



**A Complete Mentoring Roadmap  
Booklet 1: The Basics of Mentoring in Academia**

**Paula Alexandra Silva\***

University of Coimbra, Department of Informatics Engineering  
paulasilva@dei.uc.pt

**Rebecca Claire Anne Patterson**

Patterson Consulting, Lda  
patt.consulting@gmail.com

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***“Having a good mentor early  
in one’s career can mean the  
difference between success  
and failure in any career”<sup>1</sup>***

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**Please address all correspondence to:**

Paula Alexandra Silva  
University of Coimbra,  
Department of Informatics Engineering,  
Pólo II da Universidade de Coimbra, R. Silvío Lima, 3030-790, Coimbra  
Tel: +351 239 790 000  
E-mail: paulasilva@dei.uc.pt

**Executive Summary**

The main goal of this booklet is to provide a basic understanding of what mentoring is and why it is needed. The principal target audience of this booklet is mentoring programme coordinators or individuals exploring how to create an effective mentoring programme. The topics covered include how mentoring as a good practice can help to address gender equality; some of the definitions used to define mentoring and similar terms; the benefits of mentoring across all STEM areas and in particular for women; evidence at industry and county-level; and addressing different mentoring needs according to the different career stages of the two main target groups of mentees (undergraduate and postgraduate students; and faculty following a teaching and research career within academia) and lastly when transitioning from university to the workplace.

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# The Basics of Mentoring

## ***“Achieve gender equality and empower all women and girls”***

is one of the seventeen United Nations Sustainable Development Goals, which clearly calls for action related to the gender gap in science and technology<sup>2</sup>. One of these actions should be to include mentoring from an early age, that is to say, school-based mentoring, in particular in the field of science and technology. If we consider mentoring to be a ‘good practice’, then it will effectively foster gender equality across a multitude of areas from school-level to career-level, “Good practices are multi-dimensional and address the gender gap in science across many contexts: in society; in school and vocational education; in higher education; in careers; and in research, policy-making and entrepreneurship”<sup>2</sup>.

However, along with creating awareness and promoting good practices, robust and actionable steps are crucial, “By far the most frequent type of initiative involved promoting Science, Technology, Engineering and Mathematics (STEM) careers to girls and young women in school or vocational education contexts; for example, by stimulating interest, providing career information, and presenting role models. But simply telling females about STEM opportunities is unlikely to make a great difference to the gender gap, unless other supporting strategies are implemented”<sup>3</sup>. Mentoring should be viewed as a supporting strategy in terms of empowering women. Therefore, the value of introducing and establishing a successful mentoring programme within academia cannot be overlooked.

## **What is mentoring?**

Mentoring is a very broad term. Megginson et al.<sup>3</sup> define mentoring as, “off-line help by one person to another in making significant transitions in knowledge, work or thinking”<sup>4</sup>. According to Meschitti et al.<sup>4</sup>, “mentoring implies an exclusive relationship in which a more experienced person provides strategic advice to facilitate the professional and personal development of another, less experienced one.”

Although a multitude of mentoring definitions exists in the scientific literature, Cuerrier<sup>5</sup> explains: “Mentoring is a form of voluntary help, which is not necessarily gratis, which favours development and learning, based on an interpersonal relationship of assistance and of exchanges in which an experienced person invests their acquired wisdom and their expertise, in order to favour the development of another person, who has to attain some competences and professional objectives”<sup>6</sup>. When applied more specifically such as to organisations, “mentoring should help the mentee to better understand the organizational context and career opportunities, avoid isolation, and access relevant networks”<sup>4</sup>.

## Mentoring and Sponsorship

However, nowadays, the word mentoring is often used interchangeably with such terms as, “advising and supervising, as well as coaching, leading, teaching, and socialising”. Therefore, Mullen<sup>7</sup> noted that the scope of the definition can be problematic<sup>4</sup>. The differences between mentoring and sponsorship are not always obvious. Both promote career advancement, and mentors may also be sponsors; however, while mentors provide guidance, feedback, and psycho-social support on an ongoing basis, sponsors provide specific strategic opportunities to an individual at a particular time<sup>8</sup>. Peers or more senior colleagues tend to be mentors whereas sponsors are likely to be more senior in rank<sup>9</sup>.

