Economic and Social Research Council

Strengthening the Role of Training Needs Analysis in Doctoral Training

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EXECUTIVE SUMMARY

A robust development needs analysis process is of critical importance in training the next generation of social scientists, both in terms of enabling the supervisor and student to identify gaps in knowledge and skills required to fulfil their PhD requirements, but also to ensure the student cohort are ready for their post-PhD careers. This review considered current practice in training needs analysis (TNA) with the intention of identifying 'quick wins' and good practice for implementation across the newly commissioned Doctoral Training Partnerships (DTPs), as well as fundamental areas for longer-term development, including piloting and innovation of new approaches.

The work considered Training Needs Analysis (TNA) and Professional Development Planning (PDP) together, foregrounding the importance of tailoring training and development to the individual needs of the student and having a mechanism which promotes:

- Self-reflection
- Methods and technical research training
- Research in practice (aligned to the ESRC's aspirations for future Doctoral Training)
- Breadth of careers
- Student diversity

The term Development Needs Analysis (DNA) has been adopted for use in the remainder of this report, and as a recommendation for future DTP terminology, as this term is already in use by some DTPs and is felt to encourage reflection on broader development opportunities beyond participation in training courses. DNA is used in this report to encompass the whole process of reflection on needs (including PDP). It is possible that some DTPs may wish to use the term TNA within that to demarcate early-stage identification of methods training.

The complexity of institutional structures and requirements means that DTPs have had to be reflective of where they can best add value in DNA, without duplication of effort for students and supervisors. This has resulted in differences across the DTPs in the breadth of purpose and implementation practices across the DTPs. However, drawing on evidence of good practice across the sector, and workshops with academics and students from across the DTPs, a set of common principles and expectations are proposed for ESRC to consider. These are designed to underpin the implementation of DNA in future commissioning of Doctoral Training, with institutions providing evidence of how these will be addressed in their bids.

Proposed principles for Development Needs Analysis in future DTPs

The ESRC's ambition is for the Development Needs Analysis (DNA) to be a continuous process that is student-centred, promotes engagement with, and reflection on, a range of research and professional development opportunities and enables the student to be aware of their own skill sets.

To ensure a robust and meaningful process in support of this ambition, it is recommended that DTPs will:

1. Move from the use of TNA to DNA terminology.
   Conceptualise development broadly, as stretching beyond training courses and workshops to include a range of other developmental and experiential opportunities.

2. Ensure that DNA is promoted as a core and regular component of the Doctoral journey.
   In particular, the application and induction periods should be used to communicate the broad aims of DNA within the wider PhD experience and ensure that students feel ownership of a bespoke process that is aligned to their needs and aspirations.

3. Foreground the importance of student self-reflection and support this through a range of tools and approaches.
   Reflection should be encouraged and supported as a critical part of DNA, throughout the entirety of the Doctoral journey.

4. Equip Supervisors to effectively support the DNA process.
   Set clear expectations for Supervisory input to DNA and provide training to support Supervisors in navigating DNA conversations, enabling a robust and equitable approach to be embedded across the board.

5. Support exploration of a broad range of careers and development opportunities.
   This includes maximising input from internal and external stakeholders, as well as partnerships for experiential learning. Specific consideration should be made of diversity and where particular groups might experience difficulty in accessing opportunities.

6. Evaluate the effectiveness of support, tools or other interventions relating to DNA.
   Gather evidence on the effectiveness of interventions and work in partnership with the students and supervisors to flex and adapt their approach where required.

7. Make use of aggregated data (alongside other means of consultation) to identify gaps in provision and areas for development.

8. Be creative in identifying and responding to emerging needs.

The evidence base for these principles is outlined in the following sections of the report. Suggested ‘quick wins’ include the shift in terminology from TNA to DNA and efforts to embed the above principles. Some areas, such as piloting and evaluating the use of specific reflection tools, ensuring approaches to DNA are supportive of diversity and inclusion, and developing effective DNA support for Supervisors are all likely to require longer term development.

1. BACKGROUND AND CONTEXT

The 2021 evidence report from the Review of the PhD in the Social Sciences highlighted the centrality of a comprehensive, robust and meaningful TNA in realising the ESRC's ambitious vision for postgraduate training:

> To develop **globally competitive** social science researchers; able to operate in **interdisciplinary**, **collaborative**, and **challenge-led** environments; across a **range of sectors**; and that are characterised by **diverse backgrounds** and experiences

A robust TNA process is crucial to delivering a bespoke doctoral training process in which students receive the necessary skills training, opportunities, and funding to become the next generation of cutting-edge social scientists.

The ambition is for the TNA to be:

> A continuous process that is student-centred, promotes engagement with and reflection on a range of research and professional development opportunities and enables the student to be aware of their own skill sets.

The TNA should take into account the discipline, prior qualifications and experience and career aspirations of students, supporting them to reflect on their evolving needs and develop a personalised training plan in collaboration with Supervisors and other key specialist staff.

In January 2022, the ESRC commissioned this review of the literature relating to TNA, as well as existing practice within current ESRC DTPs and beyond, with the intention of identifying good practice as well as opportunities to strengthen training needs analysis in future DTPs.

2. METHODOLOGY

This project made use of a literature review and key document analysis (including DTP student survey data, DTP mid-term assurance reports and current TNA templates or guidance). Questions used when reviewing the documentation included:

- What is it called (language)?
- Is the focus on linking to training, wider development or confidence? Do the objectives relate to reflection or prospective activities? How is prior knowledge or learning valued and celebrated?
- Is there an explicit link made to non-academic careers?
- What guidance is provided (for example, around timing and regularity)

- Who is involved in the process? e.g. peers, Supervisor, alumni, specialist staff?
- What tools or platforms are used?
- Are there examples of innovative practice?
- How do these help institutions or DTPs to gather data on gaps or training needs?

The literature review was followed by two 1.5hr online consultation workshops: one with DTP Directors or training leads and the other with current DTP students. Workshops were co-designed with ESRC leads to gain feedback on the draft principles and ideas emerging from the literature review. This included eliciting views on how they might apply on the ground and be practically workable, as well as how to effectively embed inclusion into the DNA process. This iterative approach supported co-creation of a set of guiding DNA principles, underpinned by current research.

