-term project or when people are new to the (research) area 	<p>How is participating in this experience beneficial for the individual?</p> <ul style="list-style-type: none"> • Develop skills such as communication, leadership team working and project management (9) • Provides context for the research (6) • Learn new ways of thinking (5) • Builds knowledge and capabilities (4)
<p>What are the barriers to providing this experience?</p> <ul style="list-style-type: none"> • Lack of suitable projects; needs to be meaningful and properly integrated into main project (6) • If a separate project, takes time away from doctoral work (4) • Hard to do within in the institutional system/logistics of finding suitable supervisors etc. (4) • Barriers between disciplines • Lack of supervisor support/ expertise in working this way • Lack of training/support for students to make them feel comfortable working on this type of project 	<p>How might these barriers be overcome?</p> <ul style="list-style-type: none"> • Works well when integrated into the programme from the beginning (3) • Better communication on the benefits of interdisciplinary working (3) • Specific events/activities to bring communities together (3) • Proper training and support for students and supervisors (2) • More streamlined processes (1) • Make collaborative working more flexible by incentivising "best-with-best" interactions and reducing barriers to doing this (1) • Students progressing as a cohort

Working with others on a research project (Team working) (12 th March; 8 th April; 21 st April)	
How is participating in this experience beneficial for the doctorate project?	How is participating in this experience beneficial for the individual?
<ul style="list-style-type: none"> Improves the output of the research through the benefit of multiple idea/ways of thinking – stronger research, more publications (27) Provides a variety of ideas which leads to problem solving (15) Sharing of best practice (9) Allows a broader range of activities to be carried out compared to a single researcher (3) Better cohesion for the cohort (2) Keeps continuity of knowledge through sharing between members of the team with different experience levels (1) Cross disciplinary input is easier to achieve 	<ul style="list-style-type: none"> Team working skills are useful for employment in all careers (25) Provides experience of other ways of working (14) Develops communication skills; negotiation skills; delegating skills (13) Develops network (11) Develops confidence of the student (5) Increased student wellbeing (4) Develops leadership skills (2)
What are the barriers to providing this experience?	How might these barriers be overcome?
<ul style="list-style-type: none"> Development of the project/team takes a significant amount of time and resources (14) Teamwork undervalued as a skill by supervisors and students (9) Need to have a critical mass of people in the research area and its helpful if they are local (6) Finances to support the whole team (5) Needs to be a relevant project/team (5) PhD study still needs to maintain individual elements to satisfy regulations and quality control (5) Lack of mechanisms to organise this (3) Not everyone has the skills to work in a team environment 	<ul style="list-style-type: none"> Dedicated funding for team projects (12) Reinforcing the value of teamwork (9) Training in teamwork/negotiating/delegating etc. (7) Consistency of how students are allocated More resources for course providers (5) Clear aims and working rules set out at the beginning of the project (5) Supervisor training (3) Specific short-term activities designed to enable/promote teamworking (4) Allowing students to develop their own collaborative projects

Scientific/ Technical writing (25 th March; 8 th April)	
How is participating in this experience beneficial for the doctorate project?	How is participating in this experience beneficial for the individual?
<ul style="list-style-type: none"> • Essential to write a thesis that is understandable (14) • Outputs need to be disseminated to others inside and outside of the community (13) • Outputs are of better quality (2) • Provides a record of experimental work and analysis (1) • In writing deeply about a project, often our understanding of the project advances dramatically 	<ul style="list-style-type: none"> • Useful for future career both inside and outside of academia (23) • Developing the skill early helps the doctorate progress well; more publications and easier thesis writing (12) • Communicating their ideas help develops ideas and solutions to problems (8) • Publishing builds their external profile and the impact of the research (2)
What are the barriers to providing this experience?	How might these barriers be overcome?
<ul style="list-style-type: none"> • Lack of tailored resources to doctoral students (11) • Time and opportunity to practice (9) • Engagement of the students to develop their skills (2) • Funding for suitable course (1) 	<ul style="list-style-type: none"> • Access to specialist courses (including funding) (17) • Requiring students to participate in activities which require them to practice writing (5) • Disability services for people who require them* • Encouragement and opportunities provided by supervisors (4) • Writing retreats for students (3) • Emphasis from EPSRC/UKRI on the importance of the skill (1) • Explicitly factor in writing up into time allocated for project** <p>*this is provided for students via the Disabled Students Allowance for students</p> <p>** UKRI terms and conditions state that projects should be designed to include time to write the thesis in the funded period</p>

