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ABOUT THE PROJECT

DISCOVERY LEARNING pursues a new training model in the curricula for early-stage researchers (ESRs) in order to promote a set of transferable skills related to Open Science and Innovation in their pathways, achieving replicable and sustainable results over time.

Its ultimate goal is to establish a set of knowledge performance indicators (KPIs) about what works in higher education for training **transferable skills** related to open science and innovation and, in doing so, to broaden the spectrum of career and job opportunities for the young researchers.

For this purpose, DISCOVERY LEARNING model involves **different players** (academic, non-academic and practitioners) and **types of training** (digital, gamified & work-based), taking advantage of open education and lifelong learning paradigms.

THE TEAM



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Project Coordinator



UniOslo - Norway

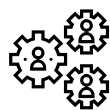


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GLOSSARY



TRANSFERABLE SKILLS

Ability or expertise which may be used in a variety of roles or occupations, such as the capacity to be entrepreneurial, manage complex information, think autonomously and creatively, use resources, communicate effectively and being resilient.



GAMIFICATION

Process of using mechanisms to help gaining the attention of the trainee, enhancing their confidence, and motivating them to learn. It includes a component of desire, implication and motivation.



REAL WORK-BASED LEARNING

Resource to make students get to practice over real tasks or cases which are alive (happening in real time, really owned by somebody: a professional, a company, an institution, etc.)



INNOVATION

The practical and active implementation of ideas to result in reaching impact in societies, and potentially, markets.



SKILL

The proficiency, facility, or dexterity that is acquired or developed through knowledge and experience. Skills are learnt and are dependent upon deliberate practice driven by enthusiasm and commitment.



LIFE-LONG LEARNING

Provision of formal and informal learning opportunities throughout people's lives in order to foster the continuous acquisition of knowledge and skills needed for the labour market.



COLLABORATION WITH PRACTITIONERS

Process of understanding between learners and task owners in order to develop higher order skills (interpersonal, managerial and communication) and get better academic results, as well as gain better employability prospects.



LEARNING

The personal process of acquiring and developing knowledge, skills and competences by training.

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Set of recommendations to emphasizes innovated methodologies to engage PhD candidates and early-stage researchers in general into continuous training skills.

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INTRODUCTION

The purpose of this document is to provide **guidelines for improving doctoral education** and its effectiveness in terms of innovated methodologies and the implementation of an agenda of skills related to Open Science and Innovation.

It is aimed to European policymakers on doctoral education and leaders of Higher European Institutions (HEIs) interested in supporting an agenda of skills ([European Agenda, 2020](#)). This white paper provides consistent recommendations for this group of decision-makers, giving a new perspective on doctoral training educational systems and keeping their activities and processes up to date and responsive to new challenges for future researchers.

The recommendations listed in this document are the result of a wide consultation process. It has included a number of practitioners, professors and PhD candidates and other relevant stakeholders, who have participated in our focus group and our advisory board, and also the implementation of different experimentation protocols that allowed us to extract data from primary sources. In total more than 500 people from 4 different continents (Europe, America, Asia & Africa) have directly participated in this process.

This white paper argues that doctoral education should include a **specific curricula on transferable skills related to Open Science and Innovation** in order to increase the capabilities of early stage researchers and help them engage in innovation processes (regardless of sector or type of innovation). This action should lead to more resilient and well-prepared researchers capable to obtain wider perspectives on employment possibilities and face future challenges in a scenario of constant changing. It also considers challenges regarding the lack of efficient mechanisms of life-long learning and mechanisms of skills recognition, at this educational level, in order to enhance the curricula of transferable skills at all stages of a research career.

DIAGNOSIS

The increase in scientific production, the growing competition amongst young talents and the linkages to the job market outside academia have been accompanied by the development of new forms of doctoral training provision in many European university systems.



Also, the [Innovation Union Scoreboard](#) and the [Innovation Indicator](#) show significant gaps in the national innovation capabilities of Southern and Eastern European countries. This evidence has important implications for Europe's innovation curricula and the need to reinforce it at all levels of education.

At this regard, DISCOVERY LEARNING promotes a common framework of transferable skills (TS) related to innovation to foster the innovative capacities of the European Research Area, promoting cohesion and equality mechanisms, and re-ducing possible gaps generated in the system.

The traditional "master-apprentice model" of doctoral education, existing in many varieties, is increasingly supplemented, superimposed or replaced by forms of so called structured doctoral education. Structuring doctoral education means achieving flexible structures to expose early-stage researchers to a wide range of opportunities, guiding students within their professional and academic development. In this line, DISCOVERY LEARNING wanted to **contribute to this process of "academic transition"**, putting the so-called "agenda of skills" at the core debate.