3. PROPOSED GUIDING PRINCIPLES

The following principles and recommendations are proposed for consideration by the ESRC in future commissioning of DTPs. They are presented with the underpinning evidence from the literature review, consultation exercises and document analysis.

3.1 Move from the use of TNA to DNA terminology

The literature highlights that the term TNA is commonly associated with auditing skills against clearly defined requirements, such as via vocational or organisational competency frameworks. The term may also imply to students that the solution to any gaps is a training course, with the obvious follow on being linking of the TNA to lists or menus of training courses (Ferreira, da Silva Abbad and Mourão, 2014). Both these concepts can be problematic in the context of a PhD, where perhaps no such competency framework is in existence, the intended career destination is unknown, or because training courses are not the best or entire solution for the particular need. Some DTPs or institutions have already moved towards the use of '**Learning'** or '**Development'** needs analysis (e.g. the Universities of Durham and Warwick and North West DTP).

Additionally, Whitnall (2013) proposes the use of a lens of **confidence** needs analysis. For some researchers, they may not be lacking a particular skill but rather the confidence to make use of it in a new context. This might be particularly important for researchers transitioning to a different subject area or bringing extensive professional experience. Where a confidence gap is perceived, a solution may be to identify opportunities, with support of the supervisor, to build confidence slowly, through reflection as well as external feedback or validation.

As noted at the DTP Directors' workshop, there are areas of core skills development where a list of clearly defined competencies is available, meaning that the term TNA may be more appropriate at earlier stages, for one part of the wider process.

However, for the remainder of this report and recommendations for future DTPs, we are using the term Development Needs Analysis (DNA) to reflect the wide range of development opportunities we expect researchers to engage in, and that there is no 'one' final destination anticipated.

3.2 Ensure DNA is promoted as a core and regular component of the Doctoral journey

The language used through all communications and experiences during the initial months of the PhD set the tone for how researchers expect to engage with reflection on their needs and to what extent they feel ownership over their professional development. Just as not everyone arrives with a common skillset, not everyone has the same level of skills in self-reflection and managing their professional development. Induction is critical to ensuring researchers feel ownership for the process and have the right balance of challenge and accountability, but also the right support, whether that's in getting to grips with how to manage the process (or how to be more reflective) or where to find communities, individuals and opportunities that might support them. There was support in both the DTP Director and the student workshops for the definition of TNA presented by the ESRC. However, students did not feel that this definition was consistently experienced at present. A few students made reference to box-ticking processes, being asked for lists without reflection, requirements to achieve a target number of courses, or the lack of follow-up as to whether or not your objectives had been achieved. Two students questioned whether the experience felt 'continuous', suggesting that it was talked about at the beginning but not throughout the PhD and that particularly with the constant situation changes due to the pandemic, it might have been helpful to have revisited objectives more often.

When to start: application or induction?

Some DTPs ask for a basic TNA to be done at the point of application (with input from the Supervisor) to help determine the training needs of the incoming cohort and length of funding needed. It is likely that this will be important in future DTPs. However, this may pose disadvantages for students who do not feel able to disclose needs at this point, or are unaware of them. This was highlighted by students in the workshop who suggested that it might not be easy to be honest about training needs (in case you come across as less competitive). Although another student felt that this was a positive, in that they could explicitly outline how they would address any methodological skills gaps (not having done a Masters). One participant suggested that first generation academics might be disadvantaged via this process if expected to know about DNA processes and skills requirements). One DTP (SeNSS) offers a mini-TNA process to potential applicants and has found this to increase engagement with the full process at a later stage, making use of Qualtrics to present data back to students (this feedback or 'checking-in' mechanism was specifically noted by a student in a different DTP as lacking). It was suggested that the application process is an ideal time to communicate to prospective students how the PhD and associated professional development activities might act as an apprenticeship to becoming a social science researcher, rather than solely focused on your niche.

The application and induction processes are important is setting expectations for DNA being a critical component of the 'work of the PhD' as well as for how students might take ownership for the process and ensure that it is bespoke to their own needs throughout the remainder of their Doctoral journey.

Supporting student ownership of the process and outcome

Initial needs analysis templates can have a variety of aims and intended outcomes. However, when presented alongside a list of training courses, the immediate impulse for students is often to spot 'deficiencies' and sign up to courses to match that. This can often result in feelings of stress when the course isn't at the right level, isn't happening until next semester, or is already full. This fear of missing out or falling behind might then lead to panicked signing up to anything that might be of interest or relevant 'just in case'.

If researchers are to feel empowered and at the centre of the process rather than hostages of the system they need to be invited to bring their whole self and own motivations and career values into the discussion. This implies time spent on active reflection on both their current strengths, values, experience and interests as well as on the identities they are forging as researchers, their career aspirations and how their development as a researcher fits into the context of their personal lives and work life balance (Niang *et al.*, 2021).

The Hidden Curriculum (Elliot *et al.*, 2020) shares a list of questions which can support researchers to reflect on their 'whole selves' with the authors highlighting a four-day induction where researchers engage in peer discussion on these issues in a 'safe' (off-campus) space. The students in this case study (Elliot *et al*) receive guidance and a *'framework for aligning expectations'* before being encouraged to make an appointment to discuss DNA with their supervisor. Taking the lead in discussions with supervisors is a huge cultural challenge for many new PGRs and the opportunity to benefit from tools, stories and structured time with peers to reflect on their own aims for the process will help pave the way for a more enriching conversation. This 'supported challenge' model could be envisaged for many parts of the DNA processes (see Table 1), with support coming from tools or examples of their use (for example, completed DNA forms, as provided by the University of Sheffield) and advice and accountability from specialist staff and peers.