Training in Grant/ bid Writing (8 th April; 21 st April)	
How is participating in this experience beneficial for the doctorate project?	How is participating in this experience beneficial for the individual?
<ul style="list-style-type: none"> • Encourage researchers to look at their research in a new way - through a funder's perspective; making it more relevant and interesting and alter how they are approaching a problem (10) • Provides additional resources if the grant/bid is successful that allows activities to occur that can't be funded from RTSG (9) • Sets project in context (4) • Helps understand the process and Key Performance Indicators better (4) • Practicing writing skills benefits the thesis and publication writing process (3) • Extends the impact of the project 	<ul style="list-style-type: none"> • Relevant experience (writing to persuade) for many careers (28) • Key to a future in academia and helps gain an early understanding of this process (20) • Awareness of funding landscape (4) • Helps develop communication skills (4) • Exposure to the various aspects that need to be considered when planning a project (2)
What are the barriers to providing this experience?	How might these barriers be overcome?
<ul style="list-style-type: none"> • Lack of opportunities for practice (18) • Lack of time available for training opportunities (10) • Lack of opportunities for training (8) • Students not recognising the importance of the skill (7) 	<ul style="list-style-type: none"> • Develop opportunities for doctoral students to apply for small amounts of funding for their projects (18) • Provision of suitable specific courses (11) • More encouragement for students to participate in such courses (5) • Require students to participate in a certain amount of additional training requirements to graduate (5) • Additional time for participating in additional activities (3) • Additional funding for courses (3)

Presenting to an Audience (12 th March, 25 th March)	
How is participating in this experience beneficial for the doctorate project?	How is participating in this experience beneficial for the individual?
<ul style="list-style-type: none"> • Increases the knowledge transfer/ impact of the research (9) • An opportunity to test their project methods and findings to a critical audience (7) • Having to present clarifies the ideas, making the link between ideas clearer (6) • May be prompted to consider new ideas/opportunities for the research (4) • Being able to communicate is a critical part of research (2) • Increases the knowledge transfer/ impact of the research (8) • Preparation for Viva 	<ul style="list-style-type: none"> • Development of presentation skills; relevant to many careers (14) • Builds confidence in their research and themselves (3) • Prepares for the viva (1) • Learning to structure and communicate a complex subject (7) • Opportunity to learn from others (1) • Networking opportunity (3) • Obtains feedback
What are the barriers to providing this experience?	How might these barriers be overcome?
<ul style="list-style-type: none"> • Opportunities to present (7) • Cost of conference (6) • Students reluctance to engage with opportunities (6) • Support for students to practice the skill (5) 	<ul style="list-style-type: none"> • Training courses made available (5) • Students encouraged by supervisors to present at a variety of events (team meetings, department seminars, conferences etc.) (5) • Make the expectation that students should be offered the opportunity to present regularly more explicit in EPSRC guidance (3) • EPSRC supported doctoral conferences (4) • Better provision of travel funding (3)

Designing/Planning/Executing experiments (25 th March)	
How is participating in this experience beneficial for the doctorate project?	How is participating in this experience beneficial for the individual?
<ul style="list-style-type: none"> • Core part of a doctorate (22) • Training in how to be a researcher (2) • Provides specific technical skills (1) • Links project findings and outcomes to real world challenges • Allows issues to be identified quickly when done well 	<ul style="list-style-type: none"> • Develop project management skills (6) • Develops independence (5) • Develops specific technical skills (4) • Useful for future careers – not just academia (4) • Provides the opportunity to fail and learn from mistakes (1)
What are the barriers to providing this experience?	How might these barriers be overcome?
<ul style="list-style-type: none"> • Access to equipment and technical support (7) • Lack of experience of the student (6) • Lack of confidence of the student to take control of project (4) • Supervisor taking control of the project (3) • A trade-off between trying to use a technique that is new to produce original results and trying to get the experiment to work so that papers can be published • Lack of training opportunities 	<ul style="list-style-type: none"> • Increased RTSG funding (6) • More emphasis that this is a key requirement of a doctorate from UKRI (3) • More structure in initial phase of project; followed by student taking control in a structured manner (3) • Supervisor training (2) • Cohort focussed approaches to ensure a more universal experience • Relevant training options (1) • Mentoring – transfer of knowledge within a group

