

## IDENTIFYING THE PH.D. STUDENTS' NEEDS FOR CAREER ENHANCEMENT SKILLS

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### Abstract

In the past few years, it has been seen that an increasing number of Ph.D. graduates are following a career outside academia. CHAMELEONS<sup>1</sup> project has undertaken the role of identifying and fulfilling the needs of Ph.D. students for following a career in the industry in digital health. This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 873105. The overall aim of CHAMELEONS is to firstly identify a range of modules and secondly co-design and deliver three interdisciplinary, inter-sectoral, and international modules which will broaden the skills of 15 Ph.D. students/Post-Doctoral Fellows to improve their employability in both academic and non-academic environments. CHAMELEONS' consortium offered the opportunity to the Ph.D. students participating in the project to attend some modules in fellow universities and outside their Ph.D. program. This work presents the choices of the students. Students were called to identify one to three modules based on their needs and interests. To that end, and towards identifying the quantitative and qualitative characteristics of the selected courses, a questionnaire was developed. The questionnaire was implemented as part of an online google classroom resource where information about the available courses for selection was made available. The questionnaire answers were completely anonymous. The questionnaire attempts to attain information regarding these courses at two levels: (i) background and skills that the students recognized as underdeveloped and the tools they used to identify them, (ii) preferences of students in terms of interest, reasons, and motivation of selection and the skills (provided by the European classification of Skills, Competences, and Occupations - ESCO<sup>2</sup>) they aim to acquire through these courses. 13 students replied to this questionnaire, all coming from diverse backgrounds (health-related or health technology-related) and the majority used a self-awareness/self-assessment tool to identify the skills that they need to improve and make their decision. Moreover, students selected courses that do not actually improve a hard skill needed for their research, but soft skills in the business and career management direction, focusing mostly on creativity, innovation, and communication. Finally, students are willing to attain what can be considered necessary for building a successful career in every sector. To conclude, our study suggests that Ph.D. students have a need to develop skills beyond their basic scientific education. These skills are related to the perspective of developing a successful career plan and being competitive in the occupational arena.

**Keywords:** *PhD courses, extra-curricular activities, career enhancement.*

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### 1. Introduction

As life expectancy has grown through the last decades, a need for more efficient healthcare systems has risen to support the increasing number of patients' care needs. Introducing state-of-the-art technology in healthcare has become essential in healthcare delivery. This intersection of disciplines is known as Connected Health (CH) (Caulfield et al., 2013). CH can relate to a wide spectrum of disciplines, which introduces the need to overcome disciplinary barriers and achieve inter-disciplinary interaction (Chouvarda et al., 2019). To achieve this, inter-disciplinary educational methods need to be introduced, (Mountford et al., 2018). CHAMELEONS project focuses on training 15 PhD students, through: (i) identifying and making available and (ii) co-design and deliver interdisciplinary, inter-sectoral, and international modules to improve their skills and employability, in a wide range of sectors, including academia, industry and entrepreneurship.

<sup>1</sup><https://www.chameleonsproject.eu/>

<sup>2</sup>[https://esco.ec.europa.eu/en/classification/skill\\_main#overlayspin](https://esco.ec.europa.eu/en/classification/skill_main#overlayspin)

