

Entry

# Supporting the Professional and Career Development of Doctoral Students

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**Definition:** A doctoral student is someone studying for a doctoral degree, which is generally considered to be the highest academic qualification a university can award. The student develops research experience, while making an in-depth and original contribution to knowledge. They are supervised by university staff members (usually there are two, or a small panel) who train, mentor, and support the doctoral student. Professional and career development refers to support that helps students to not only grow as individuals and independent researchers, but to also have the option to successfully pursue either academic or non-academic roles after graduation. While this entry considers some international contexts, it is particularly oriented to the United Kingdom (UK) model, and to the most common doctoral degree, the Doctor of Philosophy (PhD).

**Keywords:** doctoral student; supervision; professional development; employability; career; networking; publishing; internships; industry collaborations; teaching

## 1. Introduction

Historically, doctoral degrees were undertaken by students wishing to develop a career in academia, following the so-called apprenticeship model [1]. They still often remain a requirement for those who wish to rise up the university promotions ladder. However, since the 2000s, there has been a change in the way doctorates are perceived. Countries globally, realising the importance of research innovation to their development goals, began promoting doctorates through education, research, or labour market policies [2]. A few countries, such as Germany, Saudi Arabia, and Brazil, offered no-fee or reduced-fee doctorates regardless of nationality [3]. Diverse new fellowships, living cost stipends, and other funding opportunities were created in most countries, and this is the main model followed in the United Kingdom (UK). For some, this model has provided both a possible route into academia, and a way of deferring career decisions whilst having a small income. Many fellowships became institutionalized and, together with the rest of academia, commodified (that is, dominated by economic criteria [4]). Doctorates began to be seen as a pathway to greater earnings outside as well as inside academia, a way of entering the job market at a senior level. This caused a rise in their popularity globally, for example they trebled between 2004 and 2019 in China and almost doubled over this period in the UK [5]. Demand far exceeded the fellowship offerings and increasingly students self-financed.

The subsequent glut in doctorates and simultaneous changes in academia mean doctoral employment advantages are no longer guaranteed. Changes in university governance and funding, rising higher education costs, an expanding emphasis on liaison with industry or government, the increasing ‘internationalisation’ of universities [6], technological advances, the COVID-19 pandemic, and remote conferencing have forced changes in the academic skillset. Formal doctoral training and development programmes evolved to reflect some of these changes [7]. New degree formats such as the ‘professional’, also known as the ‘practice-based’ or ‘practice-led’, doctorate led to the development of taught modules for doctoral students who needed to engage with research methods while concurrently employed in professional occupations.



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Whilst doctorates remain a popular route to hoped-for career advancement [8], Human Capital Theory predicts this will only be sustained if the expected benefits exceed the expected costs [9]. According to this theory, doctoral students typically go through a process of weighing up expected benefits, such as a sense of achievement and higher future earnings, against the expected direct costs of living, education, and the income they have potentially foregone while they undertake the degree. Hand in hand with these considerations, there has been a change in doctoral students' expectations of the training and development they should receive. This needs to encapsulate continuing changes within academia and also consistently give students a competitive edge for careers outside academia. Supervisors, meanwhile, in the commodified academy, are most invested in ensuring the student obtains their doctorate, and their support is shaped by the expectations of university benchmarking and challenging workloads, as encapsulated in the Theory of Job Demands and Available Job Resources [10]. This has the potential to create tension between what the student expects and requires and what the supervisor provides. However, with careful thought, the needs of both can be suitably met. This entry explores the different possibilities.

## 2. Background on Professional and Career Development Concepts and Principles

### 2.1. Conceptualisations of Professional Development and Career Development

There is no standard definition or understanding of professional and career development for doctoral students. At its most basic, it should advance academic skills (that is, specific learned abilities) and competencies (the knowledge, attitudes, and personal traits that enable effective skill usage) for degree completion. The supervisor's task in this model is to develop research, technical, and cognitive skills [11] to progress the student through the so-called 'threshold concepts'. This entails moving from a functional project management approach to enculturation within an academic community of practice and the honing of critical thinking, and finally to emancipation as an independent researcher [12]. In line with this approach, in making the required original contribution to knowledge, doctoral students are expected to become academic and research experts in their chosen topic and its related field (discipline) of study. This tight academic focus may lead to what Evans in the UK [13] has called disciplinary acculturation, with a reduced capacity to function outside the discipline. This situation prevails worldwide. Ganapati and Ritchie [14], for example, surveyed Science, Technology, Engineering and Mathematics (STEM) doctoral students in Canada and found most of their 188 respondents had been trained to be highly skilled researchers but had little awareness about other career options, lacked professional networks outside academia, and were poorly supported in the transition to life after the doctorate.

This is problematic; many doctoral students obtain employment outside of academia after graduation and some surveys suggest the proportion is increasing [15]. Private sector employers internationally tend to value technical competencies and 'soft skills' such as teamwork more than research skills and knowledge [16,17]. The relevance of research-oriented training to life after the doctorate has therefore been questioned, leading to an increased focus on employability, that is, the development of transferable professional skills and competencies [17–19]. Examples are the ability to write a summary report, teamwork, engaging and communicating with a variety of audiences, managing people and budgets, and self-promotion. These are useful across different professional settings, as well as within academia. Translational skills may also be important to some disciplines and doctoral formats, namely the application of academic research within society or professional practice.

Taking this holistic employability approach, the European Alliance on Research Career Development (EARCD), defined doctoral student professional development as:

*A: structured approach to the continuous development of researchers' knowledge, expertise and attributes at all stages of their career to improve their competencies, employability and ability to pursue multiple careers paths. . . achieved by a variety of activities, whether formal and structured, or informal and self-directed. [20], (p. 10)*

Within this approach, development activities may, some of the time, be more focused on research skills and competencies and, at other times, may lean more to work outside of academia. Nonetheless, there is substantial overlap between academic and broader employability needs. Therefore, while the supervisor may consider the student's priority is to meet the requirements of their doctoral programme and obtain their doctorate [17], this should not be viewed as incompatible with transferable skills and competencies development. Activities designed to cut across these different needs may arguably be especially important for students discriminated against in employment based on such characteristics as race or disability [21–23].

## 2.2. Researcher Development Guidance and Frameworks

Relevant researcher attribute frameworks and associated structured doctoral programmes and training networks have been developed within universities and in some cases nationally, regionally, or internationally, such as in the UK [24], Australia [25], and Europe [26]. UK guidance and policy is complex, with different documents at the national, institutional, doctoral, and individual researcher levels. Nationally, the 'Quality Code for Higher Education: Advice and Guidance: Research Degrees' [24] produced by the UK regulator, the Quality Assurance Agency for Higher Education (QAA), explains what higher education providers must do, what they can expect of each other, and what the public can expect of them. It includes a specific section on doctoral student professional and career development. The specialist organisation Vitae has used the separate, but related, QAA Doctoral Degree Characteristics framework to develop the institutional level UK Researcher Development Concordat [27]. This is a set of principles that institutions and funders should follow to create a supportive culture and infrastructure for the career development, progression, and wellbeing of all researchers, including doctoral students. Vitae provides guidance, resources, and tools to support institutions and researchers to use the 'Concordat', including the Research Development Framework (RDF), which they developed in 2009, following a government directive, and updated in 2019 [27]. The RDF is a practical tool to help researchers develop a wide range of skills, knowledge, and transferable attributes, principally relating to research, personal effectiveness, governance, and engagement [27]. It is divided into four broad attribute domains, as follows, each with three sub-domains and associated descriptors, and accompanying support materials:

1. Knowledge, intellectual abilities, and techniques necessary for research and academia;
2. Personal attributes, self-management skills, and approaches to be an effective professional;
3. Knowledge of the professional standards and requirements for research;
4. Knowledge and skills needed to work with others to maximize research impact.

