How Philosophy of Science Can Enhance Research in Science and Engineering: The Benefits, Challenges, and Ideal Conditions for Philosophy-STEM Collaborations

This document provides a summary of key findings from Plaisance & Doody (2026), published in Synthese.

Executive summary

- We found that scientists and engineers who have collaborated with philosophers of science report genuine benefits to their work: sharper questions, clearer concepts, improved methods and models, deeper ethical reasoning, and lasting changes to how they approach research.
- A previously unrecognized benefit emerged from our findings: philosophy–STEM collaborations have a *capacity-building* function, shaping scientists' thinking long after a collaboration ends—an outcome unlikely to show up in traditional research metrics.
- Participants faced two types of barriers*: internal barriers* (language differences, divergent norms, investment of time) and e*xternal barriers* (colleagues' dismissive attitudes, evaluation difficulties, publication challenges). Internal barriers were real but generally surmountable, while external barriers were experienced as the most frustrating and hardest to overcome.
- This study empirically validates and extends existing philosophical scholarship on the value of philosophy of science, but does so through *scientists' and engineers' own perspectives*, further motivating collaboration between these disciplines.
- Of course, not all scientists need to collaborate with philosophers, but for the right people in the right contexts, these collaborations can be transformative.

Background and motivation

A growing body of scholarship argues that philosophy of science can enhance scientific practice—e.g., by clarifying concepts, interrogating underlying assumptions, and identifying alternative explanations. Yet most of this literature reflects philosophers' perspectives rather than those of scientists themselves. We know surprisingly little about how scientists actually experience philosophy-STEM collaborations: what they gain, what barriers they face, and what conditions make them likely to succeed.

Methods

We conducted semi-structured interviews with 20 scientists and engineers (spanning biology, chemistry, physics, earth science, engineering, and psychology) who had collaborated with philosophers of science. Interviews took place in 2022 via Zoom and were analyzed using Braun & Clarke's thematic codebook analysis. For methodological details, including participant demographics, see Plaisance & Doody (2026).

Findings: The benefits of philosophy–STEM collaborations

Interrogating foundational concepts and assumptions

Collaborating with philosophers prompted scientists to question ideas they had previously taken for granted. An astrobiologist described how engagement with philosophy challenged their field's uncritical use of the concept of emergence, opening up new ways of thinking about physical systems; a cellular biologist found that philosophical clarification of contested biological terminology had direct consequences for how cell types were identified and studied.

Asking better questions

Over half of participants highlighted how collaborating with philosophers helped them ask better questions both within their specific projects and about the broader aims and assumptions of their fields. One physicist noted that the inability to make progress in quantum gravity may be a problem of not yet asking the right questions. As they noted, "Philosophy can help us with this."

Practical benefits: methods, models, and data interpretation

Beyond conceptual benefits, participants also reported concrete, practical impacts on their research. A chemist described how philosophical conversations helped them home in on their experimental goals more efficiently. An engineer noted that philosophical discussions led them to reconsider foundational assumptions in their models, which led to improvements that were "really significant in terms of what would even be on the table" within their field.

Enhancing ethical reasoning

Several participants described how collaboration deepened their thinking about the societal implications of their work—from incorporating discussions of values into engineering education, to questioning whether data collection practices were ecologically justifiable, to confronting how scientific land management affected the rights of Indigenous peoples. One participant emphasized the importance of training engineering students to consider the following questions:

> *"What are the larger ramifications of what you're working on here? Are people going to maybe be put out of work because of this? Or is there non-visible damage because people become too reliant on this technology?" — Engineer*

Capacity-building: lasting impacts on scientists themselves

Perhaps the most novel finding is that philosophy–STEM collaborations impact scientists themselves, enhancing their capacity for philosophical reasoning in ways that persist long after the collaboration.

> *"I loved interacting with [my philosophy collaborator]. Thanks to [them], I think I grew as a scientist to think more clearly." — Cellular biologist*

Notably, these types of impacts are invisible to traditional research metrics, which is precisely why qualitative methods are needed to surface them.

Findings: Barriers to philosophy–STEM collaborations

We identified two types of barriers: *external* barriers arising from the broader institutional and disciplinary context, and *internal* barriers arising within collaborations. Participants found external barriers more frustrating and harder to address.

External barriers

The most common external barrier was colleagues' dismissive or ambivalent attitudes toward philosophy, which made these collaborations professionally risky—especially for junior researchers.

> *"I think many, many practicing biologists would think that philosophy is kind of useless." — Biologist*

Participants also faced evaluation difficulties (as most of their colleagues lack the philosophical background to fairly assess these outputs), funding gaps, and publication challenges—with few journals well-positioned to evaluate work that substantively integrates both disciplines.

Internal barriers

Internal barriers arose from the disciplinary distance between philosophy and STEM. Participants navigated differences in technical language and background knowledge, divergent research and writing norms, and the sheer time required to build productive working relationships across disciplines. Writing collaboratively was described as especially challenging given different conventions around what a research output looks like. One engineer noted, "I like being around people who are thinking about things differently, but actually trying to write together is pretty hard for our two disciplines."

Importantly, most participants found internal barriers to be surmountable with sufficient time, willingness, and interpersonal skill—and many described creative workarounds, such as having one collaborator take the lead on a manuscript depending on the target venue.

Findings: Ideal conditions for philosophy–STEM collaborations

Participants consistently offered insights about when, with whom, and how these collaborations are most likely to succeed. We identified four conditions:

- **The right scientists:** those who are open-minded, genuinely curious about philosophy, and who are working in interdisciplinary or emerging fields or grappling with foundational questions their discipline alone cannot answer.
- **The right philosophers:** those with genuine knowledge of scientific practice, epistemic humility, and a willingness to learn—and who treat scientists' concerns as equally important to their own.
- **The right context:** research in emerging/interdisciplinary fields is likely to benefit since foundational ideas tend to be under development. In more established fields, philosophy is particularly valuable at inflection points, when standard approaches are no longer sufficient.
- **The right framing:** the most successful collaborations start with meaningful shared questions. Participants also stressed the importance of ensuring the collaboration was mutually beneficial.

Implications

By centering scientists' voices, this study provides evidence for the value of philosophy–STEM collaborations that may carry more weight with STEM audiences than arguments advanced by philosophers alone. Our findings contribute to existing scholarship by highlighting the capacity-building function of these collaborations and the role of peers' attitudes as a systemic barrier. Such barriers suggest that awareness-raising within scientific communities may matter as much as, or more than, targeted funding interventions: institutional incentives are unlikely to be sufficient if scientists' peers continue to dismiss this kind of work. Philosophers of science may also be pleased to note that participants characterized these collaborations as partnerships, *not* philosophy in service of science. In short, they pursued what we call "philosophy *with* science."

Read the full paper

Our paper, "*How philosophy of science can enhance research in science and engineering: the benefits, challenges, and ideal conditions for philosophy–STEM collaborations*," is published in *Synthese*. It provides full methodological details, extended participant quotations, and situates findings within existing philosophical and interdisciplinary scholarship.

You can also read more about external barriers in Doody & Plaisance (2025).