## Mentoring and Coaching

It is also important to distinguish between mentoring and coaching, where the former is directive as the mentor leads discussions, instructs, tells, gives advice, offers suggestions, shares knowledge, experience and skills, and ultimately guides through direction. Mentoring is also less structured in terms of meetings and goals, which are initiated by the mentee. In contrast, coaching is non-directive, short-term, poses questions, allowing the person being coached time to carefully consider the topic and then lead discussions and subsequently go on to reach objectives by themselves. Coaching is helpful to raise awareness, give feedback, ask questions and follows a more rigorous structure<sup>10</sup>. In addition, mentoring is relationship-oriented and development-driven, that is, the mentee sets achievements and goals they want to reach through the mentoring programme. On the other hand, coaching tends to be task-oriented and performance-driven, the coachee needs to perform their tasks<sup>11</sup>.

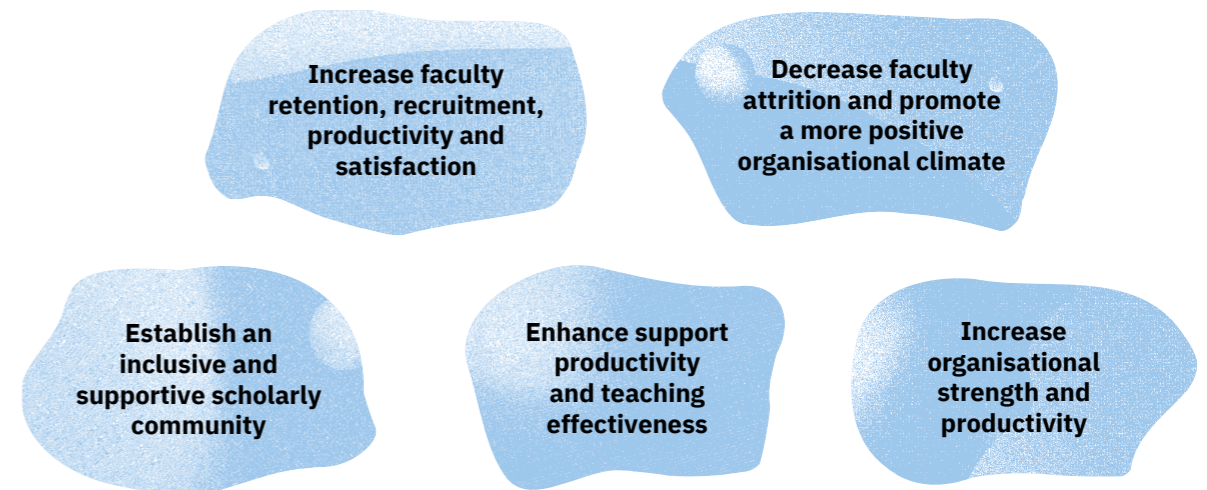
## Advising and Supervising

Advising and supervising are limited to guiding academic progress<sup>12</sup> and primarily involve the transfer of information from advisor to advisee<sup>13</sup>. A supervisor typically manages a team or group of individuals and is accountable for overseeing their work and ensuring that it meets the necessary quality and deadlines.

The distinctions between the abovementioned roles are subtle and individuals may adopt one or more roles at distinct times in their lives. While mentoring, sponsorship, coaching and supervising can all involve providing support and guidance to individuals, there are some key differences between these approaches namely, the focus of support, the relationship between individuals and specific activities.

## Why mentoring?

Mentoring can lead to several benefits within an organisation such as increased strength and productivity, in addition to fostering a more positive climate. In terms of faculty, it can help to establish an inclusive and supportive scholarly community, support productivity and teaching effectiveness, increase retention, recruitment, productivity and satisfaction and decrease attrition as outlined in The Guide to Best Practices in Mentoring<sup>9</sup>, among others, and as detailed in infographic 1 below:



Infographic 1- An outline of the benefits of mentoring.

**Mentoring support should be applied and carries valuable benefits across all STEM fields** and mentorship “is essential to the holistic development of scientists, technologists, engineers, mathematicians, and physicians, including but not limited to developing a strong identity as a STEM professional, developing confidence in one’s ability to work as a STEM professional, and successfully navigating the culture of STEM”<sup>14</sup>.

