

A special mentoring program for Master's students in astrophysics and high-energy physics promoting DEI

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Abstract

In the pursuit of promoting diversity, equity, and inclusion (DEI) in the field of Astrophysics and High Energy Physics, a group of young researchers at the Universitat de Barcelona (UB) and the Institute of Cosmos Science (ICCUB), under the scope of the DEI-ICCUB commission, has built a mentoring program for students in the Master of Astrophysics, Particle Physics and Cosmology at the University of Barcelona. This initiative aims to support and guide aspiring scientists through their academic journey and beyond, while keeping a focus on individuals from minority groups. The program started in 2020, during the pandemic, and initially targeted only female Master's students. In 2021, a group of PhD students formalized the program, now targeting two groups: students who belong to minority groups in academia, and a general group including all Master students interested in the program. The objectives of the mentoring program, which is still in operation, are to facilitate the engagement of Master's students with researchers across various academic levels, with a different focus depending on the group. The outcomes of the program have been positive and encouraging, with students reporting increased motivation, a sense of belonging, and tangible academic progression.

1 Introduction

A group of young researchers at the Universitat de Barcelona (UB) and the Institute of Cosmos Science (ICCUB), working under the guidelines of the ICCUB's Diversity, Equity and Inclusion Commission (DEIC) have developed a mentoring program for students of the Master in Astrophysics, Particle Physics, and Cosmology at the UB. The mentoring program aims to promote diversity, equity, and inclusion in the field of Astrophysics and High Energy Physics and to support and guide aspiring scientists through their academic journey and beyond, while keeping a focus on individuals from minority groups.

1.1 The Institute of Cosmos Sciences

The ICCUB is an interdisciplinary center in the fields of particle, quantum, and nuclear physics, cosmology, and astrophysics, with a focus on fundamental research. In addition to having a robust technology and knowledge transfer program linked to it, the Institute aims to take advantage of connections and synergies between these research areas from a theoretical, observational, and experimental standpoint.

The ICCUB, a María de Maeztu Excellence Unit that is part of the UB, supports and strengthens the University mission by offering excellent, multidisciplinary, high-impact research, talent attraction, training, technology transfer, and societal impact – all from a global, international standpoint. Over the last ten years, the ICCUB has hosted eight ERC grants (16% of UB's) despite only comprising 2.9% of UB staff. It has been awarded twice with the Maria de Maeztu seal of excellence.

1.2 The Diversity, Equity and Inclusion Commission

Our mentoring program falls under the broader task of the DEIC of the ICCUB. This Commission has the aim of “promoting specific actions to provide a welcoming environment to our members and visitors, regardless of gender, gender identity, sexual orientation, ethnicity, beliefs or disability”. The mentors from the program are in close contact with the DEIC and work together to ensure that the students of the Master’s program feel included in the Institute and that their diversity is safeguarded and nurtured.

2 Context and objectives of the mentoring program

The students of the Master in Astrophysics, Particle Physics, and Cosmology at the UB often expressed feelings of disconnection from the research institute, the ICCUB. This disconnection stemmed from a variety of factors, including the gap between their coursework and the research environment, as well as limited opportunities for meaningful engagement with the faculty and research projects. As students transition from structured classroom learning to the more fluid and self-directed world of scientific research, the process can feel daunting, leading to a sense of isolation. This mentoring program aims to bridge that gap, creating a supportive pathway that connects students not only to the academic research world but also to the ICCUB community. By fostering a stronger sense of belonging, the program ensures that students do not feel lost during this pivotal moment in their academic journey.

A key issue facing the broader scientific community, including Astrophysics and High Energy Physics, is the poor diversity. Women, ethnic minorities, and other underrepresented groups are often significantly outnumbered in academic and research roles. This mentoring program is an opportunity to try to address this challenge directly, by actively supporting students from these diverse backgrounds. Through mentorship, these students receive personalised guidance, aiming to empower them to overcome obstacles and see a future for themselves in scientific research.