Table 1 Suggested examples (from author) of career and professional development challenges with possible avenues of support, with accountability coming via peer discussion

Challenge student to lead	Possible support from a variety of sources
Ask for feedback from others, to develop your knowledge of your strengths	Approaches and models for feedback – how to seek it and how to learn from it
Conduct an informational interview with someone in a non-academic career	Hear from later stage PGRs or alumni who have done this (confidence / permission); support to build networks; how to approach someone and how to maximise the interaction

Current DTP templates set expectations on how (and how often) needs analysis might be conducted and how needs might be met via a range of opportunities. Several of these encourage students to think beyond immediate research or academic career needs and think about DNA as being a 'journey', which might start more akin to TNA, with the initial core methods training, but remains as a regular practice for their longer-term career.

As this 'journey' evolves, it is possible that some students may wish to make use of professional or competency frameworks of their own choice, for example from an organisation with which they are undertaking their research in practice placement. DTPs might wish to consider whether (and at what point) they might invite researchers to bring their own structures or competency frameworks into the process.

In their paper exploring the value of a PhD to Graduates, Bryan and Guccione (Bryan and Guccione, 2018) highlight the importance placed on 'extra-curricular' activities in contributing to career value. Induction programmes and (and indeed Supervisor workshops) could deliberately explore the shift in the purpose and context of the doctorate over the last 20 years, acknowledging the range of perspectives on 'value' and inviting new researchers to reflect on what value means to them within the context of the PhD. Sharing stories and literature on the hidden curriculum, researcher career trajectories and identity development (Åkerlind, 2008) and the benefits of PDP to these aspects of research life may help students look towards the journey ahead and prepare them to be more resilience in future points of career conflict or self-doubt.

One of the students in our workshop noted that it 'felt very generative' to discuss training needs with peers but that you also need time on your own to reflect. There was general agreement in the workshop that needs analysis and PDP are the student's responsibility, but it can be helpful to be 'forced' to write things down, or to spend formal time on this (perhaps with specific time allocated with Supervisor). There was also agreement that students might have different preferences in managing professional development; one student described using the software Trello to list development goals alongside other PhD tasks and goals; another felt they had not been encouraged to reflect as part of their DTP process (just being asked to list activities) but that they found analysing job adverts to be helpful; another offered the experiences from previous employment of getting 360' feedback as a positive example of being encouraged to self-reflect.

Students in the workshop noted they are invited to multiple inductions and warned against making an assumption that it would be covered in one of them, suggesting a formalised TNA workshop would stop it 'falling through the cracks'.

3.3 Foreground the importance of student self-reflection and support this through a range of tools and approaches

Many DTPs, and institutions, provide a range of tools, workshops, events, mentoring and other approaches to support students to reflect on their training needs, however there use is not always embedded as central to the DNA process or throughout the duration of the PhD. This section highlights areas of good practice relating to tools, diagnostics and prompts for reflection, which might be applied more consistently across DTPs and the duration of the PhD going forward. It also highlights the importance of neutral space, and of peers and other sources of support in the process of reflection. Whilst students in the workshop noted the benefits of all of these things (and a desire for them to be more visible and embedded), they also mentioned financing of courses, noting confusion over how Research Training Support Grants (RTSG) can be spent in support of development activity and that it may not be sufficient to support (externally-run 'industry' courses).

Tools for reflection

Self-reflection is crucial for awareness of existing skills and development areas, as well as values, motivations and strengths, and understanding of how skills might be transferred to a range of environments and careers post-PhD. Some students will already have vast experience of reflective practice and strategies for incorporating this into their lives, whilst for others, it might be entirely new concept. Peer learning may be particularly useful in these cases.

Self-reflection coupled with identification of appropriate evidence will allow a robust approach to determining development needs. Portfolio tools to support the collection of evidence are discussed in a later section but DTPs may also wish to consider more formalised ways of evidencing skills growth, drawing on good practice in Institutions (e.g. SPS Edinburgh Award for Researcher Development and Academic Practice or the Strathclyde PG Cert in Researcher Development).

There is huge value in supporting students to identify needs through their own reflection and identity work. However, this risks them falling into their own 'confirmation biases' where they don't recognise growth from a transition or their own 'blind spots'. Students should be encouraged to seek feedback from a range of perspectives, including supervisors, peers, students they teach or knowledge exchange and community partners. DNA guidance could introduce formal models for incorporating feedback into wider reflection (Brookfield, 1995) as well as offering examples of how to approach someone to ask for feedback.

Guidance should support researchers and supervisors to explore boundaries and confidentiality in reflection, including transparency over whether something is a formal requirement and if so, who will have access. This is particularly important when thinking about what (if anything) might be included in the final thesis and examination (Thomson, 2014). The University of Warwick has a clear set of FAQs on their professional development pages setting out what is mandatory, whether there can be exemptions and what is being monitored. At Utrecht, inclusion of reflection on professional development in the thesis is optional.

One approach to encourage researchers to explore their skills and emerge with a tangibly useful document is to ask them to prepare a narrative CV. This new format has recently been introduced by various European funders, including UKRI (Resume for Research and Innovation), with the aims of recognising broader contributions to research and of reducing an overreliance on uncontextualized metrics (Strinzel *et al.*, 2021). Narrative CVs are still very and new concerns have been raised over the time needed to assess them fairly, as well as potential disadvantages to non-native English speakers. However, they may prove an effective tool to encourage and document reflection on the broader skills developed during a PhD. DTPs might use completion of these to demonstrate engagement in DNA, also allowing identification of gaps where students either don't feel they have experience in a particular area or are unsure of expectations and what success looks like.

Appendix 2 provides examples of tools and approaches to support student reflection.

Evidence-informed reflection: supporting students to understand and navigate the likelihood of career paths

Inaccurate or contradicting information on both academic and non-academic careers (likelihoods and routes into them) as well as lack of networks outside of academia contribute to flawed career assumptions (Hayter and Parker, 2019), often leading to what has been described as a postdoc 'holding pattern'. ((*Sauermann and Roach 2016, Why pursue the postdoc path?*, no date).

DTPs should provide multiple opportunities for students to access and evaluate information about potential employment prospects and the likelihood of success, acknowledging that different students will be accepting of this information at different points in time, according to their own values and world views, as well as changing personal circumstances, interests, relationships and responsibilities.