The [renewed EU agenda for higher education](#) is being focused on developing policies in EU countries and it provides strategic directions to the Member States such as (1) building evidence about what works, (2) supporting cooperation, mutual learning and targeted policy advice between governments and involved authorities, (3) strengthening the capacity and outputs of HEI's by funding innovative cooperation projects, (4) supporting international mobility, and (5) strengthening collaboration between higher education, research, and business.

Thinking about PhD candidates and young holders, from the perspective of the EU agenda for higher education, it is important to recognize four additional aspects: (1) their accumulated investment in building capacities and knowledge is the highest, (2) the learning should be applicable to the learner's work, (3) the training methods need to be adjusted, (4) trainers and institutions will increasingly need to address digital-native adult learning needs.


These additional aspects foster **new ways of learning** and teaching to increase flexibility and stakeholder interaction, allowing students to **acquire skills and experiences** through activities based on "real-world problems".


DISCOVERY LEARNING was focused on this path of exploration and pedagogical innovation, experimenting with new ways of learning in the short, medium and long term, and increasing the competitiveness of future researchers within the academic context and beyond.


DISCOVERY LEARNING aimed at experimenting towards an open, participatory, empowered and evolutionary work-based learning in PhD programmes for effectively training transferable skills related to open science and innovation, based on the well-known premise that students must work actively if they want to achieve a deeper learning.

In this context, DISCOVERING LEARNING has proposed tackling **three specific challenges** in the education of ESRs, including PhD candidates, providing answers and gathering evidence to test the effectiveness of our proposals. This white paper focuses in resolving the following challenges, giving direct advice on how to tackle them and providing future recommendations on improving the curricula of ESRs.

Challenge	Scenario	DL proposals
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Transferable skills	 Academic positions and non-academic positions increasingly demand these group of skills.	Acknowledging / Choosing skills. The project focus on TS related to Open Science and Innovation, widening their options in the academic, governmental and private sectors.
Output: Ontology of Transferable Skills		

Innovated methodologies	 Great skills gaps occur at PhD programmes.	Increasing effectiveness of training. The project has focused experimentation around 3 main innovated methods for increasing the impact over transferable skills related to open science and innovation: 1) Enriched activities engaging practitioners, 2) Gamification, and 3) What we are calling “real-work-based-learning”.
Output: Open Educational Experiences (OEEs)		

Life-long learning	 HEIs are developing new solutions to economic, social and environmental problems. These changes need to be consistent over the time and HEIs need to increase innovation focus during PhD programmes	Life-long learning and traceability. The project emphasizes innovated methodologies to engage PhD candidates and young researchers into continuous training of skills
Output: Career Cards		

WHAT TOOLS HAVE WE USED?

To achieve the methodological objectives proposed in the previous section, the team of DISCOVERY LEARNING has designed and delivered a set of tools that allow us to **validate and test out theoretical model** and ultimately, provide us with **robust evidence** to support the recommendations expressed in this white paper.



EXPERIMENTATION PROTOCOLS

Through these experimentation protocols, DISCOVERY LEARNING has tested in real time the innovated methodologies it is committed to (**enriched collaboration with practitioners, real-work based learning and intensive gamification**) and the ontology of transferable skills proposed by DISCOVERY LEARNING by means of different formats (webinars, seminars and mini-projects). The chosen tool to measure its effectiveness was a set of questionnaires and interviews (for the mini-projects) applied at the beginning and at the end of each activity.

The application of these questionnaires and interviews, jointly with other tools that we present below, allowed us to improve our learning model.

The application of these protocols was very useful for leveraging learning and evidence generation around the project's purposes and hypothesis.

Under the principles provided by the Agile Project Management, we have been able to **update our theoretical framework** as the project was being implemented, bringing in new inputs and changes to the experimental protocol.



FOCUS GROUPS

A key aspect of DISCOVERY LEARNING was to engage multiple stakeholders in the process of development and implementation. For that purpose, it was essential to include co-creation at different phases of development, from considering stakeholders' needs and requirements, to ensuring their participation and support during validation and testing processes.

In this case, we have focused our work with stakeholders in the validation and testing processes, using their knowledge and feedback, to discuss the main outputs of the project as well as giving us expert insights on the main issues concerning DISCOVERY LEARNING.