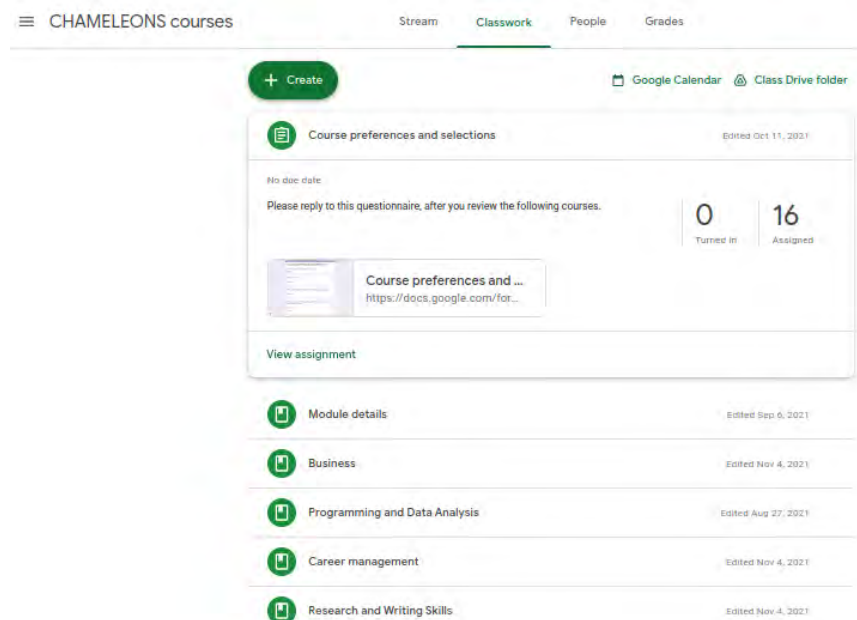
During the project's lifetime two surveys were undertaken across the consortium to gain the views of those who take interdisciplinary, inter-sectoral and international modules (young researchers) and those who design and implement such courses (Program Directors or equivalent) (Kosvyra et.al, 2021). The results of these surveys identified the impact of these courses on future career challenges, determine gaps and use this information to develop innovative educational interventions. These surveys also produced a list of modules that both groups considered helpful for the students' career opportunities. This list of courses was made available to the students participating in the CHAMELEONS consortium as PhD modules that broaden student perspectives beyond academia. Students were called to choose one to three modules based on their needs and interest, that they were willing to attend. To that end, and to identify the characteristics of the selected courses and the motivation of the students, a questionnaire was developed aiming to identify how students recognize their needs and how they address them.

## 2. Design & implementation

The questionnaire presented in this article was developed to attain information about the students, their needs, and preferences at two levels. In the first level, it attempts to obtain more general information about the background of each student, the skills that the students recognized as underdeveloped and the tools they used to identify them. Moreover, students were asked which of the modules that they become available to them, they found interesting/useful for their career development during the first screening and considered them as potential candidates for attending. The second level of questions aims to attain information about the specific preferences of students for the courses made available to them, meaning how many and which courses they decided to attend. Moreover, students were asked for information about these specific courses in terms of interest, reasons, and motivation of selection and the skills they aim to acquire by these courses. With respect to the skills, students were called to identify them from a list of skills provided by the European classification of Skills, Competences and Occupation (ESCO).

The questionnaire was implemented as part of Google Classroom that was built to provide the courses information to the students in a condensed and detailed way. The classroom contains four categories of courses, as depicted in Figure 2, and the survey was added in the format of a Google Form on top of this list. This way the students could review the list and, in parallel, answer the questionnaire. The answers were completely anonymous and no personal information was requested by the students.

Figure 1. Implementation of the survey in Google Classroom.



## 3. Results

The results presented in this work are divided into two categories, (i) the attributes of the courses and (ii) the survey results.

The results of the first category were acquired through the consortiums' procedures to gather and present the courses to the students and focus on their properties and popularity. Table 1 depicts the selected courses' titles, the duration of the course, the university that delivers each course, the number of students that selected it and the delivery mean. It is worth mentioning that the courses are available through the 5 universities participating in the CHAMELEONS project, namely Aristotle University of Thessaloniki (AUTH) in Greece, University College Dublin (UCD) and Maynooth University (MU) in Ireland, University of Porto (UP) in Portugal and University of Oulu (OULU) in Finland. This information was made available to the students prior to their investigation along with the content details.