In using game theory to explore the career strategies of Doctoral Researchers, Hancock explains that students are likely to experience a range of emotions, conflict and self-doubt as they lose confidence in academia as a career goal, leading to different levels of proactivity and engagement in transferable skills training throughout the journey (Hancock, 2019). The study found participants became more pragmatic as PhD progresses: *Career strategies are observed to be values-based, but are shaped also by calculations of risk and probability* whilst students experiencing feelings of conflict around the 'pure' nature of academic careers and lack of academic jobs may be more likely to take a passive approach to their careers ('*wait and see'*).

This should be recognised in the variety of 'careers' interaction points offered and signposted by the DTP, perhaps supporting students to explore the individual and structural factors which influence agency in career decision making (McAlpine and Emmioğlu, 2015). DTPs could also usefully suggest 'stepping stone' actions which boost confidence in exploration and move individuals away from passivity without feeling like they are making a high-stakes decision.

Diagnostics, frameworks and evidencing skills

Many DTPs make use of competency frameworks for initial self-assessment, such as the Vitae Researcher Development Framework (RDF) or a bespoke institutional framework (e.g. University of Warwick or CamRDF) These often feed into an e-portfolio tool or app, many of which are commonly used in HE (Strivens, 2007) to allow recording of both 'activity' and reflection, with intended benefits for both the student and for institutional audit.

However, some at the DTP Director workshop voiced concerns over students at early stages being asked to rate their skills using a Likert scale. Appendix 1 lists some frameworks and tools currently in use. All such tools have their limitations, particularly when encouraging thinking beyond academic careers and whilst e-portfolios may be particularly attractive for documenting and evidencing skills, these methods alone are unlikely to replace the need for peer support and learning conversations.

If a particular skills-based audit tool is presented as the only formal requirement for DNA, this may lead students to believe that it is the only thing of importance. Therefore, DTPs may wish to also encourage reflection on individual motivations and values, at the same point as the initial skills reflection. Additionally, self-rating against a pre-set framework can be disempowering as implies the student has no say in where they want the post-destination to be or what they want to feel proud of having achieved.

The value of encouraging researchers to reflect on what they actually want to gain from their PhD experience can be seen from the experiences of one research student (Schnoes *et al.*, 2018)

> No one had ever told me to sit down and say what are your skills, what are your values, what are your interests and I found that to be incredibly helpful. Where are the overlaps and where are the disconnects? Because I had never really thought to acknowledge that just because I'm good at something doesn't mean I'm interested in it.

A helpful way of supporting students to explore these tools for themselves is adopted by the University of Liverpool Prosper Programme (Box 1) in which they highlight the possible benefits and limitations of a variety of approaches, providing context and advice for their use as one data point within many, inviting researchers to take what they need from each to inform their own choices.

Pros of diagnostic tools: support structured reflection and self-exploration; give students a common language for discussion.

Cons of diagnostic tools: cost (both financial and in student / supervisor time); may be demoralising if not properly supported by a trained professional; not all tools are underpinned by rigorous research or may have been developed for a particular group (e.g. STEM or students with no prior work experience). In general, these only invite self-reflection and may reinforce blind-spots and biases.

Box 1: Use of self-assessment tools to identify motivations, values, strengths and skills in the Prosper Programme

Prosper (funded by Research England to support postdoctoral researchers to transition to non-academic careers) introduce a range of self-assessment tools (including MBTI, skills can, Imagine PhD, strengths finder and career anchors) to postdocs, with pros and cons of each, to support self-exploration. A short video aims to empower researchers to understand the value and limitation of these tools and how they might be used. Participants are encouraged to explore these tools prior to deciding on which career sector to investigate and to discuss results with a career coach or peer.

Introduction of e-portfolio tools at DTP level may risk clashes with home Institutional processes or expectations. One DTP reports successfully making use of such a system whilst avoiding duplication, but this will not be possible for all. One advantage of e-portfolios is that they can be automated to prompt regular reflection or enable students to quickly create a summary of skills development for use in other documentation, whether that's as part of the PhD process or for job applications and CVs. For example, Warwick prompts researchers to draw on evidence collated via the tool Skills Forge to create a short narrative for use in annual progress review.

Where e-portfolio tools are not appropriate, DTPs should consider other ways in which they might prompt this continual reflection and reminder of goals or previous DNA reflection. This was highlighted in the student workshop as lacking in some instances.

It is also noted that e-portfolio tools which focus on recording are unlikely (by themselves) to support researchers to build the confidence that they can 'claim' particular skills and they may struggle to translate their research skills into non-academic contexts. In the following section, we consider some of the ways in which DTPs might facilitate deeper self-reflection and confidence building.

3.4 Support exploration of a broad range of careers and development opportunities

The Supervisory team plays a critical role in a researchers' feelings of identity, identification of their needs and co-creation of a DNA. However, they are far from the only influential voice. In fact, Mantai (2017), indicated that the supervisor was '*largely absent'* from many researcher development conversations:

> All the individuals involved in the PhD process, no matter the context, relation, setting, or degree of involvement, serve as an extensive developmental network to the PhD candidate, which is dynamic, fluid, and always adjusting to the student's needs (Mantai, 2017).

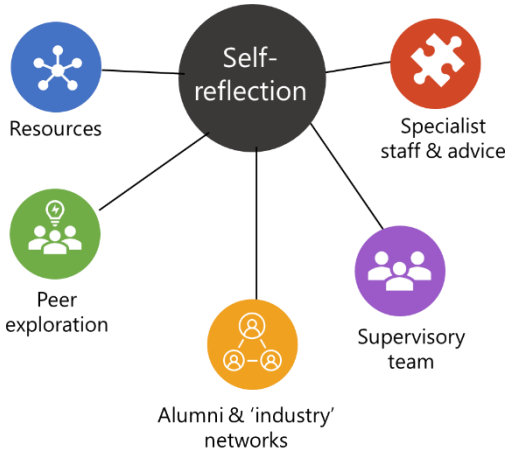


Figure 1 Who or what might be involved in TNA for researchers? And how do we make these roles explicit?

