

Guidelines for Effective Research Supervision

A. Effective Supervision

The supervisor plays a central role in supporting the professional and personal development of early-career researchers (ECRs), including PhD candidates and postdoctoral researchers. The supervisor's guidance can have a profound influence on the scientific development of ECRs, as well as on their career choices and long-term professional success.

Beyond providing scientific guidance, supervisors are expected to support ECRs in their professional development and help them prepare for future careers in academia, industry, or other sectors. In particular, supervisors should be aware of a sponsorship gap documented in recent studies (see, e.g. Delgado and Murray, 2023; Zar *et al.*, 2024), whereby women are typically less likely to receive opportunities to participate in high-impact projects, assume leadership roles, or engage in high-profile collaborations, potentially hindering their career opportunities.

B. A Core Principle of Doctoral Supervision

For PhD students, one message should be clear from the very beginning: "You do the PhD - not your supervisor".

A PhD is not simply a collection of tasks assigned by a supervisor. It is the PhD student's research project, intellectual journey, and responsibility.

The supervisor's role is to guide, challenge, support, and mentor PhD students throughout their journey. The supervisor's role is not to make every scientific decision, solve every problem, or conduct the research on their behalf.

The ultimate goal of doctoral supervision is not simply to guide a candidate towards the successful completion of a PhD thesis, but to help them develop into an independent professional capable of leading complex projects, solving challenging problems, and making creative contributions in academia, industry, or other sectors.

C. General Guidelines

Effective supervision is a skill developed over time. The following principles can help supervisors establish productive and supportive mentoring relationships:

- **Listen patiently.** Give ECRs enough time to discuss concerns, including issues they may find difficult or uncomfortable to raise.
- **Build a relationship.** Foster trust by engaging in informal interactions, such as having coffee together or attending seminars and lectures.
- **Do not abuse your authority.** Never use your position to ask ECRs to perform personal tasks or activities outside their academic responsibilities.

- **Promote independence.** Encourage confidence, critical thinking, and scientific autonomy rather than attempting to "clone" yourself.
- **Protect meeting time.** Minimize interruptions during scheduled meetings so that ECRs receive your full attention.
- **Share your experience.** Allow ECRs to observe how you approach scientific problems and decision-making. Showing your "human side" helps create a more open and authentic relationship.
- **Facilitate networking.** Introduce ECRs to colleagues and actively support the development of their own professional network.
- **Provide constructive feedback.** Honest criticism is essential for scientific growth, but it should always be respectful, specific, and balanced by recognition of achievements.
- **Acknowledge success.** Do not assume that ECRs know when you are pleased with their progress. Recognize good work and celebrate important milestones. Positive feedback is essential for building confidence and sustaining long-term motivation.
- **Avoid micromanagement.** Resist the temptation to control every decision. Give ECRs the freedom and responsibility to take ownership of their projects.

D. Recommendations

The following sections provide practical tools to facilitate clear communication and establish shared working agreements between supervisors and ECRs.

These resources are intended to be flexible. Depending on the needs of the supervisory relationship and the dynamics of the research group, supervisors may choose to use individual tools or adopt the complete framework.

The following guidance is organized into two complementary components:

- 1) **Role Clarification.** A self-reflection guide to help supervisors define their supervisory style, responsibilities, and boundaries before meeting a new researcher.
- 2) **Aligning Expectations.** Two practical checklists: one for the recruitment interview and another for the first meeting with the ECR.

1) Role Clarification

Before beginning to supervise a new ECR, supervisors should reflect on their supervisory style, responsibilities, and boundaries to ensure consistency across the research group.

- **Define your expectations.** Identify the principles and behaviors that you expect from every group member (e.g., *document research data promptly, attend seminars, maintain high standards of scientific integrity*).
- **Clarify your role.** Distinguish between your responsibilities as a scientific advisor (research guidance) and mentor (professional development).
- **Promote independence.** Encourage ECRs to develop their own scientific judgment and research style rather than trying to reproduce your own way of working.
- **Set clear boundaries.** Be explicit about what you will and will not do as supervisor (e.g., *I review scientific content but do not edit thesis formatting*).
- **Recognize the power imbalance.** Academic supervision is inherently asymmetric. Create a psychologically safe environment in which ECRs feel comfortable asking questions, expressing concerns, admitting mistakes, and disagreeing respectfully without fear of negative consequences.
- **Foster a respectful and professional research environment.** Clearly communicate that mutual respect, inclusion, and professionalism are core values of the research group and center, and that harassment, bullying, discrimination, or other forms of misconduct will not be tolerated.
- **Conflict resolution.** When conflicts cannot be resolved within the group, remind researchers of the confidential support mechanisms available at nanoGUNE (e.g., the Conflict Management Team or the Whistleblower Channel).
- **Be aware of unconscious bias.** Reflect on whether administrative or "academic housekeeping" tasks (e.g., organizing meetings, taking notes, coordinating events) are being distributed equitably among group members.
- **Provide equal opportunities.** High-visibility opportunities should be offered on the basis of the quality of the work, engagement, and suitability of the researcher, regardless of gender or background. These opportunities may include leading publications, presenting at international conferences, participating in grant proposals, or taking on leadership roles. Avoid making assumptions about ECRs' interests or availability; offer appropriate opportunities and allow them to decide.

2) Aligning Expectations

Effective supervision is a shared responsibility. It is built on open communication, mutual trust, respect, and a shared commitment by both the supervisor and the ECR to achieving the goals of the project while fostering the ECR's professional development.

2.1. Interview Checklist

A. Introducing the Research Group

During the recruitment process, the prospective supervisor should explain how the group works, and both the supervisor and the candidate should assess

whether this is compatible with the candidate's expectations and preferred working style.