*Table 1. Overview of the Selected Courses.*

Course	Length	Location	Popularity	Accessibility
Creative Thinking & innovation	1 week	UCD	6	Face-to-face
Communication for Impact	1 week	UCD	2	Face-to-face
Social Entrepreneurship	8 h	MU	1	Face-to-face
Design your Purposeful Life	1 week	UCD	1	Face-to-face
Basics in eHealth	5 weeks	OULU	1	online
Computational medical research	6 weeks	AUTH	1	online
Scientific Writing and Publication	81 h	UP	1	Blended
Data mining	6 weeks	AUTH	1	online
Entrepreneurship: application and mindset	1 week	UCD	1	Blended
Exploring Intellectual Property	1 week	UCD	1	online

Among the 15 students from universities across Europe that are participating in the CHAMELEONS project, only 10 decided to attend courses. One student chose not to attend a course but used this opportunity for a short-term placement in another university to perform part of his/her research. As concerns the four that opted out, the reasons were mostly the limited time to offer in an activity outside their PhD program and the fact that they already have fulfilled the number of ECTS required to complete their studies. For the rest of them, 2 students selected 3 courses, 2 more students selected 2 courses, while 6 students decided to attend 1 course.

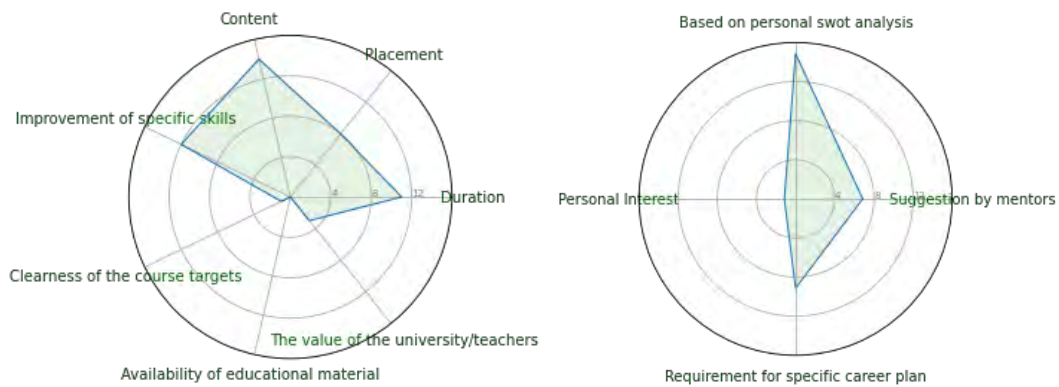
The questionnaire was answered by 13 students coming from diverse backgrounds. Specifically, 7 of them come from a technical/engineering background, 2 of them from the Business field, 3 of them from Education (Physical/Health) and 1 from a Healthcare background. 12 students used one or more swot analysis tools to identify their underdeveloped skills before they made their decision on the course that they will attend. Most students used MyIDP tool<sup>3</sup>, while other choices were a SWOT Analysis, use of the PhD competencies model, Career Goal Setting Tool, and Career Development Toolkit for Researchers.

The underdeveloped skills identified belong to a wide range of skills, including mostly communication and creativity/innovation skills, and many others as business, presenting, research, teaching, time & project management, teamwork, data analysis and interpretation, and academic publishing skills. The courses from the Career Management and Business categories were identified by the students as the most interesting. The most popular course was 'Creative Thinking and Innovation', followed by 'Communication for Impact,' 'Creative Thinking & Problem Solving' and 'Design Thinking for Innovation' as it is inferred by figure 3(a).

The 10 courses that were selected, already presented in Table 1, are counted for the analysis as 16 individual selections representing all the students' preferences. With regards to their categorization, 9 of them belong to the Business category, while 5 are in Career Management and 2 in Programming and Data Analysis. The most voted reason for selecting a course was the content of the course voted by 14 participants, followed by the specific skills' improvement -12 participants-, the course duration -11 participants- and the placement -8 participants-, while attributes like the value of the institution, the clearness of the objective and the available material appeared less important. 13 students selected the specific courses based on their swot analysis, 8 of them because specific skills were required for their career plan, while for 6 of them it was suggested by their mentoring panel. Only one student considered personal interests as a motive. Figure 2 summarizes the students' motivation and reasons for selecting specific courses.