Networking with Others (25 th March; 21 st April)	
How is participating in this experience beneficial for the doctorate project?	How is participating in this experience beneficial for the individual?
<ul style="list-style-type: none"> • Talking to others, provides new perspectives and leads to new ideas (9) • Helps build collaborations that can contribute to the research (6) • Provides knowledge exchange (1) • Provides the societal and commercial context • Visibility of the project and research team 	<ul style="list-style-type: none"> • Develops relationships for now and in the future (5) • Provides career opportunities (5) • Gain greater awareness of the context of the research (4) • Develops interpersonal skills (4) • Boosts confidence (2) • Peer to peer interaction helps with subject specific and social support (2) • Provides a greater awareness of potential careers (1)
What are the barriers to providing this experience?	How might these barriers be overcome?
<ul style="list-style-type: none"> • Lack of suitable opportunities for doctoral students (6) • Participating in networking events often involves travel and occurs outside of 9-5. This isn't possible for everyone (5) • Not always a top priority for the student (3) • Lack of funding for networking events (1) • There is an administrative burden on organising the events (1) • Difficult to teach (1) 	<ul style="list-style-type: none"> • A tailored course on networking for doctoral students (3) • Encourage conference attendance (3) • Providing specific funds to enable organisations to host networking events (3) • More workshop style events focussed at students (2) • Set up more networking events (1) • A structured programme that ensures opportunities are available to all students • Provide more time for the doctorate to enable participation in 'nice to have' activities • Facilitate remote networking

Commercialisation of research / Entrepreneurship activities or training (25 th March; 21 st April)	
How is participating in this experience beneficial for the doctorate project?	How is participating in this experience beneficial for the individual?
<ul style="list-style-type: none"> Increases the impact of the research (17) having an awareness of commercialisation is useful to help identify future opportunities early (8) Can lead to future funding opportunities (5) It can lead to new ideas and new collaborations (5) Important for all types of research to understand the commercial context (4) Can be profitable (1) 	<ul style="list-style-type: none"> Having an insight into commercialisations will be useful for future career in many sectors (22) Learn new transferable skills (negotiating, presenting) (10) Provides a career opportunity/financial gain (9) Provides insight into a range of careers (5) Understanding commercial context beneficial for project and viva (4) Develop networks (3) Very fulfilling – contributing to society in a tangible way (1)
What are the barriers to providing this experience?	How might these barriers be overcome?
<ul style="list-style-type: none"> Time pressures on supervisor and student (14) Supervisor requires expertise in order to pass it on (1) Not every project is suitable for commercialisation (6) Training in this area requires specialists – which requires money; the ones already employed by universities are often already stretched (15) Lack of opportunities for students to get engaged (5) Lack of interest from the students (6) 	<ul style="list-style-type: none"> Specialised training (16) Seminars/case studies from those with expertise (7) Networking with industry and other stakeholders (4) Integrate training into the doctorate process – make it a formal part of qualification (4) Encouragement of participation in these activities (4) Provision of funding for these activities (3) Provision of additional time to allow for commercialisation activities (2) Entrepreneurial mindset development and engaging in knowledge exchange - Spin Up Science and their model of PhD participation in early stage commercial activity with real case studies (1)

Working Internationally (12 th March)	
How is participating in this experience beneficial for the doctorate project?	How is participating in this experience beneficial for the individual?
<ul style="list-style-type: none"> • Brings in additional expertise (3) • Builds a broader network • Access to different facilities/instruments etc (1) • Sharing of knowledge • Provides a broader context for the research 	<ul style="list-style-type: none"> • Increases the reach of their network • Experience of different perspectives (1) • Learn to work outside of comfort zone • Awareness of other cultures • Develop language skills (2) • Awareness of career opportunities • Provides a broader context for the research
What are the barriers to providing this experience?	How might these barriers be overcome?
<ul style="list-style-type: none"> • Lack of funding (1) • Not having appropriate language skills • Visa restrictions • Student lacking confidence/interest in participating • Student not able to move due to personal circumstances • Administrative issues (2) 	<ul style="list-style-type: none"> • More funding available for travel • Full participation in Horizon Europe • More encouragement • More use of e-working to enable collaborations without travel • Provide funding for workshops linking CDTs in similar areas • International challenges and competitions that form networks