Another main objective is to raise the mentee’s awareness about the structure available at the ICCUB, since many students are unfamiliar with its research lines, resources and career opportunities. For instance, a specific session helps students to make an informed decision on their Master’s thesis topic and supervisor. At the same time, this improved feeling of connection to the research of the institute encourages the participants to explore a career in the ICCUB. Or, in other words, this is also an opportunity for the Institute to better retain talented students. This is especially important for increasing representation from underrepresented groups, whose sense of belonging in academia might be lessened by many external factors.

Last but not least, this program also allows young researchers to develop mentoring skills. By involving PhD students as mentors, the program provides them with valuable experience in leadership, communication and teamwork. This prepares them for future roles in academia and beyond where mentoring, guidance and teamwork are essential skills.

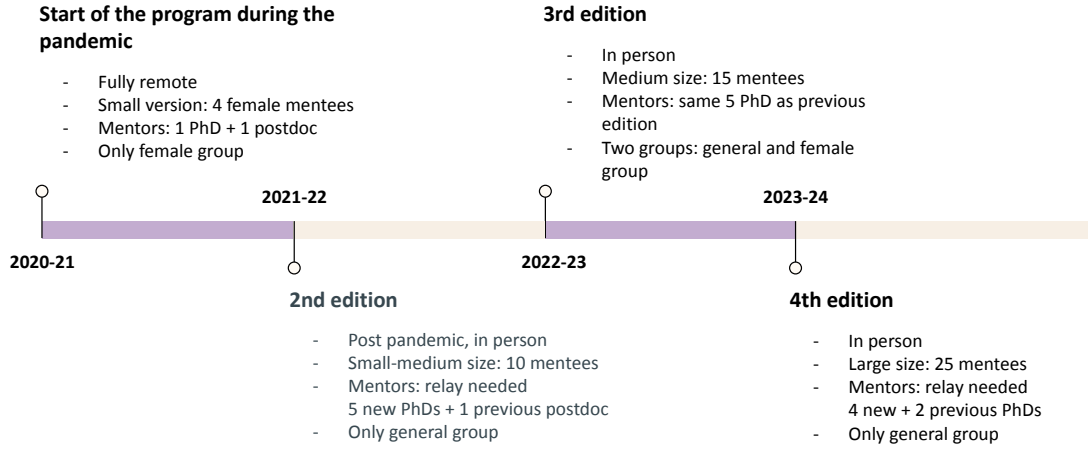


Figure 1: Trajectory of the mentoring program. The program started in the 2020-21 academic year, and has lasted for 4 years, at the time of writing this manuscript. This scheme encapsulates the details and changes to the program during these years.

3 Organisation

The program started in 2020, during the pandemic, as the initiative of a female postdoc and PhD student and initially targeted only female Master's students. Building on the remarkable success of this initiative, a group of PhD students and a postdoc, with the support of the DEIC, formalised the program in 2021 and gave it the generic format that it currently has. The mentoring program is structured around two groups, each designed to meet different needs of the Master's students. The program adapts to the inquiries and motivations of the mentors and mentees, and as such further details of the program can be found in Figure 1.

The first group, called the general discussion group, is aimed at all Master's students and explores many general topics. Discussions typically revolve around the Master's program itself, the academic career path, and life beyond academia. These sessions offer students a chance to ask questions, share concerns, and receive guidance on both academic and personal matters, helping them navigate the challenges they face at this stage of their studies. All mentors participate in this group, allowing students to benefit from a wide range of experiences and insights, and fostering a sense of connection to the broader academic community.

The second group focuses specifically on female Master's students and is centred around the experiences and challenges women face in Science, Technology, Engineering, and Mathematics (STEM) fields. Recognising that women in Science often encounter unique barriers, this group provides an additional supportive environment, where these issues can be discussed openly. The goal is to create a space where female students can find solidarity, exchange experiences, and gain inspiration from the female mentors who lead these sessions. By building this network of support, the program aims to empower women in Astrophysics and High Energy Physics and provide them with the tools to advance their careers in a field where they remain underrepresented.