To this end, we have gathered multiple stakeholders from different backgrounds (students, policymakers, VET professionals and lifelong learners) and different professional profiles (professors, academics, practitioners, etc.) organising 3 separated sessions for discussion for each field of expertise (first focused on policy makers, the second on VET and lifelong learning, and the third on early-stage researchers and students)



ADVISORY BOARD



The Advisory Board of Experts (ABE) is an external panel of experts established to deliver continuous inputs and feedback at different activities, deliverables and actions implemented by DISCOVERY LEARNING.

Profiles from academia and beyond -private and public sector- were chosen to consider a diverse and balanced perspective of the supervision, as it is shown in the following list:

CEO

Associate professor

EIC evaluator



Transferable skills

CHALLENGE 1

The latest [recommendations issued by the European Commission to the European Parliament \(2020\)](#) concerning the design and development of a new European area for research and innovation emphasise, among their priorities, the objective of transferring the results of science and innovation to the European productive and economic tissue.

To achieve this objective, it is needed to create a supportive environment in which companies and academia share trajectories and participate in the development of joint projects, but it is also required to train the scientific community to **make it “think outside the box”** and contribute effectively to the generation of added value in close collaboration with other social key players (companies, NGOs, entrepreneurs, etc.).

At DISCOVERY LEARNING we have asked ourselves a question: How could we encourage these training processes for early-stage researchers? We have concluded, in alignment with other research groups and projects ([RA SGHRM](#), [EUA-CDE](#), [Coimbra group](#) among others) that the improvement of transferable skills in the doctoral curricula is a key factor to enhance these processes of exchange and collaborative creation and higher employability.

The determining features of today's society (knowledge society) increasingly demand the ability to update knowledge and skills at all levels of education, which means there is a need to reinforce the mechanisms of innovation and cognitive resilience, thus becoming an essential part of the educational system.

In this context, the outbreak of the COVID 19 has exacerbated the features and effects of the so-called "knowledge society", accelerating the processes of change and requiring faster demands for flexibility and resilience, both in academia and beyond. Against this scenario, the goals of learning are shifting their focus from knowledge acquisition by single individuals to peer knowledge generation.

On the other hand, the [Skills Agenda \(2020\)](#) underlines the need for Higher Academic Institutions (HEIs) to be involved in this process of change and implementation of a skills agenda in their curricula to help society to innovate and **address its big challenges**. Special mention is made about doctoral education, indicating that re-searchers are "at the forefront of science and innovation" and therefore a specific skills agenda needs to be developed. This agenda also emphasises the need to promote mechanisms for learning transferable skills in formal curricula, which are increasingly essential to access the labour market, but they are not sufficiently developed in the traditional academic curricula. DISCOVERY LEARNING is therefore doubly aligned with the action plan designed by the European Skills Agenda, promoting the development of an effective skills curriculum at European Universities, and also actively contributes to this action plan, by creating a new **skills ontology to foster Open Science and Innovation** processes.

SKILL ANALYSIS: DL ONTOLOGY

The project has contributed to the furthering of the skills agenda in the training curricula of doctoral students through the creation of an ontology that emphasises the acquisition of transferable skills and puts the focus on INNOVATION. We conceive that concept as practical and active implementation of ideas resulting in the concrete impact in societies and, potentially, markets.

The skills included in the ontology focus on **three broadly defined stages of innovation** process: IDEA, IMPACT and IMPLEMENTATION.

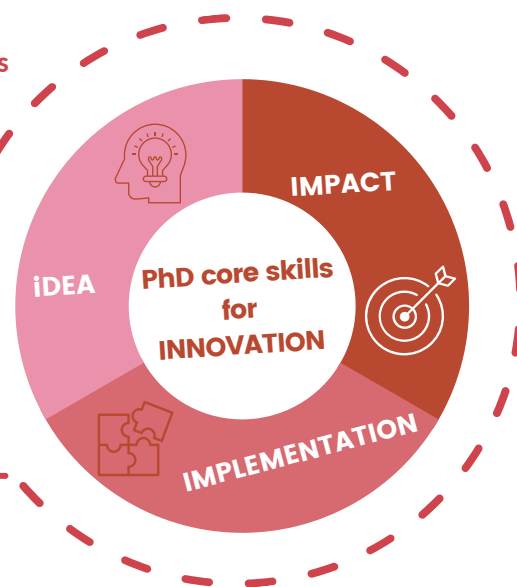
***What skills do PhD holders need to successfully engage in innovation processes and/or to create impact through the innovation?**

IDEA: Skills necessary to identify the problem-need-opportunity and solutions.

IMPACT: Skills necessary to spread or scale up the innovative solution to create a broader impact.