There are many sources of advice and support open to researchers but what might be lacking is **explicit discussion over the potential role and expectations or accountabilities** for each.

- From each of these, the researcher may be seeking…
- Confidence in existing skills
- Opportunities to practice these, recontextualize or develop them
- New skills or knowledge
- Ideas for potential careers
- Insights into other roles or cultures
- Feedback on self or better understanding of self
- Support with reflection

There is likely an additional 'colleagues' or 'workplace' dimension to Table 2 for part time or professional doctorates, those working with non-academic partners or bringing significant professional experience.

It would be useful to draw in their experiences of managing a variety of perspectives and sources of support to share with other researchers.

The **UK Researcher Development Concordat (2019)** sets out the expectation for institutions to *Provide training, structured support, and time for managers to engage in meaningful career development reviews with their researchers*, as well as the institutions for managers, funders and researchers themselves. The concordat could be a useful starting point for conversations around responsibilities.

DTPs may wish to undertake a systematic mapping of the types and nature of potential interactions with different stakeholders for DNA. The BEST programme (Ramadoss *et al.*, 2022) explored researcher motivations to engage with a range of stakeholders and have produced a helpful set of templates to support this mapping process.

In reality, the landscape is vastly more complex than simply the roles and influences presented in Figures 1 and 2. The *Hidden Curriculum in Doctoral Education* (2019) highlights how the various influences might lead to competition and 'marketing' of opportunities. When presented with so many options and potentially conflicting demands or information, students may feel overwhelmed and perhaps simply choose not to engage at all, as reported by a student in a Scottish research pool, who described being invited to multiple inductions but with no idea how to prioritise these, other than that one involved whisky tasting.

Figure 2 Beyond the supervisor, there are many potentially competing sources of advice and opportunity across the University, which may lead to overwhelm or stress due to 'fear of missing out' or picking the wrong one.

Learning approaches to professional and career development from alumni and other stakeholders

DTPs are in a strong position to bring a disciplinary lens and alumni or collaborative partner networks to institutional careers support and may benefit from working in tandem with Institutional Careers Advisers or other specialist researcher development staff.

Business boost training within the Scottish Graduate School for Social Sciences (Ferrie, Jo, 2019) was demonstrated to increase participant confidence, their awareness of their skills and of how their research might contribute to industry.

In particular, the talk from a PhD graduate now in industry proved insightful. Most DTPs and institutions run events where alumni explore how personal factors have influenced career decision-making (McAlpine and Emmioğlu, 2015).
The workshop students felt that there was an assumption made that you want to stay in academia (although at the same time, they are told that there are limited academic jobs). One participant said that they found it difficult to have a conversation about leaving academia as they '*don't want to offend'* with another offering the reflection that '*it's strange because we haven't really had that conversation*' (about non-academic jobs). The students offered positive examples of careers panels and alumni events, with one describing how: '*it was the first time I thought- I don't have to do this!'* and '*They were funding me for a PhD so I didn't think I was allowed to do something else'*.

This approach of bringing researchers into contact with alumni can be expanded into mentoring and longer-term engagements, as adopted by Wellcome Broadening Horizons cross-sector mentoring, the VISTA programme (Box 2) and the UKRI Future Leaders Fellowship mentoring which matches Research Fellows with mentors from a range of sectors. A suggestion was made at the DTP Director workshop that the DTN might produce some short videos asking DTP alumni to reflect on how they have managed their own professional development journeys, perhaps inspiring consideration of opportunities for development which were not previously on students' radar. Examples of where collaborative partnerships might be leveraged to deliver bespoke training were also shared at the Directors workshop and within the student workshop (e.g. relating to policy). However, students noted the cost of industry courses and that the bureaucracy around organisation internships might act as a barrier. One student (part of a collaborative award) felt that it was likely the access to non-academic partners might bring benefits to career and professional development but wasn't as yet able to articulate what these benefits might be.

Box 2: v i s t a (2013-18, University of Sheffield) used blogs and online mentoring to support researchers to broaden their awareness of careers and gain insights into those sectors or roles, as well as build confidence in career decision making.

Blogs, mentoring and other approaches to peer support in DNA

As well as sharing networks and helping each other to build confidence through shared exploration (Clair *et al.*, 2019) students can support each other to build their own process of managing DNA.

For example: a research student in the Scottish Graduate School Arts and Humanities blogged about learning to reframe the TNA process from her initial fears that it was something '*official'* '*procedural'* and with '*unknown consequences'* such as '*getting found out for not being smart enough' to an opportunity for* exploration: *I want to take responsibility for my own learning, and that involves being reflexive about my training needs and using my initiative, ultimately in an effort to become a more effective, stronger, bolder researcher* (Hamilton, Mairi, 2018).

Kuhn, 2016 describes a mentoring circle approach where two more senior postdocs matched with five more junior, with emphasis was on skills development, broadening networks, bringing diverse perspectives and knowledge together and providing safe spaces for reflection on successes and failures. The circle had shared ownership for success of the programme and responsibility to each other and was found to lead to increased confidence in job searching and career development.

Mentees reported (with 60% participation in the survey) that their competency in development of career skills, exploring non-traditional careers, learning how to transition to industry, academic problem resolution, networking, interviewing skills, CV preparation, grant writing, science communication and improvement of work–life balance had improved.

This mentoring circle model might be adapted to celebrate the knowledge of PGRs with significant professional experience, described by Pat Thompson as 'Later on PhD-ers'.

While they are not perhaps the majority of the overall PhD population, later on PhDers have important life and work experiences and funds of knowledge that they might share. They are a ready-made and on-hand resource. Training programmes might call, if not gleefully fall, on them. Graduate schools might pay their later on PhDers (who usually have mortgages and families to support) to co-design resources and programmes that 'teach about' beyond-academia work.