In addition to these two groups, the mentors are interested in offering personalised mentoring for other minority groups, such as racialised students or members of the LGBTQI+ collective. There has been no demand for personalised mentoring from these groups so far. However, the program remains flexible and ready to provide tailored support should the need arise in the future, even if we have doubts on whether we can provide a good mentoring if no mentors belong to such minority groups.

Both the general discussion group and the women in STEM group meet once a month, ensuring that there is regular engagement and opportunities for students to receive ongoing support. Beyond these formal meetings, the program also encourages informal gatherings, often held in more relaxed settings like the university bar. Casual meetings help to bridge the gap between mentors and students, fostering a more personal connection. The narrow age gap between mentors and mentees, which allows to share similar experiences, makes the process organic. By creating a safe and open environment, the mentoring program ensures that students feel comfortable discussing their concerns and seeking the support they need.

3.1 Special case study: the 2022-23 female group

The mentoring program has been particularly successful in the two women's groups, since there has been a strong connection and meaningful engagement between mentors and mentees. These mentorings placed the focus on the personal experiences of the participants in academia. Thus, the discussion was not focused on technical issues, but on empathy, active listening and sharing vulnerability. Common feelings such as the imposter syndrome or internalised gender bias were addressed and linked to the experiences as Master students and PhD applicants.

In particular, in the 2022-23 case, where in-person attendance was possible, such an approach created a welcoming, non-judgmental environment where mentees felt comfortable to share their thoughts and challenges. The mentors' experience as women and their connection to the institution were crucial in understanding and addressing specific problems mentees faced. Furthermore, the existence of this space allowed to detect conflicts whether between mentees or between mentees and faculty members, allowing for the activation of appropriate mechanisms to address these issues, sometimes with the involvement of the DEIC. What could have been a negative experience in academia became an example of how a support network within an institution can be mobilized to assist young researchers. Without this program, such challenges might have gone unnoticed.

4 Attendance, valuation and feedback

Participation in this program has steadily increased every year. As shown in Figure 1, the mentoring program has grown from four mentees to around 25. We celebrate that the audience grows, which is a hint that the students demands such guidance, and that it proves to be useful. However, it must be emphasised that fewer participants do not diminish a program's success, but offer the possibility of a more personalised guidance and improved satisfaction. Similarly, a larger audience also requires a broader format and can make it harder to address

personal inquiries of specific participants.

All in all, every edition has been successful in its own way. This success has been possible thanks to the enthusiasm of the mentors about the program, together with a strong commitment to support the Master's students through their academic journeys. This spirit has been echoed by the students, who have responded positively to the program and greatly appreciated it. Many students recognise the value of having dedicated mentors to guide them through their studies, contributing to a more supportive and engaged academic environment.

One of the standout features of the program has been the informal meetings, which are seen as a crucial opportunity for building trust between mentors and students. These relaxed gatherings allow for open conversations and foster a sense of community, making it easier for students to approach their mentors with questions or concerns. The informal setting encourages authentic interactions which have happened and grown beyond the walls of the mentoring's room, now having become lasting relationships. Finally, we also recommend working in small groups rather than in big general discussions, so even shy participants can feel comfortable expressing their doubts.

5 Future

Throughout the duration of the mentoring program, there have been two to three changes of mentors, which speaks about the reliability and stability of the initiative. This consistency not only highlights the commitment of the mentors but also reflects the strength of the program. However, as of now the continuity of the program depends entirely on the goodwill and altruism of the mentors. We feel extremely fortunate to have these in the ICCUB, and we emphasise that this is the result of young researchers having built a strong and connected PhD community. However, in order to have a durable program, it requires both formal recognition of the mentors' work and support from the institutions that hold it. In the same line, we also encourage institutions to boost spaces for young researchers to meet and create organic relationships that can lead to ideas such as this mentoring program.

Finally, we strongly advocate for a mentoring program specially addressed to under-represented groups, and to women in STEM in particular. Taking into account the two editions where we had a specific group for women, 6 out of 8 female participants enrolled in PhD programs. This targeted mentoring program has proven to be an effective tool to empower female students to pursue a career in STEM, and as such, these programs should be promoted across various institutions and at different levels.

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