IMPLEMENTATION: Skills necessary to develop innovative solutions and implement them in practice.

INNOVATION: Skills gained via regular PhD training and practicing research.



LESSONS LEARNED & RECOMMENDATIONS

LL.1 **Transferable skills aren't specific of a field, but they have multiple benefits in the career development of academics and beyond, no matter which area.**

Some examples of their positive impact on researchers are: increasing critical thinking, increasing self-confidence, becoming more independent but more enabled to co-create with others.

R Specific trainings on transferable skills should be included in doctoral programmes in order to increase the efficacy and quality of those studies.

LL.2 **We have identified considerable differences in how the role of transferable skills training is perceived across the EU countries** (specifically Spain, Norway and Slovakia). This is linked to different academic cultures, available resources but also different structures of the labour market and demand for the skills possessed by PhD students.

EU and national tools play a crucial role in raising awareness about the importance of transferable skills training for PhDs. However, resources to implement the necessary measures and strategies are still insufficient.

R

Promotion of European tools to foster an agenda of transferable skills across HEIs, to reduce inequalities and increase cohesion across the EU system. The implementation of these tools should contribute, as long as possible, to reduce inequalities and take lessons learnt from countries that have proven to be successful (e.g. in Norway all projects for postdocs need to have a career plan).

The extent of the change expected is quite big and if the European Commission wants the institutions to implement them, additional funding should be provided as, for example, in the case of Gender Equality Plans. Although, EU level tools contributed to awareness about the need to develop the transferable skills and in some countries they are the “game changers”

In the same line, national budgets also should contribute to jointly support this process of change.

Also, clear incentive programmes for researchers should be included to increase the interest of students in joining those trainings (best practices could be learnt from those countries taking the lead).

LL.3

The provision of transferable skills training is often fragmented within research systems at national levels.

Training of transferable skills in PhD programmes is fragmented and very heterogeneous across institutions and programmes. The involved actors have very little visibility about what others are doing (this is the case of Spain or Slovakia).

R

University or national level guidelines (aligned with EU principles) on how to deliver this type of trainings and how they can be homogeneously included in doctoral curricula, could be useful in this transition.

LL.4

Effectiveness of training in (disciplinary and) transferable skill depends on how these courses are incardinated in the development of research plan careers.

This also concerns engagement of employers which should be done in a systematic way to ensure that PhDs' careers take advantage from it.

R

These researcher career plans should be designed and implemented by guide-counsellors, professionals with the necessary resources and time to efficiently advice PhD candidates from the very beginning of their careers until the thesis defence.

Wide range of trainings should be offered so that PhD candidates have an opportunity to choose what is best for them and what fits their careers plans.

Tools such as DISCOVERY LEARNING ontology, can help the actor see the transferable skills in the wider context and understand how they are linked to different career path, allowing them to develop more effective training programmes.

Many transferable skills are developed via the activities that are already in the core of regular PhD training.

LL.5 Transferable skills shouldn't be seen as something parallel to the discipline-related skills, but something that happens simultaneously if researchers raise enough awareness around them.

If PhD candidates understand the skills they have, they are able to better communicate what they can do and they will be more likely to be offered a job that matches their capacities.

R

It is necessary to make transferable skills more explicit and help PhD candidates -and their supervisors- to identify and communicate them in a more accurate way;

- ✓ Increasing researchers' awareness around transferable skills and their importance to different career development paths is very important. In the same vein, it is also highly relevant to make them aware about what level they are being trained on (what falls behind, what remains to be achieved)
- ✓ Supervisors should help PhD candidates to reflect on what tasks they perform, why they do them, and how it contributes to the development of certain skills.
- ✓ Institutions should systematically consider how transferable skills are developed via the activities that took part of doctoral training, also highlight this aspect in the main description of the doctoral programme curricula. The tools provided by DISCOVERY LEARNING, especially the ontology and career cards, can contribute to this process.

LL.6

In general terms, there is a cultural change in how different stakeholders (including academia) perceive doctoral trainings and the role of transferable skills in it.

Transferable skills are key for increasing the employability of PhD candidates, in the industry and the private sector, but also in academia.

R

In the last years, this progressive cultural change is also reflected in how EC approaches the researcher's skills. Earlier it was a domain of Directorate General (DG) Research. Now, DG Employment is also involved, and researcher skills are perceived as one of many categories of professional skills.

This path should be continued, and it also should include all actors involved in the employability and training of PhD candidates (industry, academia and students) to better link the industry's needs and the offer from academia.



Innovated methodologies

CHALLENGE 2

DISCOVERY LEARNING vision seeks to set a more **effective, flexible and motivational training** of transferable skills related to Open Science and Innovation.

