GENERAL RECOMMENDATIONS

TRANSFERABLE SKILLS DURING THE DOCTORATE

The present document consists of a series of recommendations based on the report "Gaining insight into transferable skills: Perspectives from doctorate holders and non-academic employers". The full report detailing the analyses can be found at

http://www.observatoire.frs-fnrs.be/_media/report.employers.1.pdf

1. **Structurally integrate transferable-skills training into doctoral education not only for doctorate holders who plan to work outside of academia but also for those who plan to work inside**

According to the analyses developed in the report, it would be beneficial to structurally integrate transferable skills training into doctoral education for all doctoral candidates. The patterns of match and mismatch between the skills acquired by the end of the doctorate and those used in the workplace are in fact very similar for doctorate holders who work in the university sector after their thesis and those who work outside the university sector. Indeed, both groups seem to mainly lack skills related to working with others ("collaboration and teamwork" and "social skills"), general management skills ("business skills" and "project management") and "communication skills". In the same way, the correspondence between the skills acquired by the end of the doctorate and those used in the workplace is very similar whatever the research domain of the doctorate holders.

These findings have two implications. Firstly, transferable-skills training is not important only for doctorate holders who wish to leave the university sector. It is, in fact, just as important for those who pursue their careers in academia. Secondly, training in transferable skills is of similar importance for all doctoral graduates, regardless of their research domain. As a result, it may not be necessary to prepare separate training experiences for doctoral candidates based on the career path that they are envisioning or their research domain.

Examples of good practice

Training during the doctorate - University of Nantes - France

In its doctoral charter, The University of Nantes formally encourages its doctoral candidates to consider their professional future early on : " *Writing a thesis is at the same time a professional experience and a training in and through research.*" Whether by training in scientific integrity and research ethics, language courses, cross-disciplinary or complementary training, the stated goal is to better prepare doctoral candidates for their future job transition after the thesis: "*In order to broaden their field of expertise, and disciplinary horizons, and to facilitate their future job transition, all doctorates must carry out at least 100 hours of training or equivalent activity*

(approved by the doctoral school) while writing their theses. The number of hours and the balance between transferable-skills training (e.g., project management, communication) and disciplinary training (e.g., medicine, writing workshop) will be tailored to the specificities of the thesis under preparation and the doctoral project."

https://staps.univ-nantes.fr/fr/formation-initiale/doctorat/doctorants-preparer-son-insertion-professionnelle

2. Pay particular attention to "collaboration and teamwork" and "project management"

47.5% of doctorate holders in our sample indicated that they had acquired "collaboration and teamwork" skills by the end of their doctorate, the third least acquired skill by doctorate holders. However, this skill was the second most wanted skill by 614 non-academic employers in our sample, after "scientific and technical expertise", which demonstrates the importance of having employees that can fit in and work together with others. Therefore, collaborations at various levels (be it inter-lab, inter-project, inter-university and/or inter-sectoral) should be encouraged and enhanced.

On the other hand, 60.1% of doctorate holders in our sample indicated that they had acquired "project management" skills by the end of their doctorate. Moreover, the levels of satisfaction of non-academic employers echoed this shortfall: more than a quarter of them said they were dissatisfied with the "project management" skills of doctorate holders. We recommend universities and doctoral schools to take these results into account.

3. Encourage "learning by doing" as part of transferable skills training

Most non-academic employers were very supportive of the proposal of "encouraging project-based learning activities and more applied research focused on the real needs of industry". The positive response to this proposal highlights the importance that non-academic employers place on "learning by doing" and the capacity to apply knowledge in a given context and solve concrete needs and problems within the work environment. These hands-on experiences can make transferable skills less context- and task-specific and more "translatable" for doctorate holders (Beier, Kim, Saterbak, Leautaud, Bishnoi & Gilberto, 2019). Therefore, universities and doctoral schools could consider, as part of their transferable skills training programmes, a project-based learning approach to familiarise doctoral candidates with what could be expected of them in their future workplace.

Examples of good practice

Project-based learning: Beier et al.,2018- U.S.A.

Project-based learning is a form of learning based on active construction, in which concrete problems to be solved are worked on in small groups. In these contexts, instead of being passive (one person teaches and the others listen), learners become active in investigating issues by

offering explanations, ideas and confronting them with others. Learners need to engage in a goal-oriented process of inquiry, knowledge acquisition, and problem solving. They develop their own understanding of a field by applying its methods and principles. They thus have a high degree of responsibility and autonomy (Brundiers & Wiek, 2013; Krajcik & Blumenfeld, 2006). Compared to direct instructions based on lectures, project-based learning activities have advantages when it comes to developing skills such as collaboration, problem solving, initiative and, critical and creative thinking (Guo, Saab, Post, & Admiraal, 2020; Lee, Huh & Reigeluth, 2015; Stefanou, Stolk, Prince, Chen, & Lord, 2013). In addition, it can improve the motivation of the people concerned and their level of satisfaction and help them define their professional aspirations (Beier, Kim, Saterbak, Leautaud, Bishnoi & Gilberto, 2019; Helle, Tynjälä, Olkinuora & Lonka, 2007).