The RDF is also structured by levels of proficiency, ranging from doctoral students to Principal Investigators. This provides a clear framework for doctoral students to assess, plan and set development goals. The RDF encourages self-reflection, flexibility, and adaptability in skill development [27]. It has been adopted internationally, though scholars such as Chen et al. [28] in Australia argue that it requires adaptation to align with different cultural contexts and national and institutional goals.

Students around the world are encouraged to follow guidance such as this, and surveyed to explore whether they are developing employability skills in areas such as communication, teaching, leadership and management, personal development, and career development. National monitoring examples include, in the UK, the Postgraduate Research Experience Survey (PRES) [29], and in the US, the Student Experience in the Research University (SERU) Consortium survey [30], developed by a community of research-intensive universities. These have the limitations inherent in surveys such as a specific focus and outcomes that may not be suitable for all [31].

### *2.3. Lack of Coherence in Characterisations of Employability and Best Practice, and the Development of Specific Employability Frameworks*

Despite recognition of the need to transform doctoral student training, a lack of consensus on employability needs has led to different emphases within frameworks and surveys. Some prioritise the capabilities, skills, and attitudes of the individual students as absolutes (that is, constants irrespective of the specific career path pursued) [27]. They may cross disciplines and higher education institutions and they may include practical experience within the university [32] but development tends to be centred on academic settings despite aiming for some transferability. In the UK, for example, the Qualifications and Curriculum Authority (QCA) framework has clearly specified that employability requires skills in information technology (IT), numeracy, communication, problem-solving, team working, and an ability to improve one's own learning and performance.

The impact on employability is then measured by surveying graduate employment rates nationally; the OECD's Careers of Doctorate Holders (CDH) project has aimed to produce internationally comparable data [33]. However, such surveys continue to be methodologically fraught [34]. In 2012, for example, the European Council benchmarked employability, stating that by 2020 at least 82% of graduates (20–34-year-olds) should be employed three years after having completed education or training [35]. This benchmark was reached in 2022 [36]. However, what 'employment' means is highly variable, and this benchmark does not incorporate earnings, or upwards mobility [37]. Moreover, the COVID-19 pandemic provides a dramatic illustration of Kalfa and Taksa's 2015 [38] critique that such statistics may be varied by external social, institutional, economic, and political factors as much as by higher education development plans.

External factors have been considered within European Policy alongside individual factors in stipulating, and later acknowledging the failure of, another European benchmark, that by 2020 at least 20% of those graduating in the European Higher Education Area should have had a study or training period abroad [39]. Several employability frameworks and programmes have been developed that consider these broader external factors [40] and the effects on relative employability. Some include the impact of discrimination within the labour market [41] such as by ethnicity [22,23], and the interplay or duality between the relative (adapted according to the student's career path) and the absolute. Small, Shacklock, and Marchant [42] (p. 4) consider this employability duality as: "capacity to be self-reliant in navigating the labour market, utilising knowledge, individual skills, and attributes, and adapting them to the employment context, showcasing them to employers, while taking into account external and other constraints". This entry leans to duality considerations.

### *2.4. Summary of This Section*

Overall, despite their different emphases, the various development frameworks encourage the engagement of doctoral students in a range of activities related to their subject disciplines or to the wider institutional, research, or labour market environment in ways that enhance both their doctoral research and their employability. Nonetheless, the manner by which the different frameworks have supported doctoral students to develop professionally and in terms of employability have scarcely been explored in the literature. The different understandings and emphases have both problematised research in this area and made it a necessity, yet the focus has been on what is missing from student development plans (e.g., [14,43]) and the effects on their social and emotional support [44] rather than on examples of best practice. The next section explores the current understanding of the different influences on student development support.

## **3. Key Influences Enhancing Doctoral Student Professional and Career Development**

### *3.1. The Supervisor–Student Partnership*

Regardless of which framework or doctoral programme students and their supervisors are expected to adhere to, the professional and career development of the doctoral student will be heavily influenced by their relationship with and the attributes and experi-

ence of their supervisors, as well as the supervisor's relative Job Demands–Job Resources capacity. Therefore, the first stage in the development process arguably begins at the student–supervisor selection stage. Hockey [45] argues that the main selection criterion is usually whether the candidate has the capacity to generate or develop original and autonomous thought. Usually this is determined via their academic references, formal qualifications, and the reputation of their previous institutions, but when deciding whether to supervise students from decentred (marginalised) groups, this becomes problematic. Structural inequities may make their qualifications and even references a poor reflection of their capacities. Solutions proposed in the literature include asking the student to critique their proposal without notes, and ensuring they fully understand the demands of the work [4,46] and can meet these with an appropriate development plan. This requires what Hockey [45] calls 'having a nose for it' (p. 52). Internationalising doctoral research can lead to tensions [8]. For example, candidates may suggest perspectives, theories, or development plans that are at odds with the culture of the proposed host university. On the other hand, international students often show creativity and particular dedication to the tasks of their doctoral studies and their professional and career development [47]. Farrar and Young observed that the promotion of inclusivity and diversity, while important, should be realistically deliberated [48]. Supervisors who are overworked and also unfamiliar with disability, for example, may not be best placed to support disabled students effectively through the course of the degree. This is one area where the Theory of Job Demands and Job Resources [10] can be fruitfully applied, as an imbalance can lead not only to poor supervision and even abuse [10], but also stress and burnout for both supervisor and student. However, the usual arrangement of two or three supervisors or a panel of supervisors means that a supervisor with the relevant expertise may be appropriately included. Authors such as Farrar and Young [48] have also provided useful recommendations and guidance.

### *3.2. Developing and Using Professional and Career Development Plans*

Some scholars have used Basic Needs Theory to argue that a triad of student competencies, relatedness, and autonomy needs must be satisfied for successful doctoral supervision [49,50]. All three are connected, dependent on the supervisory relationship, and they map onto the domains of the RDF and should, it is argued [50], be advanced by good professional and career skills and competencies development. Therefore, some scholars have produced questionnaires for the formal assessment of the competency needs and expectations of the individual student as they begin their doctoral journey. Examples are provided by Van der Linden et al. [51], the University of Adelaide [52], and Mainhard et al. [53]. Though similar to Vitae reflective exercises, both the supervisors and the student complete these questionnaires simultaneously. The results can be used to work out a student development plan that takes account of the supervisor's approach, the student's learning style [54], and any mismatches between these. Here the Job Demands–Job Resources model is helpful in encouraging consideration of realistic plans for both student and supervisor, especially when the student is part-time. A UK survey in 2020 showed that part-time students are less likely to spend time developing transferable skills, receiving advice on career options, or taking part in a placement or internship (19%, 14% and 8% fewer than for full time students, respectively) [55]. Some scholars have raised the concern that particular groups of students, such as international or minoritised students, may be squeezed into stereotypical typologies of learning style; the assessment questionnaires enable the supervisor to explore styles with each student as an individual [56,57].