The importance of training processes to fulfil this vision has been briefly mentioned along the previous chapter, with particular focus on reinforcing highly efficient adult learning and leveraging experience-based mentored learning. In this new chapter we will address the fundamental elements related to our vision, which are taking full advantage of training technologies and its instruments.

In this context, the outbreak of the pandemic has also strongly conditioned the mechanisms of resilience and methodological adaptation of teachers to this new educational scenario, highlighting the **need** for higher education institutions to **develop strategies of digital reconversion and hybrid learning**.

Traditional teaching/learning methodology needs to evolve and best methods are to be identified to improve the required skills of the teachers and students. There is a strong need to change pedagogy from fact-based traditional lecturing to **interactive teaching** with the aim of fostering durable and employability skills.

Many academics are only used to traditional teaching methods and find it challenging to commit to learning and applying new approaches to teaching, but at the same time, this becomes a big obstacle to delivering better quality education to ESRs. The lack of incentive structures, the busy agenda of the supervisors or the insufficient capacity to develop PhD training schemes, are some of the reasons that explain the inefficiency of the system.


(Innovating Professional Development in Higher Education, 2019)



OPEN EDUCATIONAL EXPERIENCES-OEE

In order to contribute to the continuous improvement and evolution of training methods, we have created the Open Educational Experiences, a set of educational cards that allow the exchange of individual teaching experiences of trainers in the application of innovated me-

thodologies (i.e: different ways to implement enriched collaboration, gamification and real work-based learning) with the whole teaching community, with the goal of continuously improving this collaborative teaching-learning process.

RESOURCES	GUIDELINES & ADVICE FROM THE AUTHOR		
OEEs	Author 		
	Advantages and benefits 		
	Duration 	N° participants 	Age  Modality 
	Transferable skills trained 		
	Case studies & testimonials 		

LESSONS LEARNED & RECOMMENDATIONS

LL.7

There seems to be a slightly negative correlation between the number of skills developed and the perception of effectiveness of the training, meaning that the greater number of skills trained simultaneously, perception of efficiency by participants tends to lower. Also, it was noted that the full agenda of the PhD candidates makes it necessary to focus on the number of competences covered by the training curricula.

R

In line with the recommendation LL.4, more initiatives for allowing students to “design” their training path on transferable skills should be promoted. With the support of professional advice, researchers should be given the opportunity to design their own development plan (for which they need to be supported / trained into) to maximize the impact and optimize the time of the training received.

LL.8

The implementation of courses focused on training specific transferable skills instead of contents, are more effective in terms of motivation and acquisition of these new skillsets.

R

The trainings on transferable skills should be more focused on the process (how it is done) than on its theoretical approach.

LL.9

The online format of DISCOVERY LEARNING webinars and their short format has proven to be highly appealing to students as well as effective.

R

New technologies maximise resources and improve time efficiency. European universities must take profit from these possibilities to provide these trainings in collaboration with other universities and actors beyond academia, while maximizing the available resources.

LL.10

The international character of the trainings allows students to discover other cultures and learn complementary skills related to communication and team building.

R

This modality shows a huge opportunity for European universities to create synergies and launch partnership initiatives with other HEIs. These initiatives can also contribute to shortening the European innovation gap that we mentioned in the previous section.

LL.11

The multidisciplinary character of the trainings creates opportunities for peer interaction with students from different disciplines highly valued by participants.

R

This feature allows the optimization of the resources allocated to implement these trainings, creating training programmes for PhD candidates from different disciplines and scientific fields under the same umbrella.

This modality is also an open door to building bridges between students from different disciplines (seldomly connected in other kind of situations).

LL.12 The implementation of enriched activities with practitioners increased the engagement of trainees during these sessions, becoming more interactive, proactive and profitable for all parts involved.

Also, VET shows that experiences always provide meaningful learning processes for students, regardless of the level of training (VET or doctoral education), because they include the acquisition of knowledge, skills and attitudes.

R

More synergies should be created with practitioners, by including internships in doctoral curricula or by providing occasional training with practitioners.

In this sense it is also important to adopt the approach of “training the trainers”, a practitioner may be a great expert in his/ her discipline, but he/she must also know how to appropriately transfer their knowledge.

One interesting idea that comes from VET systems, is the implementation of dual training programmes with practitioners from other sectors beyond academia.

Some pilot projects have already been implemented in academia, such as industrial doctorate programmes, with excellent results; but it would be interesting to explore the possibilities in other fields of research.