Beier et al., 2018 have built a training comprising the following steps:

1. Meetings were organised with potential project partners, who were community partners, research faculty, physicians, humanitarian organisations and business leaders. In these meetings, partners were debriefed about the goals of the course and then were asked about existing "problems, needs, or opportunities" in their workplace. They used concrete questions depending on the context. For instance, to a physician "what do you wish you had in your intensive care unit?" or to someone working with animals "what would improve your ability to work with this animal?"
2. Once the problems were identified and were considered "appropriate" for the course, the problem statement was written in a document.
3. Groups of four- to six-student teams were formed to work on one of the identified problems.
4. The groups first worked on better defining the problem and then on brainstorming solutions.
5. They selected a solution.
6. They worked on developing and testing the solutions.

The authors tested the impact of this method on the career goals of STEM students. By the end of the training, the students involved had increased their desire to pursue a career in STEM fields.

4. Give time to early-career researchers for career development

Time seems to be a barrier and a concern for doctorate holders in our sample. Their concern (and that of their doctoral supervisors) about the risk that professional development activities could slow down the progress of their research and lengthen the time it takes to obtain a doctorate is understandable, especially in view of the current tendency to further shorten the duration of doctoral training (e.g., Shaller & Barbier, 2021). Time spent on career development activities such as internships, collaborations or transferable-skills training contribute to researchers' development. In addition, collaborations with the non-academic sector foster knowledge circulation.

Some research funding agencies have started to encourage researchers to devote their time to activities other than doctoral or postdoctoral research. For example, in 2014 in the United States, the National Institutes of Health (NIH) released a statement on the "dual role" of researchers. In addition, the FWO (Fonds voor Wetenschappelijk Onderzoek – Vlaanderen) has allowed researchers to devote time for career development (see below). These types of initiatives are welcome to encourage inter-sectoral mobility.

> **Examples of good practice**
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> *Time for researchers' development: FWO- Flanders*
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> For the past two years, the FWO has started to give funding that encourages researchers to spend a portion of their time on activities (such as internships or collaborations) other than their doctoral or postdoctoral research. The goal was on the one hand to support researchers and help them gain experience within and outside of university and on the other hand to help companies and institutes to profit from the skills of doctoral candidates and doctorate holders.
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> *"Every FWO researcher can **spend 20 percent of their available time** on activities other than the actual PhD or postdoctoral research, so long as they contribute to the researcher's development. The researcher may also choose, in consultation with the doctoral supervisor, to devote all or part of this time to teaching or university services. To develop specific skills, a junior researcher can also choose to do an internship within an organisation. In addition, postdoctoral researchers may suspend their fellowship in order to accept a full-time paid research fellowship or grant in a university, scientific institute, company or organisation."*
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> https://www.fwo.be/en/the-fwo/research-policy/hr-strategy/research-careers/

5. Reinforce collaborations between universities and non-academic sectors

Most doctorate holders would like universities to collaborate more with non-academic sectors and non-academic employers would like more doctoral theses that involve collaborations (other than the university sector). Given the importance non-academic employers give to having professional experience outside of academia, it seems appropriate to offer doctoral candidates, during their doctoral training, learning opportunities in collaboration with other professional sectors. This can be done through:

> Internships. Most non-academic employers in our sample were very positive about temporarily hosting doctoral candidates as interns. This support was even greater for those working in the sector of professional, scientific, and technical services (particularly in the information and communication sector). Internships can be integrated into the doctorate as part of the training.

> Collaborative doctoral programmes. More than half of non-academic employers in our sample were in favour of hiring a doctoral candidate in collaboration with a university, covering only part of their salary. The existing funding schemes such as "Win4Doc" could

be broadened to include multiple sectors, including the public sector, and candidates from all domains, including those from Social Sciences and Humanities, and to fund a greater number of doctoral candidates (e.g. in the Brussels-capital region, the "Applied PhD " programme, extended to the public sector and Social Sciences and Humanities, funds on average only seven doctorates per year, divided between Flemish and French-speaking universities and the region's higher education institutions outside of university. In addition, other funding programmes could be implemented.