Acting as mentors may encourage researchers returning to the academy to actively reflect on how their skills and knowledge might be recontextualised and shared with other researchers, thus building confidence in their own skills and experience, as well as sharing vital cultural and practice-based insights and networks to researchers without those links. This skills development approach was found successful in an EdD mentoring programme, which also had a strong focus on work life balance. (McConnell, Geesa and Lowery, 2019)

In '*the importance of coffee'* (Boultwood, Taylor and Vaughan, 2015) peer mentors were paid an honorarium as well as being given coffee vouchers for an independent café. The coffee vouchers actually proved to be more important to mentors than the honorarium, prompting the use of an off-campus 'neutral' space for discussions.

One student in the workshop suggested it might also be beneficial to meet their Supervisor in a less formal space for DNA discussions, to change the dynamic. Another student mentioned the 'PhD tea-times' set up by their DTP as a welcoming space for discussions.

Summer schools or themed DTP events might provide opportunity for students to consider how their knowledge and expertise is relevant to different areas (e.g. The Scottish Graduate School of Arts and Humanities Global Scotland event, invited students to think about the international context of their studies).

Some DTPs or Institutions have communities of practice which support reflection or skills development. These are seen in many sectors, such as the Civil Service professional networks (which aim to raise standards; encourage collaboration and provide development opportunities) or 'Hacky Hour' where researchers come together in a social environment to get research support. DTPs should consider how they can cultivate communities of practice to 'think together' about professional development (Pyrko, Dörfler and Eden, 2017), perhaps via funding and mentoring for student-led initiatives, as has already been demonstrated to be successful in many of the DTPs. These communities, or reading groups, might be collaborative (e.g. unpacking fieldwork; #IOUReadingGroup (Idea of the University); #CRMethods) or link to other organisations, such as the emerging researcher hubs via the British Academy.

The role of specialist staff in supporting reflection

Most DTPs direct students to 'neutral' (non-supervisory) staff who might support with DNA. This includes the DTP Directorate or a specialist researcher developer (in some cases listed as part of the supervisory team). DTPS have used inductions or summer schools to bring students into contact with specialist staff, providing supported and 'forced' time to think, where students might otherwise find difficulty setting aside career-planning time (Watts *et al.*, 2019).

Williams *et al* outline a group coaching intervention for under-represented minorities (Williams, Thakore and McGee, 2016) with the aim to *improve PhD students' perceptions of academic careers and to help them achieve such careers by addressing the identity, self-efficacy, and cultural capital that they must develop to navigate research communities of practice.* Regular coaching sessions with an 'expert' appeared to be successful in creating a 'safe space' and helping to make an academic career seem more *achievable*. Interestingly, it was less successful in making academic careers seem more desirable. It would be useful to know if the parallels are true for exploring non-academic careers through such a model. A key aspect of this coaching approach was to provide space to discuss difference, acknowledging that not all researchers have access to the same opportunities for development during the PhD and may face specific barriers, such as lack of networks, time or the social and cultural capital to make use of these. This is likely to be true for many first-generation HE students. (Collier and Morgan, 2008).

DTPs could address this as part of efforts to widen access to the academy, by providing support for under-represented researchers to explore professional development planning with mentors or coaches from outside of their institution, as well as peers. The need for independent mentors and coaches is supported by Ellis in the blog on coffee and cake mentoring circles, where the neutrality of off-campus space is also found to be important (Ellis, Jonathan, 2018). One student in our workshop specifically mentioned a mentor as being beneficial to their DNA thinking.

DTPs should seek opportunities for specialist staff and Supervisors to work in tandem (Sharples, 2015) and where peer mentoring can actively enhance supervision (Godskesen and Kobayashi, 2016).

Box 3: Case study of elite sport: coaching to support transitions

The quest for an academic career might have some parallels with elite athletes being encouraged to think about transitions to new careers, should they choose or be forced to leave sport.

Edwards (2021) outlines a coaching programme which makes use of the Bridges model of transition, highlighting: *the resulting feeling of loss and ending that often comes with this point of transition makes identification of the new beginning harder still (Bridges, 1980).* This description is also apt for researchers and the Bridges model was used in the four day induction programme described earlier (Elliot *et al.*, 2020). Both of these approaches made use of specialist, external advisers. The (Edwards) programme identified that broadening definitions and understanding of identity, in an informal manner and 'breaking taboos', from the point of joining an elite programme, were key to a successful transition. Mind-mapping and questioning helped participants to *tell their story in a more appreciative and useful way.* Once participants gained a broader awareness of themselves outside of their identity as an athlete identity, coaches could work with them on more practical matters such as CVs. The coaches themselves had previous athlete experience '*sport trusts sport'*.

As found in studies for PhD students, this study asserts that asserts that thinking about what comes next can lead to improved current performance rather than hindering it.

3.5 Equip Supervisors to effectively support DNA

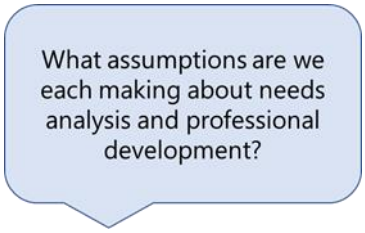
The evidence report from the Review of the PhD in the Social Sciences (2021) highlighted the crucial role of Supervisors in encouraging students to prioritise and make the most of the opportunities available to them during their funded period. However, Supervisors are less likely to have extensive knowledge of non-academic careers (a view expressed by both the workshop students and the literature (Nowell *et al.*, 2020)) and, alongside supervising DTP students, will also have different responsibilities and requirements from their institution. From the DTP assurance statements, the level of supervisory involvement required in forms and processes was variable, with more than one DTP commenting on the challenges of engaging Supervisors.

The ESRC student workshop (run as part of this project in March 2022) asked students to describe a time in which they'd been supported to think about their development needs. A few mentions were made of the supervisory role in this – particularly where the Supervisor had enquired about longer-term goals (which was felt to be quite motivating) or specific student-supervisor 'contracting' discussions. However, limited mention was made of the Supervisor within a wider context of discussion of peer support, forms, processes and other DTP staff.

An additional challenge was raised by one student who noted that you don't know who your Supervisor will be at the outset of your Masters, when you begin your DNA.