Many students need a structured approach to their development [50,58], at least in the first year of the degree, the so-called project management stage [11]. This is often partly provided by the taught element found in many doctoral programmes, which has evolved to improve the quality of degrees as a response to the QAA and other frameworks. University regulations often specify some taught courses as compulsory early in the student journey, with others recommended for later in the doctorate. Evidence of at least a minimum level of training is needed to complete the degree; in the UK, for example, this is at least

10 days each year, with training spread across the degree period. It has been shown that training assessments and plans need periodic follow up as the student progresses, to adjust to changes in the student's development needs and competency gaps and their perceptions of these [59,60], external factors, and supervision relationships [61]. Alongside such assessments, Hiemstra [62] recommends that students keep a diary or journal, so they can monitor their own progress and development whenever they choose. The advantages and disadvantages of this have been reviewed by O'Connell and Dymont [63].

### 3.3. *Developing Researcher Skills and Competencies*

#### 3.3.1. Publishing Decisions

Publishing support is the best covered of all doctoral student development needs in the literature. The publishing process undoubtedly forms an important part of doctoral professional development. Academics are under continual pressure to publish their research—the oft-stated 'publish or perish' dilemma—and doctoral student publications in peer-reviewed journals form an indicator of scholarship and competencies [64]. This can not only raise the student's profile, it can also act as affirmation of their progress to their thesis examiners, while in a few countries, such as the Netherlands, students normally need to have published at least part of their thesis before the doctorate can be awarded [65]. In recent years, the expectations of doctoral student publishing have become so entrenched [66,67] that on degree completion, those seeking academic employment may be unsuccessful if they do not have several peer-reviewed publications.

Some doctoral supervisors therefore place considerable emphasis on the importance of students publishing in academic journals during the doctoral programme [68,69]. In some cases, this may also be self-serving; supervisors may push for co-authorship because of their own academic career considerations, in a manifestation of power and performativity critiqued by Macfarlane [70]. Some supervisors may do little to earn authorship, as the 'invisible second author' [71], whereas others may impose too much control at a time when the student is developing autonomy. Predatory journals are an increasing problem; they might seem both complimentary and attractive to a student approached by one and under pressure to publish [72]. Awareness of these issues is part of the student's development process, preparing them for academia.

Notwithstanding that authorships and author orderings are often difficult to navigate in academic collaborations, supervisor co-authorship has several benefits. Overall, it should be viewed as good pedagogic practice when the student is fully mentored through the publication process [73], and it extends the reach of the final paper, through the supervisor's broader networks. Two international surveys by Dinham and Scott [43] suggest a relationship between publishing support and increased productivity for the doctoral student, when the support is individualised according to student needs. For example, some students need fine-grained scaffolding, such as explanations of an argument's structure, whereas others improve by dissecting and analysing completed dissertations or journal articles. Doctoral writing has been described as both communicative and epistemic [74], meaning that the supervisor needs to engage in both collaborative discussion and less dialogic text editing of students' work [75]. Collaborative discussion and consecutive text editing by supervisors may, it has been argued, be particularly helpful if supervisors give opposing feedback [76]. Writing support may be provided as part of institutional publication policies [75].

Despite its importance, some supervisors discourage their students from publishing until after they complete their doctorate so as not to distract them from the main purpose. According to Evans [13], this can reduce the student's self-esteem and make them feel inadequate. A useful strategy to avoid this issue of competing demands is 'doubling-up', for example submitting a thesis-relevant literature review to a journal in the first year and getting peer-review feedback that can then be used to improve the final doctoral thesis. When the supervisor works through reviewer feedback with the student, this can help them to develop a positive approach to constructive feedback, rather than feeling wounded

by it, and also to defend criticism that is unwarranted [76]. These are invaluable skills for the viva voce and employability.

Writing retreats and peer writing groups, which often incorporate guest instruction by writing specialists, may increase academic outputs [77] and broader writing, communication, autonomy and connectedness skills, competencies, and needs. Else [78] reports an interesting example of doctoral students going so far as to set up their own journal as a result. Writing groups require the student to externalise and discuss the concepts of the thesis or parts of it, often including the use of graphic representations of its structure [77]. In terms of 'doubling-up', Lee and Kamler [67] suggest this can help the student to re-imagine the purpose of their work and obtain a critical distance that facilitates strategic decision-making around the core arguments and focus of their thesis.

### 3.3.2. Other Outputs and Ways of Disseminating

Academic competitions such as the 3 min thesis, science cafes, and other public engagement events, and student conference presentations and posters, may be designed 'with a purpose' [79] in the same way as publications, with the same benefits. Thus, they help students to develop critical thinking and communication skills and competencies through externalisation to different audiences, and they provide students with feedback as they develop, help them test emergent ideas, and raise their profiles. Conference attendance has also been described as a good way to develop connectedness and autonomy, acquire self-promotion/self-presentation skills, and identify potential examiners [80]. Using doubling-up strategies, these different ways of disseminating may be seen as an integral part of student professional and career development, rather than an additional burden or distraction. The increase in remote and hybrid conferences can further facilitate this.

### 3.3.3. Teaching as a Formal Part of Development Plans

Teaching is a core component of academic practice and yet the opportunities for doctoral students to incorporate this into their development plans are variable and depend largely on the host institution and even department. For example, according to national student surveys, in 2019 (with similar figures in previous years), just under half (48%) in the UK had taught or demonstrated during their degree, a third of whom had not received formal training [81]. Similarly, 16% of Australian doctoral students with academic career intentions reported teaching development in 2011 [82]. Knowledge may be considered to comprise three forms, explicit or factual knowledge which is easily articulated, implicit knowledge, which is the practical application of explicit knowledge, and tacit knowledge, which is accrued experientially, hard to articulate, and often developed subconsciously [83]. Without practicing teaching by shadowing and doing, doctoral students may not be able to tap into experienced teachers' implicit or tacit knowledge [84]. Most recently, there has been a trend for doctoral students to be paid to run seminars for undergraduate and Masters' students as post-graduate teaching assistants, to support overloaded academic staff [85]. Increasing numbers of undergraduate and post-graduate taught (Masters) students, combined with reductions in government funding of universities, and relaxed labour laws have enabled the casualisation of teaching that promotes this trend [86]. Doctoral students in these roles experience various wellbeing issues, which are considered to require, as a minimum, regular debriefing and feedback sessions for informal training, and ideally formal training by the institution [87]. As with peer writing groups, teaching has a doubling-up effect; students extend their professional knowledge and critical thinking, as well as developing transferable skills in autonomy, communication, teamworking, and managing groups. Doctoral student supervision skills, however, are developed simply from the experience students have with their own supervisors [88], so the reach of good supervision, scaffolded by appropriate needs assessments and development plans, extends beyond the original student. Some doctoral students may have the capacity and institutional support to train for Associate Fellowship with Advance HE (a global higher education improvement

charity based in the UK), or equivalent organisations. This includes reflection on small teaching exercises and is useful if the student plans an academic career.