Examples of good practice

Collaborative doctoral programmes: Cifre programme- France

The Industrial Research Training Agreement programme called "Cifre" in France allows companies to receive financial aid to recruit a doctoral candidate in collaboration with a university or research institution, which leads to the defense of a thesis. This system is considered to be an important lever for public-private cooperation in R&D and the employment of doctorate holders. It contributes to the innovation process of French companies and to their competitiveness. The evaluation of Cifre highlights its positive impact for employers (increased R&D workforce, benefit from R&D skills as well as the infrastructure of a research laboratory) and doctorate holders (wage premium and higher probability of having a permanent contract three years after obtaining their doctorate compared to non-Cifre doctorate holders who are engineers) (Guillouzouic & Malgouyres, 2020).

https://www.enseignementsup-recherche.gouv.fr/fr/les-cifre-46510

Examples of good practice:

Internships: Mitacs Accelerate- Canada

Mitacs Accelerate connects a partner organisation (could be for-profit corporations or not-for-profit corporations, municipalities, and hospitals, etc.) with universities through doctoral and postdoctoral internships. It is open to all academic disciplines. Applicants submit a proposal and successful candidates receive $15,000 in funding for each four-month internship. Internships can vary in length from 3 to 8 months. Interns gain new skills while broadening their professional network, and companies benefit from high-quality research expertise and gain a competitive advantage.

https://www.mitacs.ca/en/programs/accelerate

TARGETED RECOMMENDATIONS

> **Policy makers**

- Encourage collaborative doctoral programmes. Existing funding schemes could be broadened to include multiple sectors, including the public sector, and candidates from all research domains, including those from Social Sciences and Humanities, and to finance a greater number of doctoral candidates. In addition, more funding schemes can be added.

> **Funding agencies**

- Formally provide, in the regulatory provisions for doctoral or post-doctoral funding, that part of researchers' time be devoted to career development activities (such as internships or collaborations) other than the doctoral or postdoctoral research.
- When evaluating the research environment, consider an evaluation criterion related to the conditions available to researchers to ensure career growth and support.
- Support the international mobility of researchers and research stays. A mobility experience allows researchers to be exposed to other professional practices in their field of research and develop transferable skills.

> **Universities, research institutions and doctoral schools**

- Formally recognise in the doctoral charter that the academic degree of doctor is associated with training divided into three parts: thematic training, scientific production and transferable training that can be dedicated in particular to carrying out internships or participating in transferable-skills training.
- Ensure that researchers at all stages of their careers are offered career guidance.
- Facilitate the possibility of completing an internship during doctoral and postdoctoral training. A thriving innovation ecosystem requires a good flow of knowledge. Internships allow doctoral candidates to acquire new skills and help organisations benefit from high-level technical expertise and research knowledge. Universities or doctoral schools could organise a working group to start thinking about the possibility of an internship during the doctorate, defining the potential expectations, responsibilities, tasks to be performed or objectives to be achieved in terms of acquisition/reinforcement of transferable skills. A guide and/or an online platform could be created to inform interested doctoral candidates and employers looking for interns. Universities could then initiate a pilot project with an organisation and evaluate its success.
- Strengthen links with non-academic sectors and provide exchange opportunities for doctoral candidates and non-academic employers. Several events and programmes, such as job fairs, laboratory visits for non-academic employers, company visits for doctoral candidates or meetings where doctoral candidates or doctorate holders pitch their research projects or start-up ideas can be organized by universities. Such meeting

opportunities build mutual awareness between the actors of the business world and young scientists.

- Pay particular attention to the acquisition and reinforcement of "collaboration and teamwork" and "project management".
- Encourage "learning by doing" to make transferable skills training "translatable" in different contexts.
- Support collaborative research projects.

❯ Doctoral supervisors and thesis committee

- Give doctoral candidates time for career development activities and transferable skills training.
- Encourage the participation of researchers in transferable skills training, in particular to strengthen their skills in "collaboration and teamwork" and "project management".
- Initiate, encourage and/or strengthen collaborative research activities (inter-lab, inter-project, inter-university and/or inter-sectoral).
- Encourage doctoral and postdoctoral candidates to carry out internships and/or research stays within and outside the academic sector.
- Find out about existing support systems within universities (e.g., job fairs, information sessions, mentoring programmes, etc.) and encourage the participation of early-careers researchers in these activities.
- Support doctoral candidates in creating a "career development plan" , which defines training needs, taking into account their career aspirations.

❯ Doctoral candidates

- From the beginning of your doctoral training, reflect on the career path you would like to pursue after obtaining your degree.
- Inquire about existing career opportunities within and outside of academia.
- Self-assess your skills using existing tools (e.g., "Yes I can! Assessing my doctoral skills") to understand which skills you need to reinforce or acquire.
- Create your "career development plan" with the help of your professional network (e.g., doctoral supervisors, thesis committee, career management professionals, etc.) to define your training needs, taking into account your career aspirations.
- Participate in transferable-skills trainings within universities and pay particular attention to the acquisition and strengthening of "collaboration and teamwork" and "project management" skills.
- Take advantage of the existing tools and supports mechanisms available at universities (e.g., job fairs, information sessions, mentoring programmes, career centers, etc.)
- Participate in collaborations at different levels (inter-lab, inter-projects, inter-universities and/or inter-sectors).
- Find out about opportunities for internships and research stays within and outside the academic sector.

- Use the "PhD Employers' Directory of the Observatory" tool to search for employers working outside the academic sector who are interested in hiring doctorate holders.

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