LL.13

The application of gamification methodologies in these sessions increases the motivation of the trainees and therefore the effectiveness and efficiency of the learning process.

In doctoral programmes, students start from an inherent motivation to know and learn, so that the methodological and pedagogical relevance of using innovated methodologies (such as gamification) is often neglected. However, we have identified that the challenge of teaching a greater volume of content (much more complex and difficult to understand) makes the methodological value of explanations still to be a key element in the learning process.

R

This situation evidences the need to implement continuous innovated training programmes for supervisors and trainers on transferable skills. If universities decide to apply these methodologies in its learning programmes, these are expected to improve, and so will the interest of the students to join them.



Life-long learning

CHALLENGE 3

The outbreak of COVID-19 had also a significant impact on the European economy and labour market, and life-long learning must become an alternative for everyone, including early-stage researchers, since the crisis has further accelerated changes on the required positions and profiles. In this context of constant flux, skills “will make the difference between staying ahead of the curve or falling” (Mathias Cormann, OECD Secretary-General) and countries need to reinforce its commitment to lifelong learning programmes that involve all key stakeholders.

At this regard, the [New Agenda for Adult Learning \(2011\)](#) underlines the need for **holistic adult learning and education provision** that takes into account the needs of all groups of learners, from a bottom-up perspective of the educational system.

Under its efforts to reinforce the formal and non-formal system of adult training, the European Union has created a new tool: **microcredentials**. The microcredentials are an initiative to recognise the results obtained in short courses, often in the digital field. They can increase permeability between different education pathways/systems and improve flexibility. This new system was proposed by different strategic documents ([EU Skills Agenda, 2020](#); [Council Recommendation on Validation of non-formal and informal learning, 2012](#)) to allow individuals to gather learning outcomes over time and across institutions, sectors and borders and also online through e-learning platforms.

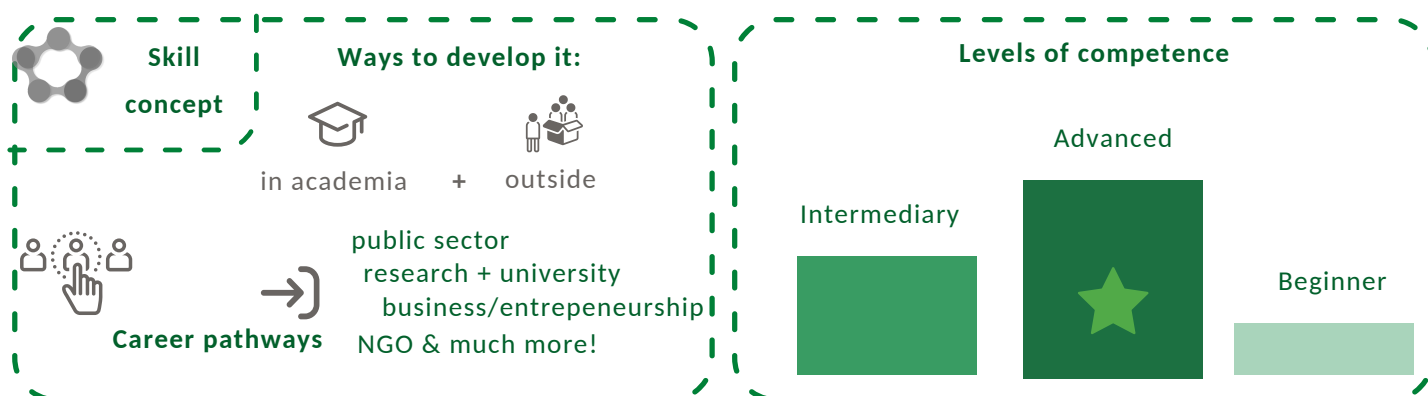
Another initiative that should be considered is the [The European Qualifications Framework \(2018\)](#), a tool designed to help individual citizens pursue their learning and employment careers, providing a reference framework of qualifications that links the interests of workers, students and trainers from all educational levels. Although this tool seems to have a better impact in their applicability to other educational systems (such as VET system) it provides an interesting opportunity for matching the educational needs of PhD candidates with the interests of the labour market, facilitating the process of life-long learning and helping learners make decisions on further education and training.

Following the previous framework and pursuing our path to strengthen life-long guidance mechanisms at the UE, DISCOVERY LEARNING supports the implementation of blended learning models, since this type of learning is rooted in the idea that **learning is** not just a one-time event, but a **continuous process**. It provides baseline benefits by using single learning delivery medium alone. These types of mechanisms also provide comfortable accessibility and flexibility to potential students and essential elements for promoting adult learning at all levels of education ([Council Resolution on a New European Agenda for Adult Learning 2021-2030, 2021](#)).