### 3.4. *Vertical and Horizontal Development in and Outside the Academy*

#### 3.4.1. The Value of Both Academic and Non-Academic Networking

The different components of professional and career development so far considered have all touched on academic networks to some degree. Both non-academic and academic networks are important for developing competencies and connectedness and to draw on in future careers both inside and outside academia. Networking involves the exchange of emotional support, influence and power, knowledge, and perhaps more rarely, goods and services [89]. Networks may be local, national, and international and involve other students, supervisors, mentors, professional associations, and others. Nerad [32,90] talks about a “global village” but emphasises within-institution and international networks, whereas national networks, for example across universities, and with organisations outside academia, may also be important. Nerad [32] describes these particularly in relation to national networking training programmes in various countries.

Networks may be developed from formal and informal activities within an institution or the group components of a doctoral programme, interaction with other students and academics within and outside of the host institution, research collaborations and internships, memberships of different organisations, journal board membership, social media connections, conferences, and even trade fair attendance. Frick et al. [91] argue that for informal networking, “the rules of the (networking) game are unwritten and difficult to decipher for the newcomer” [91] (p. 216); the doctoral student is often not supported to learn them except through trial and much error.

For connectedness within the host institution, Lahenius [92] recommends supervisors develop a strong group of doctoral students undertaking related work. Carter and Kumar [93] suggest supporting students to develop a feedback community of practice. A small study in a UK management school suggested that students may be especially likely to use informal peer networks to discuss intellectual challenges [85]. This not only helps academic development but also socialisation to reduce the loneliness of the doctoral degree process. Building up social capital in this way helps students to cope with the ups and downs of the degree [94]. Peer support networks are perhaps especially important for those from marginalised groups [94], connecting them with others so they do not remain relegated to the margins. These networks may help reduce ‘imposter syndrome’ [95]. Face-to-face communication may be the most effective [96] and many universities encourage this by holding, or facilitating students to organise, regular doctoral seminars and internal doctoral conferences. This integrates the students as members of their professional community of practice [97], which is linked to higher completion rates [98]. The development of hybrid in-person and online meetings during the COVID-19 pandemic has expanded this type of network internationally.

#### 3.4.2. Small Projects and Internships

A 2012 report commissioned by the UK Government recommended that “all full-time PhD students should have an opportunity to experience at least one 8–12 week internship during their period of study in the UK, and be encouraged to attend a short intensive enterprise skills programme alongside research students from other departments of the University” [99] (p. 8). It should be noted that, being a recommendation, this is dependent on the supervisor and university. At the same time, the Biotechnology and Biosciences Research Council (BBSRC), a UK Government-funded research agency, made it compulsory for all PhD students funded through its Doctoral Training Centres to undertake a three-month internship unrelated to their doctoral research. The rationale was to support students to appreciate the broader value of their research both within and outside of academia and the employability skills they were developing, as well as to widen their career horizons. This is an example of horizontal development or “boundary crossing” [100]. A similar example

is the University of California San Francisco (UCSF)'s Graduate Student Internships for Career Exploration programme. Doctoral internships are routine in some countries, with Germany being a prime example [101,102], and with international internships promoted by the European Union [103]. Parilla and Hesser [104] note the importance of reflexivity to get the most out of an internship and recommend that the student links their work experience to the concepts they have learned during the doctorate. This follows the ethos underpinning the BBSRC internships. Other internships may more directly relate to the doctoral discipline, to focus and specialise the student, as a form of vertical development or progression up the competency hierarchy [105]. Professional doctorates, such as those in education and medical fields, are undertaken whilst in employment, hence they involve advancement of the student's professional practice by default [106]. This needs to be accounted for in their development plans but overall does not obviate the need for similar considerations to other doctoral students in terms of professional and career development.

In addition to taking up formal internships and placements, either arranged by the supervisor or formally advertised, doctoral students may increase competencies by joining other teams on small projects. This might be for pay, experience or it may be a reciprocal arrangement made with another doctoral student needing some practical help. Such experiences are invaluable in helping students develop networks, connectedness and experience within team environments that augment the lone doctoral researcher experience [44]. Students may get motivated by the quick returns from small projects. This can help them to recognise how far they have developed and how they are able to work on a project to its conclusion; the doctoral degree's long journey can lead to moments of despair in which students may doubt this [107]. They may also be co-authors on a publication from the project, adding to their profiles and sense of achievement and scholarship.

As with other activities described in this entry, some supervisors and students may be concerned that internships, and work on someone else's project, may distract from the doctorate. Concerns have also been raised that small project work may impede the student's careful professional development when analyses and publications are churned out at speed without the in-depth deliberation of the apprenticeship process [108]. The counter view is that this work introduces the student to the reality of life after the doctorate and it provides networks that may prove helpful throughout their degree and after. It may occasionally also help them develop the skills needed to write funding proposals, which are generally not developed within the main supervisory work or doctoral programme [91].

### 3.4.3. Relationships with Industry

Internships may be taken up within academia, government, third sector organisations or commercial organisations. Academic research funders and university management are increasingly encouraging relationships with industry, from small and medium enterprises (SMEs) to global giants. According to Ankrah and Al-Tabbaa [109], student collaborations with industry take six main forms. There are two types of personal relationships. The doctoral student or supervisor may have an individual informal link with an organisation with casual collaboration, or a formal link whereby, for example, the student interns with an industrial partner or their degree is funded or part-funded by them through a scholarship. Examples of such scholarships, which are especially common for the STEM subjects, are Co-operative Awards in Science and Engineering (CASE) in the UK [110] and the Industrial PhD-programs in Norway and Denmark [111,112]. There are also two types of formal agreements that are not specifically focused on an individual [109]. These are targeted collaborations (such as specific joint research ventures that a student may join) or non-targeted agreements, for example conferences or other events organised or sponsored jointly by universities and industry. Another type of collaboration is that formed through an intermediate third party such as a university policy unit. Last but not least are collaborations that involve the industry membership of a student's research advisory group or the converse, namely the student advising industry, or else, joint consortia membership or collaborative use of physical research structures such as labs (hence this

type of collaboration was named focused structures by Ankrah and Al-Tabbaa). The industry aims of these collaborations are to enhance industrial research, give university researchers a better understanding of industrial needs and perspectives, and encourage doctoral students wishing to work as researchers to think beyond a traditional university career. For students and supervisors an additional advantage may be to increase their profile and the impact of their research, but the main benefit for which there is some evidence is the student's increased attractiveness to potential employers [113,114].

#### 4. Conclusions and Prospects

Undertaking original research is the first priority of a doctoral degree. However, a doctoral degree is nowadays considered to be more than an apprenticeship in academic knowledge production. The development of employability skills and competencies that are transferable outside of academia is also considered important. Thus, doctoral students are increasingly encouraged, often through formal programmes and frameworks, to engage in various activities that support their personal, professional and career development in different ways. This might include the extension of subject or technical knowledge through supplementary taught courses, training or seminars, dissemination and dialogue at seminars, conferences and through peer-reviewed publications, networking and knowledge exchange or entrepreneurship activity inside and outside of academia, paid or unpaid employment such as teaching or lecturing, professional work experience, internships, industry collaborations, academic citizenship activities such as reviewing for a journal, organising events, and advocating for or supporting other students. The importance of tapping into tacit and implicit as well as explicit knowledge through horizontal (boundary crossing) and vertical networking, and through practical experience, is increasingly recognized. Doctoral programme formats, and hence doctoral student development plans, remain varied, however. Examples are based on academic professional developmental frameworks, employability competency-based frameworks, practical experience planning through small projects and internships, interdisciplinary or non-academic partnerships and networking, or even a more reactive approach dependent on the results of student surveys.

