

The tenets of scientific collaboration: rules and recommendations

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The production of knowledge increasingly takes place within the framework of a broad and diverse network of researchers working together in cooperation. The achievement of a successful academic and research career among scientists is rooted in their establishment of collaborative ties with other researchers. Cooperative practices also constitute the mechanism for socializing and integrating new researchers into the academic and scientific community. This note reviews some basic guidelines and recommendations related to scientific collaboration, so that researchers from any area of knowledge can understand its importance and improve its effectiveness in their own context.

Scientific collaboration can be defined as the joint participation of two or more researchers in scientific or technical research activities with the aim of achieving a common goal. This seemingly simple definition conceals a complex reality that is difficult to measure and objectify¹. Several disciplines have explored the topic from different methodological perspectives, using different analytical levels. Beyond scientific collaboration as a topic of study, however, the successful development of academic and research career of the scientists depends on their capability to establish collaborative ties with other researchers. A sound understanding of the main characteristics that define scientific collaboration and cooperative practice management can therefore play a decisive role in driving scientific and professional success. Collaboration also constitutes the mechanism for enabling new researchers to learn and be socialized and integrated into the academic and scientific community. In the following we have summarized 10 basic principles of scientific collaboration, which are primarily based on our perception and experience in cooperative practices, our knowledge about scientific collaboration as a topic of study², and the main results and aspects examined in the extensive literature on the subject³⁻⁶.

1. Scientific collaboration constitutes a common and widespread practice among researchers and university faculty members, regardless of their professional category or academic discipline. Understanding the forms, characteristics and potential benefits and drawbacks of collaboration may contribute to improved performance in research tasks and research careers.

2. Scientific collaboration, which can take place in different stages, is particularly relevant in two tasks or phases of

study or project development: (i) formulating the research question and scope; and (ii) composing the scientific documents for publishing and disseminating the results. Given the importance of these two tasks in cooperative research projects, they should be planned carefully with the cooperation and approval of all members of the research group, clarifying the role function of each collaborator and stipulating the basic mechanisms for resolving any incidents or conflicts that may arise.

3. Although the reasons for collaborating are diverse, two of them stand out as being particularly relevant: first, the team benefits from the skills and knowledge of each member; and secondly, the topic can be addressed from a multidisciplinary perspective, which encourages creativity through the exchange of ideas and viewpoints. These are examples of intellectual motivations, which help compensate for weaknesses and enable a high level of specialization and division of labour. Other important motives for establishing cooperative ties are instrumental or purely strategic in nature. Examples include obtaining access to resources, materials, instruments or equipment; increasing productivity, and gaining recognition and visibility. In that sense, the intellectual idealism threaded into academia – which ignores aspects such as the hierarchical structure, competition and the system of rewards, recognition and prestige – may give way to pessimism and disappointment. However, strategic collaborations may also be driven by the desire for additional learning, training and integration into the academic community, which are functionally important aspects of the research system. Ultimately, all researchers should be aware of the factors that shape cooperative practices from the beginning of their

academic and research career and know how to address them in research groups as transparently and ethically as possible.

4. Although researchers may occasionally work with a much larger number of authors, it is advisable to gradually form a small but stable group of core collaborators over the course of their academic and research career. The choice of regular collaborators may be determined by the type of tasks to be performed, the reasons for collaborating or the different research topics or fields to be explored, together with personal factors and the degree of success and satisfaction achieved in previous collaborations.

5. Although scientific collaboration should not be confused with co-authorship, as the former concept has far wider and more diverse dimensions, co-authorship is one of the main embodiments of cooperative practice. It is of pivotal importance since the naming of authors in scientific publications is the mechanism generally used to attribute scientific merit. It is also a potential source of conflict. Understanding, accepting and respecting the current style guides and ethical standards of publishing in the different areas of knowledge could prevent problems related to authorship. To address these problems, particularly in the absence of relevant guidelines, researchers must set out from the very beginning how they plan to disseminate results and how to assign authorship (number of authors, order of names, acknowledgements and the choice of corresponding author).

6. The place of work or training is where most researchers meet future collaborators. The next most common method is by attending scientific meetings followed by completing research stays or working as a visiting professor in another institution. Creating a climate

of trust in the work environment by promoting social activities and spaces for meeting and exchanging experiences is therefore crucial for encouraging scientific collaboration. Scientific events and research stays are also of considerable importance in this regard. All the above-mentioned factors reveal the importance of geographical proximity and social interaction for establishing cooperative ties. They also show the relevance of mobility and internationalization to scientific collaboration, which lead to greater visibility and citation of papers.

7. Looking for collaborators is a common practice. Some of the most appealing traits or factors in potential collaborators are being accessible and favourably disposed to collaboration; having knowledge and skills that complement one's own or those of the working group, and compatibility in working style, interests and priorities. Although science is a cognitive and intellectual activity, the value of instrumental and cognitive factors should not be overestimated at the expense of personal aspects.

Once collaborative links have been established, interpersonal factors can positively impact on the impetus and success of cooperative activities, including a climate of trust, familiarity and mutual respect; the ability to fulfil commitments, and sharing the same goals and interests. These factors alert us to the importance of communication and setting expectations, objectives and tasks in the initial stage of the collaboration, as well as compatibility in terms of objectives pursued.

With regard to group factors, the organizational capacity to distribute work and set clear and achievable objectives, on the one hand, and equal participation in the work, responsibilities and credit on the other, are the two most valued aspects related to collaboration in research

groups. Other factors considered essential or important are flexibility to adapt to changes, capacity for solving problems that arise over the course of the study; and understanding the roles, responsibilities and tasks assigned to each member. Again, these are factors that depend on adequate planning of the work to be performed, and an objective and fair attribution of the credit resulting from the collective enterprise.

8. In addition to the steps researchers can take individually to find collaborators, or actions promoted in the work environment, other mechanisms must be put in place to help increase collaboration. In this respect, it would be useful to establish or strengthen the role of bodies or agencies that encourage collaborations, implement information resources for finding collaborators, and promote meeting spaces and initiatives aimed at creating stable groups, networks or structures of collaboration. Moreover, the whole range of incentives and group types must be taken into account. Researchers who have not yet begun working in collaboration, for example, may be more interested in joining local cooperative groups before going international.

9. Researchers must be familiar with the regulatory provisions governing the academic credentials required of researcher staff, as they determine the results of the evaluation of candidates or applicants. Two relevant aspects of the scientific collaboration embodied in the form of co-authorship of scientific publications are the penalization for an excessive number of authors and the attribution of different 'weights' to different named authors depending on their position in the author list. Accordingly, researchers must be familiar with the relevant limits or the average number of authors in scientific papers in their discipline as well as the criteria used to order

participating authors. They should also avoid distorting the role of contributors through unjustified authorships, ensuring that the position of each author in the list – including the corresponding author – reflects the extent of his/her participation in the study.

10. The cessation of collaboration with other researchers is a common occurrence; only in a small number of cases can it be attributed to problems arising from cooperative practices. The end of a collaboration, especially if it has been successful and satisfactory, may constitute the starting point for a new collaboration, or the researcher may remain a 'latent' contact for a future collaboration when conditions are favourable.

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