Supervisors clearly have a role and both the student and DTP Director workshops felt there should be expectations for a minimum standard of engagement in DNA (for second as well as primary Supervisors). However, they are only one part of the bigger picture of DNA and needs analysis support and DTPs have limited influence or oversight of their day to day practice. However, where DTPs do run or contribute to supervisory development workshops, the following topics may be useful for consideration.

Challenging assumptions in a learning alliance: approaches to DNA support which are adaptable to the needs, motivations and aspirations of both the student and the supervisor



In supporting students to explore broad career goals, Supervisors may be required to explore their own perceptions or biases of academic careers being the desired outcome, for example a sense of pride if former student becomes an academic (Charlwood and McBride, 2020). In a study by Watts students experienced barriers to engaging with non-academic career opportunities due to the assumption that non-academic careers are not valued: '*Many students described the tendency of academic scientists—including some of their PIs—to denigrate non-academic science as "not real science" or "selling out."*' (Watts *et al.*, 2019)

There may also be an implicit expectation on the part of the supervisor or the researcher that career and professional development needs should be left to the end: *Some students waited to do or even discuss an internship until after their research experiments were finished, because they were apprehensive about approaching their PIs to request permission for time away.*

There is some evidence that career development activities being embedded throughout the programme actually increase motivation and focus to complete (Watts *et al.*, 2019), (Lee *et al.*, 2010). Therefore, a key role for Supervisors might be in encouraging this proactive embedding and longer-term planning within the context of other research activities, such as planning around fieldwork or having to wait for access to data or ethical review. Supervisors benefit from discussion with peers on how to manage concerns with undertaking professional development activities alongside need for timely completion.

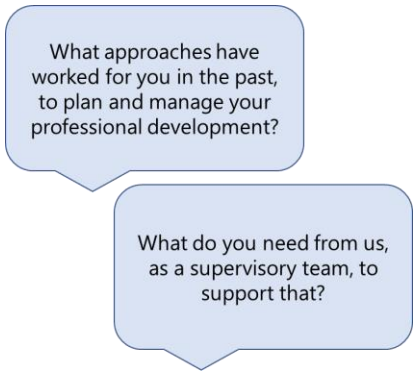


Figure 1 Example coaching style questions for supervisors

An important supervisory role could be to highlight the benefits of gaining perspective on the PhD undertaking professional development, meeting with peers and ultimately come back more motivated. Time on 'neutral territory' can be effective at supporting deep reflection but students may feel they need permission, or may not wish to ask. Supervisors can support student agency and approach with curiosity and questioning.

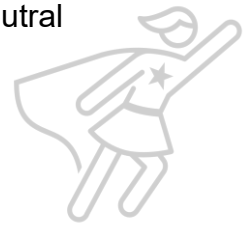


Figure 2 'No-one can be good at everything, and no-one should be expected to be'. As academia seeks to celebrate broader measures of success – including contributions to research impact- this can lead to pressure on PGRs to feel they need to do even more.

Supervisors frequently support researchers to prioritise training needs and can 'tailor' advice to the student (as suggested by a participant in the workshops). One of the dangers of competency frameworks and long lists of 'everything in one place' (a frequent request to researcher developers) is the resulting competing of 'opportunities' and researchers feeling the rising panic of having to do it all (and all at once). Students may feel anxiety over potentially missing something of critical importance and Supervisors can provide an important reminder that this is genuinely a researcher-centred process, without any one clear path. This might include sharing insights as to what is valued in academic career progression and how thinking is evolving in that sphere. (Gadd, Lizzie, 2022). Satisfaction with work life balance is likely to improve if students are able to be intentional on their understanding of what is needed for a specific role and why they are spending time on specific elements of PDP. (Nowell *et al.*, 2021)

Box 4: Topics for inclusion in Supervisory Development to support effective DNA

- Share reading relating to needs analysis, reflection or researcher identity or useful social media accounts to follow
- Share own professional development journeys, learning curves (ups and downs), strategies for managing transitions, confidence gaps and vulnerabilities
- Direct to and encourage engagement with wide range of resources, training, opportunities and people
- Share own networks (industry, alumni)
- Provide feedback to the researcher on their transferable skills as well as research
- Adopt a coaching (curious) style to professional development approaches, whilst also acknowledging the limitations of their role as a coach, due to power dynamics and their 'stake' in the outcome, inviting researchers to seek alternative, independent perspectives
- Support researchers to balance demands of project timescales and professional development within the timescale of completion, alongside deliberate reflection and proactive strategies towards work-life balance
- Identify and help to prioritise or evaluate small opportunities for practice, feedback and growth (in both skills and in confidence).

3.6 DTPs to evaluate the effectiveness of support, tools or other interventions relating to DNA

DTPs already employ a range of methods to gather feedback on support, including student surveys, focus groups, interviews, events, working with student reps, academics or pathway leads. However, it is also important to note that full responsibility for DNA does not lie with DTPs and therefore any evaluation of the process as a whole would be difficult without unpicking exactly where it is that the DTP adds value to the institutional support and processes. Some example indicators have been shared below but with the suggestion that students might set their own objectives for professional development within the context of the DTP and evaluate against those objectives.

Pulse surveys could be used to assess to what extent:

- Students and supervisors have a clear understanding of roles and responsibilities in relation to DNA / professional development processes within the DTP
- Students access to range of sources of support, including alumni, and the knowledge of how to capitalise on these
- Students feel ownership of their own professional development programme

One workshop student outlined how their DTP student forum had taken the lead in developing a more in-depth TNA survey.

3.7 DTPs to make use of aggregated data (alongside other means of consultation) to identify gaps in provision and areas for development

This, alongside the recommendations relating to evaluation, is one of the most challenging areas for DTP to act upon, due to the complexity of institutional requirements and systems and the lack of control over these from DTPs who are trying to limit bureaucracy and duplication.

DTPs are employing a variety of methods to capture and aggregate data (similar to those methods outlined in the section above and often including summaries of DNA forms being shared with committees). There are examples where this is working well, leading to new and novel or experimental types of training being commissioned, including those devised and led by researchers themselves (for example: *Drawing skills for Scholars* or *Reading Legal Texts* introduced at the LISS DTP). There is strong value in such responsive training at DTP level for cohort building, particularly where funding is available for student led activities and where students are paid for their work in leading these efforts. At least one DTP has an electronic system which captures these needs systematically but for others it would not be possible to impose an additional tool or system on top of institutional requirements.