- **Group routine.** Explain the frequency and format of meetings, such as, e.g., weekly group meetings and fortnightly individual meetings.
- **Supervision style.** Describe your supervisory approach, including whether you provide regular guidance or expect ECRs to work independently and seek advice when needed.
- **Communication practices.** Explain your preferred communication channels, for example Teams for quick questions and email for reports.
- **Presence and availability:** Clarify expectations regarding on-site presence, remote work, accessibility, and working hours, ensuring consistency with nanoGUNE's general policies.

B. Understanding the Candidate's Motivation

The interview should also explore the candidate's motivation, expectations, and longer-term goals.

- Why do you want to pursue a PhD or postdoctoral position at nanoGUNE?
- What do you hope to achieve during this period?
- What are your long-term career aspirations?
- How do you usually respond to constructive criticism and scientific disagreement?

C. Assessing Research Independence

For PhD candidates

- How do you view the transition from being a Master's student to becoming a more independent researcher?
- How comfortable are you with making decisions independently?
- What level of guidance do you expect from your supervisor?

For postdoctoral researchers

- How independently do you prefer to work?
- How do you approach the development of your own research ideas?
- How do you view your role in mentoring Master's and PhD students?
- What level of responsibility would you expect to assume within the research group?

D. Group Culture

- Explain the group's approach to collaboration, openness, knowledge sharing, general responsibilities and their distribution, expectations

regarding progress and results, as well as the responsible use of research data.

- Make clear that the group values diversity, mutual respect, collegiality, and an inclusive working environment.
- Discuss the importance of contributing to the group while also developing an individual scientific profile.

2.2. First working meeting

The first working meeting should establish a shared understanding of roles, responsibilities, expectations, and working practices. Some aspects will differ depending on whether the ECR is a PhD candidate or a postdoctoral researcher, while others apply equally to all ECRs.

A. Discussion with PhD Candidates

One message should be made clear from the very beginning:

"You do the PhD - not your supervisor".

In practice, this means that:

- This is your thesis and your intellectual journey.
- My role is to guide, challenge, support, and mentor you.
- I will not –and should not– make every decision or solve every problem for you.
- You are expected to take increasing ownership of your project as the PhD progresses.
- My objective is to help you develop into an independent professional who is capable of defining problems, making informed decisions, and taking responsibility for their own work.

The supervisor should also explain that independence develops gradually. PhD candidates are not expected to know everything from the outset, but they are expected to become progressively more proactive, reflective, and confident in their scientific judgment.

B. Discussion with Postdoctoral Researchers

A postdoctoral appointment should be understood as a period of increasing scientific independence, professional development, and responsibility.

Postdoctoral researchers are expected to take a leading role in their research, contribute original ideas, and assume substantial responsibility for the planning, execution, interpretation, and dissemination of their work.

The supervisor's role is to advise, challenge, support, and mentor postdoctoral researchers while helping them to broaden their expertise, strengthen their professional profile, and prepare for the next stage of their career.

Postdoctoral researchers are expected to:

- take ownership of their research projects;
- contribute original scientific ideas;
- work with a high degree of independence;
- identify and pursue possible solutions to scientific and technical challenges;
- contribute actively to the intellectual life of the research group;
- support and mentor less experienced researchers when appropriate;
- develop their scientific visibility and professional network; and
- prepare for their future career, whether in academia, industry, or another sector.

The following sections (C-E) apply to all ECRs, regardless of whether they are PhD candidates or postdoctoral researchers.

C. "What You Can Expect from Me as Your Supervisor"

As your supervisor, I am committed to providing:

- **Regular supervision.** We will meet regularly to discuss scientific progress, identify challenges, and define priorities.
- **Scientific guidance.** I will help you refine research questions, evaluate ideas, and develop sound scientific strategies.
- **Constructive feedback.** I will provide timely and honest feedback on your research, manuscripts, presentations, and career development.
- **Experience and perspective.** I will share my scientific experience, helping you identify common pitfalls, evaluate alternative approaches, and make informed decisions.
- **Scientific discussion.** I will challenge your ideas, encourage critical thinking, and discuss possible directions whenever appropriate.
- **Professional development.** I will support your development as an independent professional by providing opportunities for networking, scientific visibility, and career advancement whenever possible.
- **Accessibility.** I will be available for regular meetings and informal discussions whenever needed, while encouraging you to develop your own ideas and possible solutions before seeking advice.

D. "What I expect from you"

- **Engagement.** Be fully committed to your research and to the nanoGUNE community.

- **Professionalism.** Respect deadlines and commitments.
- **Knowledge Sharing.** Contribute to the scientific development of the group.
- **Honesty and Transparency.** Communicate promptly when problems arise.
- **Independent thinking.** Before asking for advice, think carefully about possible solutions. Use meetings to discuss alternatives rather than waiting for instructions.
- **Proactive communication.** Inform the supervisor when concerns, new ideas, or difficulties arise.

E. How We Will Work Together

- **Regular meetings.** We will normally meet every few weeks. Please come prepared with results, questions, and proposed next steps.
- **Informal discussions.** Between meetings I am generally available for informal discussions.
- **Digital disconnection.** Neither of us should expect an immediate response to emails sent outside normal working hours, during weekends, or on holidays. Similarly, work or documents sent outside normal working hours should not be expected to be reviewed by the start of the next working day.
- **Periodic review.** We will periodically review not only the scientific progress of the project but also how our supervisory relationship is working, adjusting expectations whenever necessary.

References

Delgado, M., & Murray, F. (2023). "Faculty as catalysts for training new inventors: Differential outcomes for male and female PhD students."
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