A lack of consensus regarding doctoral student training may reflect the diversity in doctoral formats and disciplines, but it can lead to fragmentation and inconsistency, as well as not aligning with student expectations. A relative, student-centric, approach recognizes the uniqueness of each researcher and the varied paths they may take in their careers, fostering attributes that are important for employability. However, it makes it challenging to establish common standards and benchmarks and to assess the effectiveness of training initiatives across diverse fields. It may also be slow to adapt to external factors. The most successful frameworks are so-called dual (career pathway-student oriented) approaches that evolve with the changing landscape of employment both nationally and internationally. Regular reviews and updates, informed by ongoing collaboration with stakeholders, including the students themselves, can ensure that frameworks remain relevant and responsive to emerging needs.

Doctoral degrees are inherently demanding, with high workloads, time pressures, and the stress associated with research and academic responsibilities. The need for career development and progression adds an additional layer of demands, including the pressure to publish, compete for grants, and navigate an increasingly competitive job market. According to Human Capital Theory and Basic Needs Theory, career development needs and expectations should be satisfied for doctoral students to stay the course. The Job Demands and Resources model adds nuance in showing the importance of providing, for both supervisor and student, resources for supportive institutional cultures, supportive supervision, access to facilities outside academia, and networking opportunities to avoid stress, burnout, and reduced well-being from the demands of development work [13]. Nonetheless, time is one of the least available resources in academia [115]. When faced with competing priorities, students and supervisors may halt those activities that are more aligned with longer term prospects after the doctorate. There also remain gaps between

student needs and what doctorates typically provide, even for students intending to stay within academia. To improve the doctoral student's professional and career development, students and supervisors need to develop a strategic plan, with repeated needs assessments and exercises in transferable or employability skills that double up as academic development opportunities.

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## References

1. Park, C. *Redefining the Doctorate*; Higher Education Academy: York, UK, 2007.
2. OECD. *OECD Science, Technology and Industry Outlook 2010*; OECD: Washington, DC, USA, 2010.
3. Bennett, M. PhD Study, for Free?—14 Countries That Charge Very Little (or Nothing!) for Doctoral Degrees. FindaPhD, UK. Available online: <https://www.findaphd.com/blog/5164/phd-study-for-free-14-countries-that-charge-very-little-or-nothing-for-doctoral-degrees> (accessed on 30 October 2023).
4. Radder, H. Introduction. In *The Commodification of Academic Research: Science and the Modern University*; Radder, H., Ed.; University of Pittsburgh Press: Pittsburgh, PA, USA, 2010; p. 350, ISBN 9780822943969.
5. Grant, B.; Nerad, M.; Balaban, C.; Deem, R.; Grund, M.; Herman, C.; Mrčela, A.K.; Porter, S.; Rutledge, J.; Strugnell, R. The doctoral-education context in the twenty-first century: Change at every level. In *Towards a Global Core Value System in Doctoral Education*; Nerad, M., Bogle, D., Kohl, U., O'Carroll, C., Peters, C., Scholz, B., Eds.; UCL Press: London, UK, 2022. [CrossRef]
6. Magyar, A.; Robinson-Pant, A. Special issue on university internationalisation—Towards transformative change in higher education. Internationalising doctoral research: Developing theoretical perspectives on practice. *Teach. Teach.* **2011**, *17*, 663–676. [CrossRef]
7. McAlpine, L.; Amundsen, C. Challenging the taken-for-granted: How research analysis might inform pedagogical practices and institutional policies related to doctoral education. *Stud. High. Educ.* **2012**, *37*, 667–681. [CrossRef]
8. Hnatkova, E.; Degtyarova, I.; Kersschot, M.; Boman, J. Labour market perspectives for PhD graduates in Europe. *Eur. J. Educ.* **2022**, *57*, 395–409. [CrossRef]
9. Ehrenberg, R.G.; Smith, R.S. Investments in Human Capital: Education and Training. Chapter 9. In *Modern Labor Economics*, 13th ed.; Routledge: London, UK, 2017.
10. Scheuer, M.L. Linking Abusive Supervision to Engagement and Burnout: An Application of the Differentiated Job Demands-Resource Model (Order No. 3567781). Thesis, 2013. Available from ProQuest Central; ProQuest Dissertations & Theses Global. (1418272159). Available online: <https://www.proquest.com/dissertations-theses/linking-abusive-supervision-engagement-burnout/docview/1418272159/se-2> (accessed on 2 November 2023).
11. Kumar, S.; Kumar, V.; Taylor, S. A Guide to Online Supervision. UK Council for Graduate Education. 2020. Available online: <https://supervision.ukcge.ac.uk/cms/wp-content/uploads/A-Guide-to-Online-Supervision-Kumar-Kumar-Taylor-UK-Council-for-Graduate-Education.pdf> (accessed on 30 October 2023).
12. Trafford, V.; Leshem, S. Doctorateness as a threshold concept. *Innov. Educ. Teach. Int.* **2009**, *46*, 305–316. [CrossRef]
13. Evans, L. What is effective research leadership? A research-informed perspective. *High. Educ. Res. Dev.* **2014**, *33*, 46–58. [CrossRef]
14. Ganapati, S.; Ritchie, T.S. Professional development and career-preparedness experiences of STEM Ph.D. students: Gaps and avenues for improvement. *PLoS ONE* **2021**, *16*, e0260328. [CrossRef] [PubMed]
15. Hancock, S. What is known about doctoral employment? Reflections from a UK study and directions for future research. *J. High. Educ. Policy Manag.* **2021**, *43*, 520–536. [CrossRef]
16. Klucznik-Törő, A.; Kwiatkowska-Ciotucha, D.; Törő, C.; Witwicka-Dudek, A.; Paprika, Z. Assessing the importance of internships and soft skills on the employability of university students. Chapter 6, 114–138. In *Project Work and Internship*; Escudeiro, N., Klucznik-Törő, A., Pawełczyk, A., Carbonaro, M., Nanu, S., Ward, T., Welzer, T., Escudeiro, P., Eds.; International Center for Entrepreneurship: Bukowice, Poland, 2013.
17. De Grande, H. Ready or not: Different views about transferable skills of doctoral candidates in Flanders. In *Higher Education, Partnership and Innovation*; Klucznik-Törő, A., Csepe, A., Kwiatkowska-Ciotucha, D., Eds.; Publikon/ID Research: Budapest, Budapest, 2009; pp. 51–61.
18. Tymon, A. The student perspective on employability. *Stud. High. Educ.* **2013**, *38*, 841–856. [CrossRef]
19. Sin, C.; Neave, G. Employability deconstructed: Perceptions of Bologna stakeholders. *Stud. High. Educ.* **2016**, *41*, 1447–1462. [CrossRef]