<sup>3</sup><https://myidp.sciencecareers.org/>

Figure 2. Comprehensive view of student's reasoning for their choices.



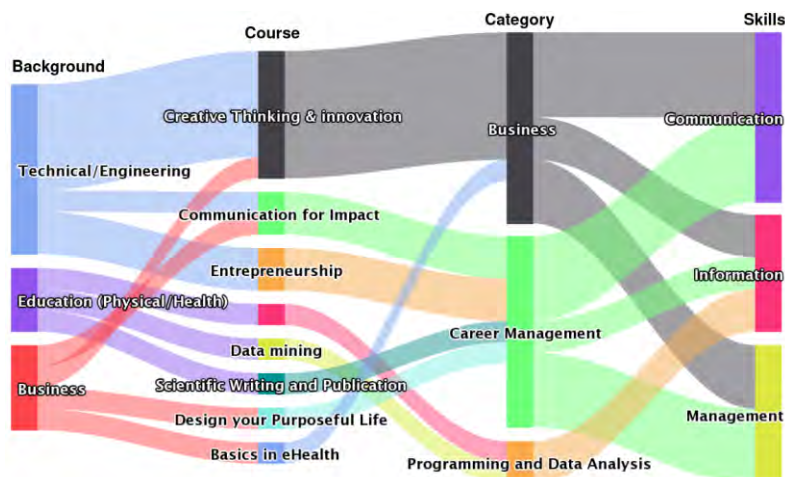
The specific skills that students aim to improve by the courses that they selected belong to 3 categories, 31 in Communication, 22 in Information and 26 in Management skills, while no student considered that the selected course will improve Computer Use related skills. Although 2 courses in Programming and Data analysis were selected, students aim to achieve Information Management and computer skills. Figure 3(b) shows these skills in detail, capturing which of them were the most popular. It seems that students are heading towards two directions, one is more practical and focused on developing plans to solve problems and create new products, while the other is more personalized including skills as processing and presenting information or making decisions. Figure 3 depicts a comparison of what courses students found interesting and what they aim to achieve by attending them.

Figure 3. (a) Popularity of the available courses, (b) Popularity of skills that students intend to acquire.



Figure 4 presents a comprehensive view about which course each student selected and from which category, in relation to their background and the skills they aim to acquire from attending the course. It is noticeable that students from a technical background are moving towards enhancing their business skills, while some of them, along with the students from a business background, are focusing on career management.

Figure 4. Comprehensive view of student's choices and expectations.



#### 4. Discussion

Taking into consideration students' responses, most of them considered it essential to use a self-awareness/self-assessment tool to identify the skills that they need to improve and help them make their selection towards this direction. This fact proves that students are aware that they need to improve some skills that are not included in the narrow curriculum of a Ph.D. program and are willing to investigate their deficiencies and take actions to improve their competence in these fields.

It is important also that students seem to look up to the future, since they selected courses that do not actually improve a hard skill needed for their current research, but soft skills in the business and career management direction, focusing mostly on creativity, innovation, and communication. Only students coming from an educational background were interested in developing a more practical skill from the Programming and Data Analysis category. It is worth mentioning that students from Business background were mostly interested in career management opportunities, while students with a technical background focused mainly on the business field.

Moreover, students are willing to attain skills such as designing systems and products, developing objectives, strategies, and decision making, and processing information, skills that are needed for building a successful career in every sector. Students need to develop a multitude of skills providing knowledge on a variety of fields and learn to overcome the cognitive, normative, and regulatory barriers so they can be a part of the CH system (Leniston & Mountford, 2021).

To conclude, PhD students in the wider domain of CH Technologies (Chouvarda et al., 2015), appear to have a need for developing skills beyond their basic scientific education. These skills are related mostly to creative and innovative thinking to create new products and provide solutions to the public. These choices are made based on the perspective of developing a successful career plan and being competitive in the occupational arena, taking also into account that Digital Health requires innovative and robust solutions. This study offers evidence and insights that can form the basis for the enrichment of future PhD programs in Europe.

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