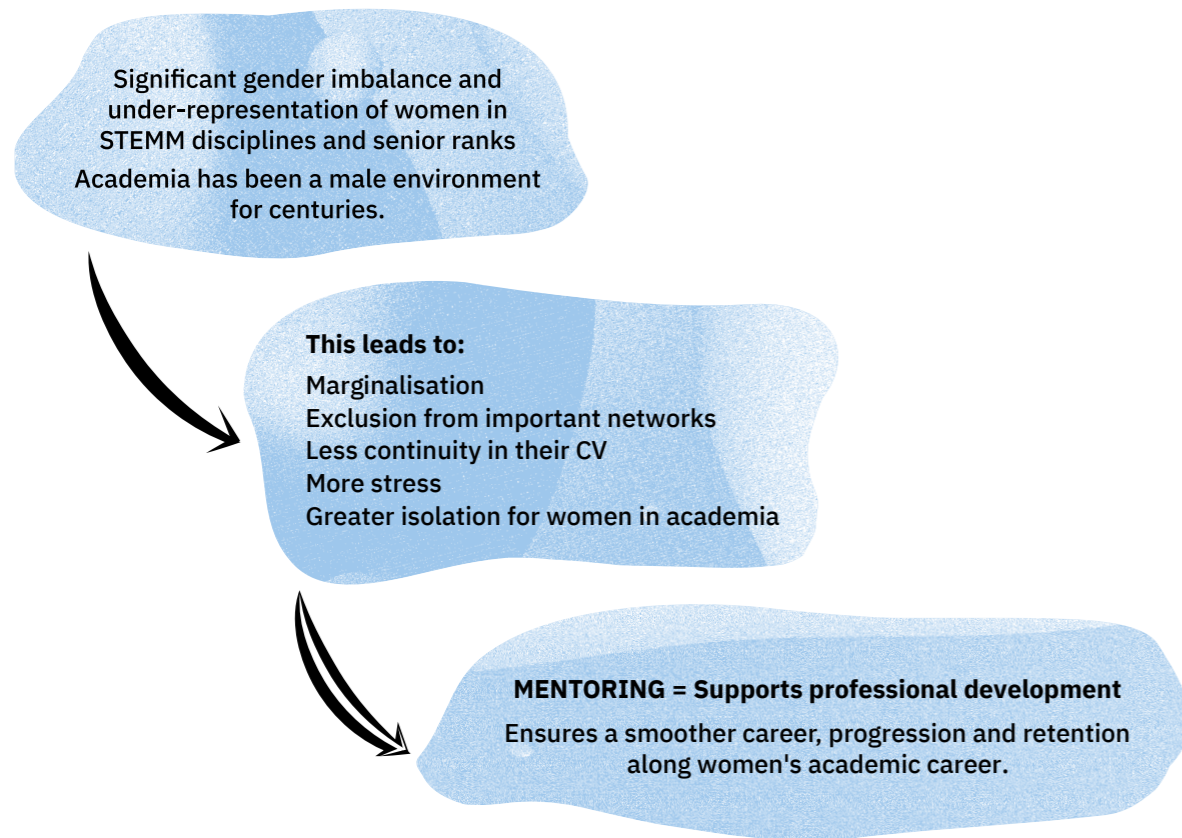
It is particularly important to promote **mentoring programmes to enhance women’s careers**. According to Meschitti et al.<sup>4</sup>, “a significant gender imbalance in science persists, and mentoring has been recognized as an important instrument for fostering academic women’s careers and addressing such imbalance”. Academia is still a male-dominated environment, and has been for a long time, and women remain underrepresented<sup>15</sup>, particularly “in the STEM disciplines, and at the more senior ranks of academic careers, (and) are therefore at risk of being marginalized”<sup>4</sup>. See section 1.3 for more recent numbers demonstrating the sizable gap between men and women in the ICT sector at a European, country-level and in academia.

This can lead to women often not being included in important networks<sup>16</sup>, even if they are not discriminated against openly<sup>17</sup>. As Quinlan<sup>18</sup> recognised and previously pointed out, and that continues to be a pertinent issue today, is how women often follow an academic career that is very different when compared to men, showing less continuity in their CV, and experiencing higher levels of stress and isolation. Therefore,

mentoring is a tool that can be used to support women’s professional development and guide their career path<sup>4</sup>. A higher number of women at the undergraduate level is not sufficient to address the real issue which remains concerning the progression and retention of women on an academic track<sup>19,4</sup>.