The collection of data on evolving training needs, sharing of practice and learning in this area and responses to these needs are likely to be a useful topic of discussion or collaboration for future DTPs.

4. CONCLUSION

This report has drawn together recommendations from the literature with current DTP practice and perspectives from DTP management and students. There is broad agreement that the ESRC's definition of TNA (as arising from the evidence review) is appropriate for future DTPs, but that there are inconsistencies across the DTPs in how this is currently experienced, particularly in terms of it being a continuous process, encouraging reflection and the role of the Supervisor.

The recommendations in this report aim to act as guiding principles in support of the ESRC's vision, whilst allowing each DTP to flex according to the needs of its partners and acknowledge the existing structures and complexities. This work will be supported by the concurrent project on Supervisor development, to acknowledge the crucial role of Supervisors in DNA, but also the limitations as to what they might be reasonably expected to address and the other important actors (including non-academic partners or alumni) who can also contribute to student development.

This review sought to identify 'quick wins' and good practice for implementation across newly commissioned DTPs as well as fundamental areas for longer-term development. These have been outlined below, alongside a set of guiding principles to be embedded within future Doctoral Training.

Quick wins

- There is a clear evidence base to move away from TNA terminology to instead using 'Development Needs Analysis' (DNA) in recognition of the broad range of development opportunities open to students, and to help facilitate student engagement and ownership of the process.
- DTPs should consider how they might embed each of the guiding principles below within the structures of their DTPs.

Proposed principles for Development Needs Analysis in future DTPs

The ESRC's ambition is for the Development Needs Analysis (DNA) to be a continuous process that is student-centred, promotes engagement with, and reflection on, a range of research and professional development opportunities and enables the student to be aware of their own skill sets.

To ensure a robust and meaningful process in support of this ambition, it is recommended that DTPs will:

1. Move from the use of TNA to DNA terminology.
   Conceptualise development broadly, as stretching beyond training courses and workshops to include a range of other developmental and experiential opportunities.

2. Ensure that DNA is promoted as a core and regular component of the Doctoral journey.
   In particular, the application and induction periods should be used to communicate the broad aims of DNA within the wider PhD experience and ensure that students feel ownership of a bespoke process that is aligned to their needs and aspirations.

3. Foreground the importance of student self-reflection and support this through a range of tools and approaches.
   Reflection should be encouraged and supported as a critical part of DNA, throughout the entirety of the Doctoral journey.

4. Equip Supervisors to effectively support the DNA process.
   Set clear expectations for Supervisory input to DNA and provide training to support Supervisors in navigating DNA conversations, enabling a robust and equitable approach to be embedded across the board.

5. Support exploration of a broad range of careers and development opportunities.
   This includes maximising input from internal and external stakeholders, as well as partnerships for experiential learning. Specific consideration should be made of diversity and where particular groups might experience difficulty in accessing opportunities.

6. Evaluate the effectiveness of support, tools or other interventions relating to DNA.
   Gather evidence on the effectiveness of interventions and work in partnership with the students and supervisors to flex and adapt their approach where required.

7. Make use of aggregated data (alongside other means of consultation) to identify gaps in provision and areas for development.

8. Be creative in identifying and responding to emerging needs.

Longer term development

DTPs may wish to consider:

- Piloting and evaluating the use of specific tools to aid reflection on needs, such as those suggested in Appendix 2. In particular, encouraging use of a narrative CV template to support reflection and evidence of broader development may prove useful should researchers later be asked to complete one of these for a Fellowship
- Specific focus on diversity and inclusion issues in DNA, co-creating with specific groups of students to uncover where 'difference' may lead to disadvantage in seeking out and maximising development opportunities.
- Introducing developmental peer support with Supervisors which includes specific exploration of DNA.

It is hoped that the guiding principles and good practice examples within this report might be adopted for either piloting or immediate application in future DTPs, with a view to future evaluation of how they support a bespoke, student-centred model of DNA, which reflects the broad experiences, needs and career aspirations of our students, and encourages development which extends beyond training courses and workshops.

APPENDIX 1: FRAMEWORKS, PLATFORMS AND DIAGNOSTIC TOOLS

There are many diagnostic tools, e-portfolio and apps in existence across Higher Education and the current ESRC DTP. Although all such tools have their limitations, however, if used carefully and presented as one data source amongst a range of others, they may prove valuable in helping students to reflect on their skills, record activity, collect evidence of skills development, articulate their skills and identify gaps. They may also be helpful for institutional or DTP auditing and gap identification.

FRAMEWORKS

- Vitae Researcher Development Framework (RDF)
- CamRDF | Researcher Development (and related skills analysis survey)
- Australian National University research skills matrix (the Thesis Whisperer)
- Professional learning and development framework for postdoctoral scholars (Nowell *et al.*, 2021)
- PhD Competence Model - Graduate School of Life Sciences - Utrecht University (uu.nl)
  See also example of broader reflection on personal development being captured in the Thesis, noting that this is optional and not-assessed but designed to give examination board a fuller picture of you as an academic: Examples PhD portfolio thesis_20210721.docx (uu.nl)
- Warwick framework (draws on Vitae RDF with helpful FAQs on how to make use of the tools)
- Your training and development (brunel.ac.uk) 3D tool (do, disseminate, develop) skills audit based on academic skills needs
- Training Needs Analysis:– Inkpath Although not itself a framework, institutional or DTP frameworks can be fed into this online platform

OTHER E-PORTFOLIO OR SELF-ASSESSMENT TOOLS

- My IDP (sciencecareers.org)
- Skills Tests, Career Aptitude, Career Counseling, Development Tools | SkillScan
- Psychometric tools such as strengths finder, MBTI etc. Some institutions may offer access to these and there is normally a cost per individual.

APPENDIX 2: SUGGESTED TOOLS AND EXAMPLE APPROACHES TO SUPPORT REFLECTION

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