20. Scholz, B. In Collaboration with the Chair and Co-Chairs of the ESF Member Organisation Forum 'European Alliance on Research Career Development'. Developing Research Careers in and beyond Europe: Enabling–Observing–Guiding and Going Global a Report by the ESF Member Organisation Forum 'European Alliance on Research Career Development' (EARCD). Available online: [http://archives.esf.org/index.php?eID=tx\\_nawsecuredl&u=0&g=0&t=1698670688&hash=436a972a0006f11c67483853c39b2014c88b0ff1&file=/fileadmin/be\\_user/CEO\\_Unit/MO\\_FORA/MOFORUM\\_EARCD/Publications/Report\\_Developing\\_Research\\_Careers\\_in\\_and\\_beyond\\_Europe.pdf](http://archives.esf.org/index.php?eID=tx_nawsecuredl&u=0&g=0&t=1698670688&hash=436a972a0006f11c67483853c39b2014c88b0ff1&file=/fileadmin/be_user/CEO_Unit/MO_FORA/MOFORUM_EARCD/Publications/Report_Developing_Research_Careers_in_and_beyond_Europe.pdf) (accessed on 25 October 2023).
21. Gill, R.; Donaghue, N. Resilience, apps and reluctant individualism: Technologies of self in the neoliberal academy. *Women's Stud. Int. Forum* **2016**, *54*, 91–99. [CrossRef]
22. Zschirnt, E.; Ruedin, D. Ethnic discrimination in hiring decisions: A meta-analysis of correspondence tests 1990–2015. *J. Ethn. Migr. Stud.* **2016**, *42*, 1115–1134. [CrossRef]
23. Davies, D.; Zhang, X.Y.; Liang, W. Skills shortages in China? A conceptual model. *World J. Soc. Sci.* **2012**, *2*, 77–85.
24. The Quality Assurance Agency for Higher Education. UK Quality Code for Higher Education, Advice and Guidance: Research Degrees, the Quality Assurance Agency for Higher Education: London, 2018. Available online: <https://www.qaa.ac.uk/docs/qaa/quality-code/advice-and-guidance-monitoring-and-evaluation.pdf> (accessed on 25 October 2023).
25. Murison, C.B.; Hepplewhite, G. Graduate Attributes in Australian Higher Education: Implications of an Economic Rationalist Approach. In *Quality Education, Encyclopedia of the UN Sustainable Development Goals*; Leal Filho, W., Azul, A., Brandli, L., Özuyar, P., Wall, T., Eds.; Springer: Cham, Switzerland, 2019.
26. Anon. Doctoral Networks. Available online: <https://marie-skłodowska-curie-actions.ec.europa.eu/actions/doctoral-networks> (accessed on 25 October 2023).
27. VITAE. Concordat to Support the Career Development of Researchers. 2019. Available online: <https://researcherdevelopmentconcordat.ac.uk/> (accessed on 30 October 2023).
28. Chen, L.; Mewburn, I.; Suominen, H. Australian doctoral employability: A systematic review of challenges and opportunities. *High. Educ. Res. Dev.* **2023**. [CrossRef]
29. Anon. Postgraduate Research Experience Survey (PRES). Available online: <https://www.advance-he.ac.uk/reports-publications-and-resources/postgraduate-research-experience-survey-pres> (accessed on 25 October 2023).
30. Anon. Every Student Has a Voice. Every Voice Is Heard. Available online: <https://cshe.berkeley.edu/seru> (accessed on 25 October 2023).
31. Dalenius, T. Errors and other limitations of surveys, Chapter 1, Pages 1–24. In *Statistical Methods and the Improvement of Data Quality*; Wright, T., Ed.; Academic Press: Orlando, FL, USA, 1983; ISBN 9780127654805. [CrossRef]
32. Nerad, M. Professional Development for Doctoral Students: What is it? Why Now? Who does it? *Nagoya J. High. Educ.* **2015**, *15*, 285–319.
33. OECD. Benchmarking higher education system performance. In *Higher Education*; OECD Publishing: Paris, France, 2019. [CrossRef]
34. Harvey, L. Defining and Measuring Employability. *Qual. High. Educ.* **2001**, *7*, 97–109. [CrossRef]
35. Garrouste, C.; Rodrigues, M. The Employability of Young Graduates in Europe—Analysis of the ET2020 Benchmark, Joint Research Centre, Institute for the Protection and Security of the Citizen Publications Office, European Union. 2012. Available online: <https://data.europa.eu/doi/10.2788/69842> (accessed on 25 October 2023).
36. Eurostat. Recent Graduates: New High in Employment in 2022, News Articles 10 August 2023. Available online: <https://ec.europa.eu/eurostat/web/products-eurostat-news/w/edn-20230810-1> (accessed on 25 October 2023).
37. Exley, K.; Dennick, R. *Small-Group Teaching: Tutorials, Seminars and Beyond*; Routledge: New York, NY, USA; London, UK, 2004.
38. Kalfa, S.; Taksa, L. Cultural capital in business higher education: Reconsidering the graduate attributes movement and the focus on employability. *Stud. High. Educ.* **2015**, *40*, 580–595. [CrossRef]
39. European University Association. Briefing: Going beyond the 20% Student Benchmark. European University Association asbl, Brussels, Belgium. 2023. Available online: <https://eua.eu/component/attachments/attachments.html?id=4245> (accessed on 25 October 2023).
40. Sin, C.; Amaral, A. Academics' and employers' perceptions about responsibilities for employability and their initiatives towards its development. *High. Educ.* **2017**, *73*, 97–111. [CrossRef]
41. McGinn, K.L.; Oh, E. Gender, social class, and women's employment. *Curr. Opin. Psychol.* **2017**, *18*, 84–88.
42. Small, L.; Shacklock, K.; Marchant, T. Employability: A contemporary review for higher education stakeholders. *J. Vocat. Educ. Train.* **2018**, *70*, 148–166. [CrossRef]
43. Dinham, S.; Scott, C. The experience of disseminating the results of doctoral research. *J. Furth. High. Educ.* **2001**, *25*, 45–55. [CrossRef]
44. Barry, K.M.; Woods, M.; Warnecke, E.C.; Stirling, C.; Martin, A. Psychological health of doctoral candidates, study-related challenges and perceived performance. *High. Educ. Res. Dev.* **2018**, *37*, 468–483. [CrossRef]
45. Hockey, J. A complex craft: United Kingdom PhD Supervision in the social sciences. *Res. Post-Compuls. Educ.* **1997**, *2*, 45–70. [CrossRef]
46. Lahenius, K.; Martinsuo, M. Different types of doctoral study processes. *Scand. J. Educ. Res.* **2011**, *55*, 609–623. [CrossRef]
47. Perez-Silva, R.; Partridge, M.; Foster, W. Are foreign-born researchers more innovative? Self-selection and the production of knowledge among PhD recipients in the USA. *J. Geogr. Syst.* **2018**, *21*, 557–594. [CrossRef]