CAREER CARDS

Based on the ontology of competences mentioned above (challenge 1-p.9) DISCOVERY LEARNING has created a system of 'career cards' that develop each of the competences presented in this ontology and provides guidance for students and workers interested in acquiring and deepening each of these competences in the medium and long term.

These cards offer detailed information on the definition of the presented skill, the levels of qualification, training opportunities (within and outside academia) and professional opportunities for which it is essential to develop this skill. The aim is that users can find out in a practical and simple way how to train and/or re-inforce the skills that are part of this ontology and make them aware of the implication's skills may have in their professional life.



LESSONS LEARNED & RECOMMENDATIONS

LL.14 Transferable skills are usually related to formal trainings specially needed for early-stage researchers, but career development does not finish at the postdoctoral stage.

R

Transferable skills training should not be limited to ESR and should be perceived as a part of life-long learning for established researchers. The key role of established researchers in training transferable skills of early career researchers needs to be reflected in the training delivery.

According to this, it is recommended to also train their supervisors and senior researchers (whether they stay in academia or not) because they are gate openers to the researcher's community for ESRs and they also contribute to hold together the institutional culture.

LL.15 Matching the possibilities of academic sector with the needs of other sectors to promote employability is still a challenge. Besides, one of the grey areas of the collaboration between academia and other sectors is the lack of ability to meet the needs and expectations of both sides. Academic researchers lack the skills and incentives to co-create with other stakeholders.

For promoting bridges between academia and other stakeholders there is a need to develop transferable skills to enable co-creation. They are crucial for researchers in academia and also can bring academia closer to other sectors.

An overview of sectors that appreciate innovative, analytical thinking and PhD's accumulated knowledge should be a part of the career guidance.

LL.16 Many transferable skills are developed via the activities that are in the core of regular PhD training.

R

If PhD candidates understand the skills they have, they will be able to better communicate what they can and they are more likely to gain a job that is relevant for their qualifications. It is necessary to make them more explicit and help PhD students (and the supervisors) identify and communicate them.

LL.17 Transferable skills training should not be limited to early careers researchers and should be perceived as a part of life-long learning for established researchers too.

Engaging established researchers in transferable skills training is also important as they are the gate openers to the researcher's community for ESRs and they also form the culture of the institutions.

The challenge is how to engage supervisors in this type of training as they are usually hesitant to take part in "training for supervisors".

LL.18 Online and hybrid formats have proven to be highly efficient for providing these types of complementary sessions to students and workers.

Based on our own experience at DISCOVERY LEARNING, ESRs declared their interest in maintaining other trainings in employability and transferable skills, as far as they could do it through online course. In many cases, this is the only chance to make this kind of training compatible with their busy calendars.

R

The offer of trainings on transferable skills should be adapted to the post-pandemic scenario, where learners and trainers are more used to hybrid and online formats for receiving all types of trainings / especially those perceived as complementary, such as the case of transferable skills.

The introduction of these technologies should lead to more flexibility and adaptability, and also, to retain more researchers of all stages interested in joining the life-long learning community.

Nevertheless, it is worth highlight the two major challenges of this new format of training: adaptation of the pedagogical mechanisms applied (on-site trainings are not the same as online or hybrid) and the importance of the dissemination mechanisms that allow the proper communication of these kind of activities to the target community.

LL.19 The micro-credentials (Skills Agenda, 2020) have a great potential, particularly for developing digital and language skills, and provide high levels of flexibility and adaptability for students & workers interested in updating their skills background.

The development of this type of qualifications is essential to foster cross-sectoral mobility. In addition, it facilitates the application of the same skillset that enable candidates to move across different sectors.

R Academia and other HEIs should explore consortia options for providing these kind of courses; some inspiring examples are the [Digital Credentials Consortium](#) and the [European MOOC Consortium](#). Institutions can benefit from sharing costs, lowering risk, and expanding offerings to the key stakeholder groups (students, employers, and partners).

At the same time, HEIs should be cautious when implementing these types of programs, watching them as a complement and not a unique tool for life-long learning. With proper planning and investment, integration with other key institutional programmes, and focus on the expertise offered by each university, the micro-credentials may become an opportunity to other forms of collaboration with private sector and employers and other providers that expand opportunities for the institution and for students.

For promoting bridges between academia and other stakeholders there is a need to develop transferable skills to enable co-creation. They are crucial for researchers in academia and also can bring academia closer to other sectors.