Working with technical equipment (12 th March)	
How is participating in this experience beneficial for the doctorate project?	How is participating in this experience beneficial for the individual?
<ul style="list-style-type: none"> • Makes the research project internationally competitive • Allows project specific needs to be addresses quickly • Advanced characterisation methods • Ability to gather novel data for research 	<ul style="list-style-type: none"> • Creates independence (2) • Develop technical skills (1) • Ability to train others • Better employability
What are the barriers to providing this experience?	How might these barriers be overcome?
<ul style="list-style-type: none"> • Funding for equipment for students is limited (6) • Also requires maintenance, technicians which have an additional cost 	<ul style="list-style-type: none"> • Access to strategic equipment via a special student fund • Paying for equipment on training grants (2) • Training available to students regardless of RO

Additional Questions

There are some areas in addition to those covered in detail in the sessions, where EPSRC wanted to gather information. During the in-person workshop, these questions were available for participants to input throughout the day. For the virtual workshops the questions were part of the survey for session 3.

The questions were:

- Are there particular International doctoral models that could work well in the UK research and innovation system, that EPSRC should investigate as part of the review?
- What are the barriers to entry for doctoral education?
- Is there anything else you would like to say on the topic of EPSRC's support for doctoral education?

Outputs:

Are there particular International doctoral models that could work well in the UK research and innovation system, that EPSRC should investigate as part of the review?

- UK model is good (7)
- America has a longer time frame but that is compensated by increased training and teaching loads (7)
- Having a longer training period with more formal early training as per European states (5)
- European and American systems: more competitive for entry; more demanding in terms of skill development (3)
- In Europe, Students are early career researcher who are employees (4)
- UK model is good. I would caution against the US model where a doctorate can take 7 years or more. We should retain a focus on the purpose - an opportunity for the student to demonstrate an ability to carry out independent original research. (1)
- Doing compulsory credit based modules as per US and India
- The EU ITN Schemes and their collaborative character
- US model has tuition waivers for international students
- UK CDT model has been praised by international companies
- International exchange models as per China/US
- Joint doctorate/industrial doctorate schemes (EU)
- America has the student have more leadership of the project
- +1 year" additional funding should be far more common
- The EC Marie Curie Scheme
- The funding models of the German Fraunhofer institutes
- UK EngD model
- Models were the students are able to choose the institution and project
- The Danish scheme "Erhvervsforsker" for industrially based PhD students
- PhD and teaching fellow with extended length to five years
- PhD level apprenticeships

What are the barriers to entry for doctoral education?

- Relatively low income during training compared with other career opportunities post first degree (37)
- Lack of awareness of possible careers (17)
- Limited places (16)
- Lack of understanding of what a doctorate is (15)
- Opportunities aren't always available in the geographical location the student wants to be based (9)
- Residence requirements of UKRI funding (9)
- Lack of confidence from students (8)
- Debt incurred at UG level can scare the student away from continuing to study (5)
- Recruitment focuses on previous academic results and/or experience not proclivity for research (5)
- Bias during recruitment processes (5)
- Caring commitments – Stipends don't cover childcare costs; student status means you aren't eligible for some support (5)
- Disjointed advertising of doctorates; often requires connections (5)
- Doctorates often require students to be mobile (2)
- Not easy for people to return to do a doctorate due to low stipend (2)
- Not enough part time doctorates available (2)
- Students are not employees so miss out on some benefits/support (1)
- View of academia as overly competitive (1)
- A perception that completing a doctorate will negatively impact your work/life balance (1)
- Not being able to be employed while completing a doctorate
- The requirement for a minimum of 50% of funding to come from UKRI
- Lack of diverse role models
- Expectation for students to be mobile during their doctorate

Is there anything else you would like to say on the topic of EPSRC's support for doctoral education?