48. Farrar, V.; Young, R.G. *Supervising Disabled Research Students*; Denicolo, P., McCulloch, A., Gough, M., Perkins, H., Eds.; Series: Issues in Postgraduate Education: Management, Teaching and Supervision; Society for Research in Higher Education: London, UK, 2007; Series 2, Number 3; p. 29. Available online: <https://srhe.ac.uk/wp-content/uploads/2022/07/S2Iss3-Supervising-Disabled-Students.pdf> (accessed on 25 October 2023).
49. Ryan, R.M.; Deci, E.L. *Self-Determination Theory: Basic Psychological Needs in Motivation, Development, and Wellness*; The Guilford Press: New York, USA, 2017. [CrossRef]
50. Meuleners, J.S.; Neuhaus, B.J.; Eberle, J. The role of scholarly identity and basic needs support during doctoral studies on career aspirations of early career scientists. *Stud. High. Educ.* **2003**, *48*, 1952–1965. [CrossRef]
51. Van der Linden, N.; Devos, C.; Boudrenghien, G.; Frenay, M.; Azzi, A.; Klein, O.; Galand, B. Gaining insight into doctoral persistence: Development and validation of Doctorate-related Need Support and Need Satisfaction short scales. *Learn. Individ. Differ.* **2018**, *65*, 100–111. [CrossRef]
52. University of Adelaide. Expectations-in-Supervision. Available online: <https://www.sussex.ac.uk/webteam/gateway/file.php?name=expectations-in-supervision.pdf&site=46> (accessed on 25 October 2023).
53. Mainhard, T.; van der Rijst, R.; van Tartwijk, J.; Wubbels, T.A. A model for the supervisor–doctoral student relationship. *High. Educ.* **2009**, *58*, 359–373. [CrossRef]
54. Benmore, A. Boundary Management in Doctoral Supervision: How Supervisors Negotiate Roles and Role Transitions through the Supervisory Journey. *Stud. High. Educ.* **2014**, *41*, 1251–1264. [CrossRef]
55. Pitkin, M. *Advance HE PRES 2020 Global Report*; Advance HE: London, UK, 2020.
56. Ryan, J.; Louie, K. False Dichotomy? “Western” and “Confucian” Concepts of Scholarship and Learning. *Educ. Philos. Theory* **2007**, *39*, 404–417. [CrossRef]
57. Taylor, S. *Good Supervisory Practice Framework*; UK Council for Graduate Education (UKCGE): Lichfield, UK, 2019.
58. Horta, H.; Veloso, F.M.; Gómez, I.F. Mapping the forms of organization of doctoral studies in Europe. *Eur. Educ. Res. J.* **2010**, *9*, 220–236.
59. Gedye, S.; Beaumont, E. The ability to get a job: Student understandings and definitions of employability. *Educ. Train.* **2018**, *60*, 406–420. [CrossRef]
60. Thirunavukarasu, G.; Chandrasekaran, S.; Subhash Betageri, V.; Long, J. Assessing learners’ perceptions of graduate employability. *Sustainability* **2020**, *12*, 460. [CrossRef]
61. Paul, P.; Olson, J.; Gul, R. Co-Supervision of doctoral students: Enhancing the learning experience. *Int. J. Nurs. Educ. Scholarsh.* **2014**, *11*, 31–38. [CrossRef] [PubMed]
62. Hiemstra, R. Uses and benefits of journal writing. *New Dir. Adult Contin. Educ.* **2001**, *90*, 19–26. [CrossRef]
63. O’Connell, T.S.; Dymont, J.E. The case of reflective journals: Is the jury still out? *Reflective Pract.* **2011**, *12*, 47–59. [CrossRef]
64. Bartkowski, J.P.; Deem, C.S.; Ellison, C.G. Publishing in academic journals: Strategic advice for doctoral students and academic mentors. *Am. Sociol.* **2015**, *46*, 99–115. Available online: <http://www.jstor.org/stable/43955568> (accessed on 2 November 2023). [CrossRef]
65. Banyard, C. PhD Study in The Netherlands—A Guide for 2023. Available online: <https://www.findaphd.com/guides/phd-study-in-netherlands> (accessed on 25 October 2023).
66. Lee, A.; Kamler, B. Bringing pedagogy to doctoral publishing. *Teach. High. Educ.* **2008**, *13*, 511–523. [CrossRef]
67. Mello, A.L.; Fleisher, M.S.; Woehr, D.J. Varieties of research experience: Doctoral student perceptions of preparedness for future success. *Int. J. Manag. Educ.* **2015**, *13*, 128–140. [CrossRef]
68. Bøgelund, P. How supervisors perceive PhD supervision—And how they practice it. *Int. J. Dr. Stud.* **2015**, *10*, 39–55. [CrossRef]
69. Halse, C. Becoming a supervisor: The impact of doctoral supervision on supervisors’ learning. *Stud. High. Educ.* **2011**, *36*, 557–570. [CrossRef]
70. Macfarlane, B. The ethics of multiple authorship: Power, performativity and the gift economy. *Stud. High. Educ.* **2017**, *42*, 1194–1210. [CrossRef]
71. Paré, A. Slow the presses: Concerns about premature publication. Chapter 3. In *Publishing Pedagogies for the Doctorate and Beyond*; Aitchison, C., Kamler, B., Lee, A., Eds.; Routledge: Oxon, UK, 2010; pp. 30–46.
72. Taylor, Z. The hunter became the hunted: A graduate student’s experiences with predatory publishing. *Publ. Res. Q.* **2019**, *35*, 122–137. [CrossRef]
73. Gonzalez, O.; Campo, G.; Castello, M. Writing in doctoral programs: Examining supervisors’ perspectives. *High. Educ.* **2018**, *76*, 387–401. [CrossRef]
74. Kamler, K. Rethinking doctoral publication practices: Writing from and beyond the thesis. *Stud. High. Educ.* **2008**, *33*, 283–294. [CrossRef]
75. Grossman, E.; Crowther, N. Co-supervision in postgraduate training. Ensuring the right hand knows what the left hand is doing. *S. Afr. J. Sci.* **2015**, *111* (11/12), 8. [CrossRef]
76. Guerin, C.; Green, I. They’re the bosses’: Feedback in team supervision. *J. Furth. High. Educ.* **2015**, *39*, 320–335. [CrossRef]
77. Page-Adams, D.; Cheng, L.C.; Gogineni, A.; Shen, C.Y. Establishing a group to encourage writing for publication among doctoral students. *J. Soc. Work Educ.* **1995**, *31*, 402–407. [CrossRef]