Furthermore, Wunsch<sup>20</sup> reports the benefits of one of the first programmes dedicated to women; Johnston and McCormack<sup>21</sup> report on the benefits of a programme designed to enhance the research potential; Madison, Knight, and Watson<sup>22</sup> report the positive experiences in Australian universities. More recently Banerjee-Batist and Reio<sup>23</sup> stress the positive relationship between mentoring and organizational commitment. Nonetheless, challenges persist, because in many universities mentoring is almost non-existent<sup>4</sup>.

As depicted in the infographic 2 below, **mentoring programmes can provide support in terms of professional development**, ensure a smoother career and facilitate progress and retention throughout women’s academic careers given the significant gender imbalance and under-representation of women in STEMM disciplines and senior ranks, as well as the long-standing male-dominated environment in academia that has caused women in academia to be marginalised, excluded from important networks, have less continuity in their CV, and be more stressed and isolated<sup>4</sup>.



**Infographic 2** - How mentoring provides support in terms of professional development.

## Industry and country-level evidence

### Industry: the ICT sector at a European level

Industry and country-level evidence points towards the need to mentor women. Firstly, evidence from industry demonstrates that the gap between men and women in the ICT sector is significant at a European level, “in 2020, men accounted for 83% of the 2.7 million people in the European Union (EU) who were employed in the ICT sector, their field of training.”<sup>24</sup>. Secondly, it is alarming to see that ten years on, figures in Portugal have still not improved and the gap has widened further, “from 2011 to 2020, the percentage of women among the total number of professionals who worked and had training in the ICT sector dropped from 20.1% to 19%”<sup>25</sup>. Like in Europe, in Portugal, in 2020, “the numbers are equally distant: 81% are men and only 19% are women,”<sup>24</sup> amongst those employed in the ICT sector.

Table 1 presents the proportion (%) of women among grade A staff, by main field of R&D, 2018, in the EU and Portugal<sup>26</sup>:

	Natural Sciences	Engineering and Technology	Medical Science	Agricultural Sciences	Social Sciences	Humanities
EU-27 Member States and Associated Countries	21.99	17.91	30.08	28.50	30.85	34.95
EU-28 Member States and Associated Countries	20.75	16.95	30.74	28.37	31.08	34.41
Portugal (PT)	28.08	12.57	27.49	30.77	27.68	39.32

**Table 1** - Presents the proportion (%) of women among grade A staff, by main field of R&D, 2018, in the EU and Portugal

Women in more senior positions have a higher tendency to be found in the domains of Humanities and Social Sciences and a lower tendency than men to be found in the fields of Natural Sciences & Technology. Additionally, in these areas, women remain under-represented and the lowest proportion of women among grade A academic staff was also seen in the fields of Engineering & Technology for all, apart from five countries: Cyprus, Luxembourg, Malta, Slovenia and Israel<sup>26</sup>. In this respect, Portugal stands out with 12.5% of the A grade positions filled by women, falling below that of the EU-28 member states and associated countries as also depicted in table 1 above.

### Country-level: the case of Portugal

Below, in table 2 are some figures from the University of Coimbra as detailed in its Equality, Equity and Diversity Plan 2019 – 2023<sup>27</sup> under Strategic Objective 1: to mitigate horizontal segregation, by promoting the integration of women and men in scientific/study areas in which they are under-represented:

Goals	Initial situation (2017)	Target (2023)
Raise awareness and promote the increase of female academic staff in the scientific area of Engineering and Technology by 3-7 percentage points (p.p.)	33.1% (91 out of 275)	36.1 – 40.1%
Raise awareness and promote the increase of female students in the field of ICT study by 3 – 7 p.p.	15.9% (132 out of 828)	18.9 – 22.9%
Raise awareness and promote the increase of male students in the areas with less representation, such as in the area of Education by 3 -7 p.p.	24.2% (159 out of 658)	27.2 – 31.2%

**Table 2** - Some figures from the University of Coimbra as detailed in its Equality, Equity and Diversity Plan 2019 – 2023

If we examine the University of Coimbra’s Equality, Equity and Diversity Plan 2019 – 2023<sup>27</sup>, as outlined above, it is evident that to reach their 2023 and future targets of an increase of 3 – 7 percentage points of (i) female academic staff in the scientific area of Engineering and Technology; (ii) female students in the field of ICT study; and (iii) male students in the areas with less representation, such as in the area of Education, respectively, mentoring could be an effective tool and facilitate this process. The gap between men and women in the ICT sector, in addition to the gender disparity between the proportion of women and men in grade A positions, is undeniable and mentoring is well placed to address and lessen this gap.