- Broadening the diversity of University participants in DTC/DTPs - to reflect the value of the diversity - and the "strength in places" (11)
- I have extensive experience of both the DTP and the CDT models. I would like to see some of the practices developed in the CDTs "transferred" to the DTPs (5)
- Both the CDT and DTP models have strengths and weaknesses; having both is beneficial to the landscape (5)
- Continuity of funding and "lumpiness" of provision are real issues (5)
- There should be a focus on career mobility for industry individuals to come back to the university (1)
- More opportunity for studentships within standard research projects where they join teams with other students and RAs should also be more widely possible. (1)
- We have always needed (funding for doctoral students) and will continue to need it; in whatever incarnation it exists in the future. (1)
- Increase support for SMEs to engage with doctoral training (1)
- What I'd most like to see if 4-year PhDs, as standard. (1)
- More part time students (1) [*Note = All of EPSRC's doctoral funding can be used to support part time students*]

- Cohort based training offers many benefits and should continue.
- A valuable feature of the CDT model is that it provides long term (5 cohorts) funding which allows for the development of experiences which are tailored to the research area. These have much higher engagement from students than "generic" training offered by the university to all doctoral students.
- Enhance opportunities for the creation and promotion of more widespread blended funding models.
- Don't be prescriptive. Provide money but don't try and control areas too much. There's a tension, obviously, between providing money for CDTs and for DTPs.
- Revise DTP allocation to also take into account quality of institution and size of academic body.
- I am delighted with the switch from "training" to "education", which I think is very much in the right direction.
- I think it is important that EPSRC does not focus too much on secondary / transferable skills just because it's what all of its students have in common: discipline-specific skills are very important and need to remain centre-stage.
- This point was touched during the workshops but exploring models with increased open-eligibility and flexibility would be welcome!
- There is a small but growing problem of younger academics, and hence PhD supervisors, with no experience or perspective on where the majority of PhD graduates will spend most of their careers, and where most UK research is done; i.e. industry settings.
- Assessment of training grants should consider what metrics of success are used, such as wider skills development, participation in enriching experiences etc.
- Encourage peer review workshops for students. Provides many beneficial skills for the students
- The RTSG allocation is too low
- The money spent on additional activities within CDTs should be better spent on more studentships across the country
- The ICASE model is excellent and should receive more funding
- EPSRC should do more assurance on the presence of suitable policies and processes in Universities
- Funds need to be provided for computing equipment
- The cohort teaching of CDTs is often at a very low level in order to be at a level everyone can understand
- I think it is really important to have a discussion with QAA and universities
- It should be a requirement that some minimum of the 4y (30 credits) are used on non-project specific training (advanced subject classes, careers planning/information, writing, outreach etc.). Perhaps you could even impose that a minimum of 3months should be spent somewhere else (industry, other lab whatever is relevant (or interesting) for the student.
- There should be less flexibility in DTP funding so that some proportion is spent on added value activities
- EPSRC should consider their role in supporting doctoral research across the sector, their obligation to look hard at diversity issues and to find mechanisms to fund innovation in doctoral education and excellent research and doctoral training environments regardless of scale.
- It is essential in the new landscape of Brexit that we continue to explore new modalities of doctoral training that matches some of the schemes available in Europe, to develop our capability using UK industry and engaging international uptake of doctoral study.

Have your say

Both due to the limitations on numbers, the timing of the workshops and the change to virtual workshops, EPSRC is aware that not everyone was able to participate. Therefore, in order to allow all members of the community to engage with the workshops there is an opportunity to provide comment on the outputs of the review available via a survey. The survey is collecting additional comments on all of the topics covered in the workshops and seeking opinions on whether the outputs are reflective of all communities across the EPS landscape.

The survey is being hosted on SurveyMonkey and is open until 16.00 14th December. The survey can be accessed here: <https://www.surveymonkey.co.uk/r/NMSZKWS>

The combined evidence, from the workshops, the survey and other engagement activities will be used as the basis to develop the recommendations on what outcomes in terms of knowledge, experience and skills should be supported through EPSRC doctoral training investments.