An overview of sectors that appreciate innovative, analytical thinking and PhD's accumulated knowledge should be a part of the career guidance.

LL.20 Build learning communities could increase the motivation of participants to learn in the medium and long terms and facilitate lifelong learning.

R Initiatives to create alumni communities should be undertaken, proposing activities and different specific events that unite the former students and facilitate life-long learning processes.

KEY REFERENCES



[A strategic reset: micro-credentials for higher education leaders \(2022\)](#)

The purpose of this article is to provide university leaders with guidance on micro-credentials to help institutional leaders assess their readiness and alignment to engage in the micro-credential market.



[European Agenda of Skills \(2020\)](#)

The European Skills Agenda is a five-year plan to help individuals and businesses develop more and better skills. This agenda underlines the need for Higher Academic Institutions (HEIs) to be involved in this process of change and implementation of a skills agenda in their curricula to help society to innovate and address its big challenges.



[GreenComp: The European sustainability competence framework \(2022\)](#)

GreenComp identifies a set of sustainability competences to feed into education programmes to help learners develop knowledge, skills and attitudes that promote ways to think, plan and act with empathy, responsibility, and care for our planet and for public health. The implementation of an agenda of transferable skills is directly linked to application of RRI principles in science and fosters a field of research more connected with society, more gender sensitive, more ethically oriented etc.



[Innovating Professional Development in Higher Education \(2019\)](#)

This report presents a discussion on how innovative professional development practices in higher education can help improve the teaching and the career progression of academics, supporting the principle that the application of these methodologies has an impact in the quality of the knowledge and skills acquired.



[Innovative teaching methods in higher education](#) (2020)

This paper holds the need to need to change pedagogy from fact-based traditional lecturing to interactive teaching with the aim of fostering durable and employability skills. To address this problem, innovation in teaching and learning has become essential.



[New Agenda for Adult Learning 2021-2030](#) (2021)

The Agenda highlights the need to increase participation in adult learning of all kinds (formal, non-formal and informal learning). It also emphasizes the importance of promoting these areas to foster inclusion and engage all society stakeholders in the knowledge society.



[The European Qualifications Framework: supporting learning, work and cross-border mobility](#) (2021)

The EQF is defined by eight learning outcomes-based levels (including doctoral education). Accompanying level descriptors show how expectations of knowledge, skills, autonomy and responsibility increase as learners progress from level 1 to level 8. These levels, along with the descriptors, function as a translation grid and make it possible to compare professional qualifications from different countries and institutions and providing a common language between education, training and labour market.



[The Impact of Horizon 2020 on Innovation in Europe](#) (2015)

The Innovation Union Scoreboard and the Innovation Indicator show significant gaps in the national innovation capabilities of Southern and Eastern European countries. This shows the need to turn on the Innovation Growth Machine in Europe.

DISCOVERY LEARNING DELIVERABLES



[D.1.1 DISCOVERY LEARNING ontology](#) (2022)

This deliverable presents a map of transferable skills related to open science and innovation in order to help understanding and choosing missing skills highly demanded by labour markets and creating great potential for professional and personal growth. This document also includes the studies, analysis and updates carried out until the end of the project.



[D1.2 Report on career counselling activities](#) (2022)

This deliverable contains the compilation of career advise cards for training contents integrated during the pilot and discussion about lessons-learnt during counselling activities.



[D. 2.2 Report on DISCOVERY LEARNING Proof of Concept \(2022\)](#)

This deliverable compiles the analysis of experimental results during Discovery Learning, presenting the applied model and showing the most significant results from their application. The report presents indicators about activity, performance, results and impact achieved blended implemented, analysis of data and scientific conclusions.



[D.2.3 Report on the creation of DISCOVERY LEARNING Community \(2022\)](#)

This deliverable explains the strategic approach to the creation of a community around Discovery Learning's results, mainly the webinars and mini-projects and related research data and activities, the ontology of skills and related career development cards, the platform of Open Educational Experiences (OEEs), and Discovery Learning White Paper.



[Research data from project to open data pilot \(2022\)](#)

DISCOVERY LEARNING has published the quantitative and qualitative data gathered during the implementation of our experimentation protocols (webinars for ESRs). All the data is accessible and free in the open digital platform zenodo.

DISCOVERY LEARNING RESOURCES



[OPEN EDUCATIONAL EXPERIENCES \(OEE\)](#)



[CAREER CARDS \(CC\)](#)



[ONTOLOGY OF TRANSFERABLE SKILLS
RELATED TO OPEN SCIENCE AND INNOVATION](#)