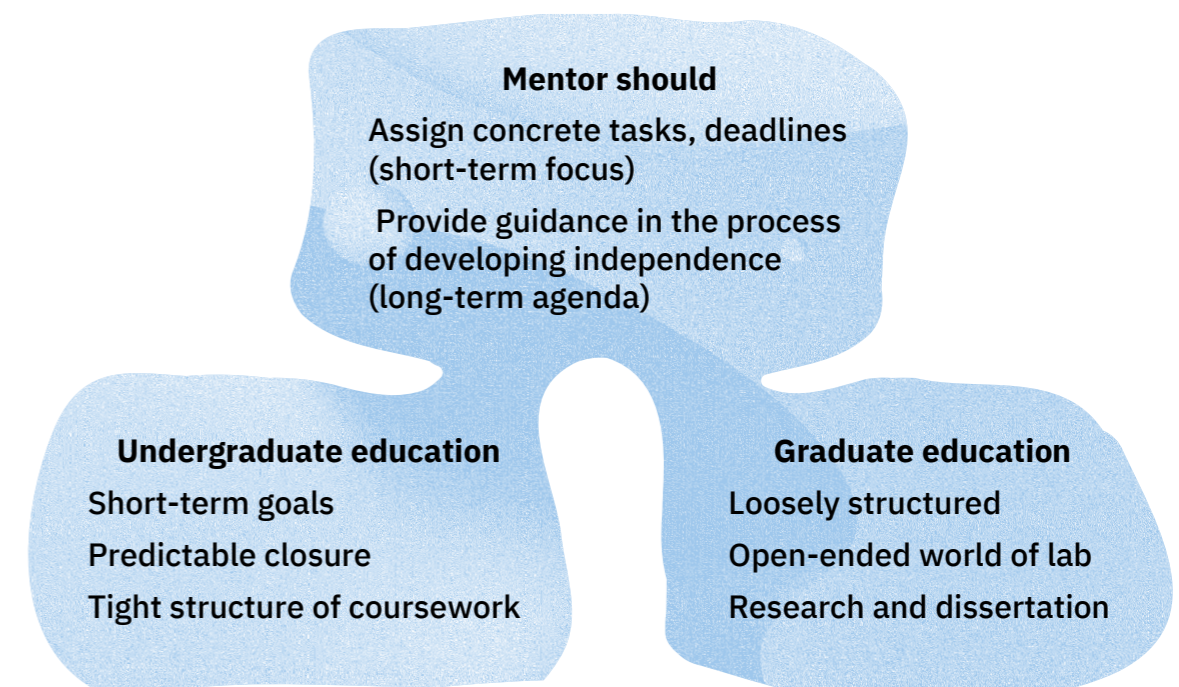
## Addressing different mentoring needs

### Undergraduate students

Within academia different career stages such as undergraduate students, graduate students, Ph.D. students, postdoc or assistant professors and senior faculty lead to the need to address different mentoring needs. When it comes to mentoring undergraduate students Shelito et al.<sup>28</sup> and Temple et al.<sup>29</sup> identified several best practices, crucial factors for successful mentoring and some of the common challenges encountered as outlined in the University of Oregon’s Mentoring Undergraduate Students<sup>30</sup>, which include, “communication, establishing expectations, planning and soft skills.”<sup>30</sup>

### Graduate students

An alternative approach is needed for mentoring graduate students as mentors play a different role, “The influence that research supervisors wield over their students is enormous; they are truly the gatekeepers of the student’s professional future. The effective mentor serves as advocate and guide, empowering the student to move from novice to professional.”<sup>31</sup> Initially, the most challenging step is the transition from the requirements of undergraduate education, “short-term goals, predictable closure, and tight structure of coursework—to the unfamiliar, loosely structured, and relatively open-ended world of lab, research, and dissertation”. The need for mentors to allocate specific tasks and set deadlines (short-term perspective), coupled with encouraging them to become more independent (long-term perspective) is emphasised and outlined in infographic 3.<sup>31</sup>