78. Else, H. Publish and Flourish: PhD Students Turn Journal Editors. Times Higher Ed, 2015 (25th June), 2. Available online: <https://www.timeshighereducation.com/news/publish-and-flourish-phd-students-turn-journal-editors> (accessed on 25 October 2023).
79. Maher, D.; Seaton, L.; McMullen, C.; Fitzgerald, T.; Otsuji, E.; Lee, A. Becoming and being writers: The experiences of doctoral students in writing groups. *Stud. Contin. Educ.* **2008**, *30*, 263–275. [CrossRef]
80. Sverdlik, A.; Hall, N.; McAlpine, L.; Hubbard, K. The PhD experience: A review of the factors influencing doctoral students' completion, achievement, and well-being. *Int. J. Dr. Stud.* **2018**, *13*, 361–388. [CrossRef]
81. Williams, S. 2019 Postgraduate Research Experience Survey. Available online: [https://s3.eu-west-2.amazonaws.com/assets.creode.advancehe-document-manager/documents/advance-he/AdvanceHE-Postgraduate\\_Research\\_%20Survey\\_%202019\\_1574338111.pdf](https://s3.eu-west-2.amazonaws.com/assets.creode.advancehe-document-manager/documents/advance-he/AdvanceHE-Postgraduate_Research_%20Survey_%202019_1574338111.pdf) (accessed on 25 October 2023).
82. Edwards, D.; Bexley, E.; Richardson, S. Regenerating the Academic Workforce: The Careers, Intentions and Motivations of Higher Degree Research Students in Australia. Findings of the National Research Student Survey (NRSS). 2011. Available online: [http://research.acer.edu.au/higher\\_education/23](http://research.acer.edu.au/higher_education/23) (accessed on 25 October 2023).
83. Davies, M. Knowledge (Explicit, Implicit and Tacit): Philosophical Aspects. In *International Encyclopedia of the Social & Behavioral Sciences*, 2nd ed.; Wright, J.D., Ed.; Elsevier: Orlando, FL, USA, 2015; pp. 74–90. [CrossRef]
84. Austin, A.E. Cognitive apprenticeship theory and its implications for doctoral education: A case example from a doctoral program in higher and adult education. *Int. J. Ac. Dev.* **2009**, *14*, 173–183. [CrossRef]
85. Cham, J. My Experience as a Graduate Teaching Assistant. PhDcomics/University of Glasgow PhD Blogs, 31 October 2017. Available online: <https://uofgpgprblog.com/pgprblog/2017/10/31/gta> (accessed on 25 October 2023).
86. Leathwood, C.; Read, B. Short-term, short-changed? A temporal perspective on the implications of academic casualisation for teaching in higher education. *Teach. High. Educ.* **2022**, *27*, 756–771. [CrossRef]
87. Slack, H.R.; Pownall, M. 'Treat GTAs as colleagues, rather than spare parts': The identity, agency, and wellbeing of graduate teaching assistants. *J. Furth. High. Educ.* **2023**, *47*, 1262–1275. [CrossRef]
88. Bitzer, E.M.; Albertyn, R.M. Alternative approaches to postgraduate supervision: A planning tool to facilitate supervisory processes. *S. Afr. J. High. Educ.* **2011**, *25*, 875–888.
89. Brass, D.J.; Galaskiewicz, H.R.; Greve, W.; Tsai, W.P. Taking stock of networks and organizations: A multilevel perspective. *Acad. Manag. J.* **2004**, *47*, 795–817. [CrossRef]
90. Nerad, M. Conceptual approaches to doctoral education: A Community of Practice. *Alternation* **2012**, *19*, 57–72.
91. Frick, L.; Albertyn, R.; Brodin, E.; McKenna, S.; Claessm, S. The role of doctoral education in early career academic development. In *Postgraduate Supervision: Future Foci for the Knowledge Society*; Fourie-Malherbe, M., Aitchison, C., Blitzer, E., Albertyn, R., Eds.; Sun Press: Stellenbosch, Africa, 2017; pp. 203–219.
92. Lahenius, K. Communities of Practice supporting doctoral studies. *Int. J. Manag. Educ.* **2012**, *10*, 29–38. [CrossRef]
93. Carter, S.; Kumar, V. "Ignoring me is part of learning": Supervisory feedback on doctoral writing. *Innov. Educ. Teach. Int.* **2016**, *54*, 68–75. [CrossRef]
94. Pilbeam, C.; Denyer, D. Lone scholar or community member? The role of student networks in doctoral education in a UK management school. *Stud. High. Educ.* **2009**, *34*, 301–318. [CrossRef]
95. Pilbeam, C.; Lloyd-Jones, G.; Denyer, D. Leveraging value in doctoral student networks through social capital. *Stud. High. Educ.* **2012**, *38*, 1472–1489. [CrossRef]
96. Wilson, S.; Cutri, J. Negating isolation and imposter syndrome through writing as product and as process: The impact of collegiate writing networks during a doctoral programme, Chapter 7. In *Wellbeing in Doctoral Education*; Wilson, S., Cutri, J., Eds.; Springer: Singapore, 2019; ISBN 978-981-13-9301-3. [CrossRef]
97. Tobbell, J.; O'Donnell, V.; Zammit, M. Exploring transition to postgraduate study: Shifting identities in interaction with communities, practice and participation. *Br. Educ. Res. J.* **2010**, *36*, 261–278. [CrossRef]
98. Åkerlind, G.; McAlpine, L. Supervising doctoral students: Variation in purpose and pedagogy. *Stud. High. Educ.* **2017**, *42*, 1686–1698. [CrossRef]
99. Wilson, T. *A Review of Business-University Collaboration*; HEFCE, HMSO: London, UK, 2012.
100. Engeström, Y.; Engeström, R.; Kärkkäinen, M. Polycontextuality and boundary crossing in expert cognition: Learning and problem solving in complex work activities. *Learn. Instr.* **1995**, *5*, 319–336. [CrossRef]
101. Schiermeier, Q. Germany: Excellence revisited. *Nature* **2012**, *487*, 519–521. [CrossRef] [PubMed]
102. Mascarelli, A. Stepping stones. *Nature* **2012**, *490*, 571–573. [CrossRef] [PubMed]
103. Professional Internships for PhD Students (PIPS), University of Cambridge, UK. Available online: <https://bbsrcdtp.lifesci.cam.ac.uk/PIPS> (accessed on 25 October 2023).
104. Parilla, P.F.; Hesser, G. Internships and the sociological perspective: Applying principles of experiential learning. *Teach. Sociol.* **1998**, *26*, 310–329. [CrossRef]
105. Beach, K. Consequential transitions: A developmental view of knowledge propagation through social organizations. In *Between School and Work: New Perspectives on Transfer and Boundary-Crossing*; Tuomi-Grohn, T., Engeström, Y., Eds.; Emerald Group Publishing: Oxford, UK, 2003; pp. 39–61.
106. Costley, C.; Boud, D. The development and impact of professional doctorates. In *The SAGE Handbook of Learning and Work*; Malloch, M., Cairns, L., Evans, K., O'Connor, B., Eds.; Sage: London, UK, 2021; pp. 223–238.

107. Ali, A.; Kohun, F. Dealing With social isolation to minimize doctoral attrition—A four stage framework. *Int. J. Dr. Stud.* **2007**, *2*, 33–49.
108. Wöhler, V. To stay or to go? Narratives of early-stage sociologists about persisting in academia. *High. Educ. Policy* **2014**, *27*, 469–487. [CrossRef]
109. Ankrah, S.; Al-Tabbaa, O. Universities-industry collaboration: A systematic review. *Scand J. Manag.* **2015**, *31*, 387–408. [CrossRef]
110. UK Research and Innovation (UKRI). Industrial CASE–EPSRC. Available online: <https://www.ukri.org/apply-for-funding/> (accessed on 25 October 2023).
111. Innovation Fund Denmark. Industrial Researcher. Available online: <https://innovationsfonden.dk/en/p/industrial-researcher#accordion2955> (accessed on 25 October 2023).
112. The Research Council of Norway, Industrial PhD Scheme–Doctoral Projects in Industry. Available online: <https://www.forskningsradet.no/en/apply-for-funding/funding-from-the-research-council/industrial-ph.d.-scheme--doctoral-projects-in-industry/> (accessed on 25 October 2023).
113. Beltramo, J.P.; Paul, J.J.; Perret, C. The recruitment of researchers and the organization of scientific activity in industry. *Int. J. Tech. Manag.* **2001**, *22*, 811–834. [CrossRef]
114. Rossoni, A.L.; de Vasconcellos, E.P.G.; de Castilho Rossoni, R.L. Barriers and facilitators of university-industry collaboration for research, development and innovation: A systematic review. *Manag. Rev. Q.* **2023**, *26*, 1–37. [CrossRef]
115. Mayo, N. Is paid research time a vanishing privilege for modern academics? *Times High. Educ. Suppl.* **2019**. Available online: <https://www.timeshighereducation.com/cn/features/paid-research-time-vanishing-privilege-modern-academics> (accessed on 2 November 2023).

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