**Infographic 3** - Addressing different mentoring needs

### Ph.D. students

For Ph.D. students, at the onset, mentoring issues may be more channelled towards developing research and presentation skills, as well as how to work best with one’s supervisor. As a Ph.D. student is finalising their work, mentoring concerns may be more directed to the options available after completing their Ph.D., that is, whether to remain in academia or look to other fields of work like industry. If a Ph.D. student demonstrates that they intend to continue in academia, “Good mentors encourage their students to teach as soon as they start their PhD, not only to supplement their income but, more importantly, to develop skill”<sup>1</sup>.

A European project, involving six European country case studies, highlights distinct experiences with mentors between the Ph.D. stage and later stages of an

academic career, where “During the PhD, interviewees looked to their supervisors for guidance in academic writing and thinking, networking, and general “socialization in the discipline”<sup>6</sup>. Further along the academic career ladder, such as postdocs or assistant professors, a strong sense of individual responsibility was prominent with expectations to work individually and make progress on their own, complemented by limited help from mentors or outside support. However, mentoring can support junior faculty to obtain and develop the key skills necessary to be successful academically, namely scholarly independence, educational skills, and preparation for academic advancement, in addition to facilitating constructive professional relationships and networks within the institution and beyond, essential for career development<sup>32 33 34</sup>. Moreover, a network of individuals improves mentoring relationships, which do not need to be limited to junior faculty, as midlevel and senior faculty may benefit from mentoring support when experiencing career transitions and new directions<sup>9</sup>.

Further evidence of the benefits of an effective mentoring programme from college entry to post-graduation are outlined below. Wu et al.’s<sup>35</sup> research confirms that “a low-cost, short peer mentoring intervention demonstrates benefits in promoting female students’ success in engineering from college entry, through one-year post-graduation.” They allocated a female peer mentor, a male peer mentor, or no mentor from the field of engineering to 150 undergraduate female students. Results were positive in terms of those students assigned a female peer mentor and were linked to, “a significant improvement in participants’ psychological experiences in engineering, aspirations to pursue postgraduate engineering degrees, and emotional well-being.” It was further linked to participants’ achievements in obtaining, “engineering internships and retention in STEM majors through college graduation”<sup>35</sup>.

## Transitioning from university to the workplace

In transitioning from university to the workplace, skill development is crucial, that is “...equipping people with the skills to be fully functioning members of the scientific community, able to prepare grant applications, review manuscripts, speak at conferences and engage with scientific administrators in a constructive manner. Such a holistic approach to running a scientific group will ultimately bring enormous benefit to the group’s alumni, giving them all the skills necessary to carve out their own niches in the academic world”<sup>1</sup>. At a later stage, mentoring may be more concerned with career prospects, work-life balance, meeting both teaching and research commitments and developing skills for leadership roles. Mentoring colleagues at a more advanced career stage may involve developing other skills in areas like management, strategy, how to handle a group, and possibly new issues that arise in relation to work-life balance. It is essential to develop mentoring programmes that can accommodate all of these different needs and it should be clear what needs the programme is serving.

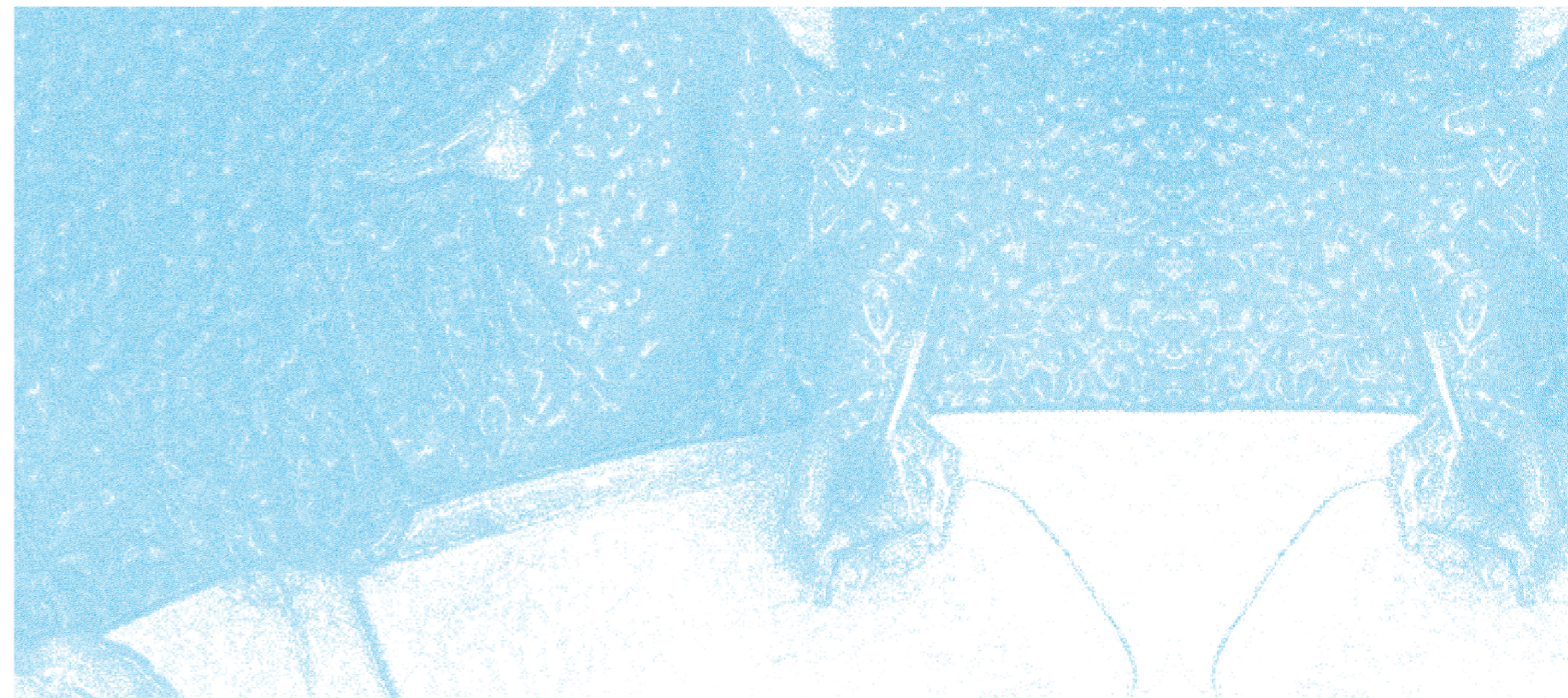
Furthermore, mentoring programmes can also help to attract and retain women beyond university as this continues to be a serious issue. There has been a steady increase in the number of women entering STEM fields at the level of tertiary education, however, they soon drop behind when their professional careers begin.

The gap continues to grow between women with a Ph.D. in the sciences and women at a more junior faculty career stage. Specific actions are required to tackle the under-representation of women in STEM as they pursue careers in this domain<sup>36</sup>.

To conclude, mentoring programmes are essential to foster gender equality and empower all women and girls, chiefly in the field of STEM, from school-level to career-level, that is to say, as early as school-going age to university entry level and then to ensure career retention and progression. Given the widening gap between men and women in the ICT sector at a European and country-level, in this case Portugal, as well as their under-representation in the scientific area of Engineering and Technology; understanding exactly what mentoring is and its benefits can only help to lessen these gaps. To ensure that mentoring programmes are effective, the different needs of the target groups such as at universities and in the workplace should be identified and a tailor-made, step-by-step mentoring programme implemented.

### Further information

For further information about launching, implementing and sustaining a mentoring programme, the following booklets, available from the same authors, offer A Complete Mentoring Roadmap - Booklet 2: A Step-by-step Guide to Setting Up a Mentoring Programme in Academia; Booklet 3: Sustaining a Mentoring Programme and Dealing with Invisible Work; and Booklet 4: Leveraging Mentoring to Promote Balance in Academia, Industry, Human Resources and the General Community. These booklets include suggestions and an outline for an introductory session, a list of activities for individual and group mentoring activities, ideas for further activities and a checklist for monitoring progress within the selected target groups. Several resources have been developed in the context of the project Equal.STEAM, please take a moment to review them on the project website [www.uc.pt/equal.steam/](http://www.uc.pt/equal.steam/)





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