

Enabling PhD student collaboration in research groups

Johan Linåker, Günter Alce, Namsoon Eom, Jonas Niklewski, Jenny Iao-Jørgensen, *LTH*

Abstract— Independence and collaboration both play crucial roles in PhD students' research practice and in their socialization into the PhD role. This study examines how the expectation of PhD students' academic independence intersects with the need for more collaborative engagements within research groups. Drawing on interviews with supervisors and an analysis of co-authorship patterns in PhD student dissertations from a sample of departments at the LTH, the study identifies various forms of collaboration and their influence on PhD students' success. The thematic analysis highlights the significant role of supervisory approaches in shaping PhD students' collaboration practices. Moreover, the findings indicate that both formal and informal support mechanisms are essential for enhancing research quality and providing emotional support.

Index Terms— Academic collaboration, PhD supervision, socialization

I. INTRODUCTION

ACADEMIC independence is as important as collaborative engagements within PhD students' research groups in Swedish research education context. However, not all PhD students manage to balance these aspects successfully in developing their research practice and socializing into the PhD role.

The literature, from both the supervisor and PhD student perspectives, acknowledges that a support network, often informal, will improve the chance of finishing the PhD through alleviating stress, loneliness and isolation [1]. The support can take on many forms, such as one-to-one (e.g. study partner), group (e.g. study group) and one-to-many (a leader to many students), with or without faculty [2]. Structured peer learning groups offer the benefits of reducing isolation, improving communication, and enhancing the overall PhD experience [3, 4]. For example, [5] share their experience participating in a peer writing group, which not only improved student writing but offered emotional support and helped members manage the psychological challenges of academic life. [2] developed a mentorship model which complements formal supervision with informal peer and faculty interactions. The initiative aids students at different stages to share knowledge, gain social support, and ease stress, particularly in navigating academic requirements.

A different type of peer support is the collaboration between doctoral students in the production of the (compilation) thesis, recognizing understandably that such collaboration can be a catalyst for other benefits. The literature, however, on co-publishing among PhD students is

scarce. Students in the natural and medical sciences are more inclined than, for example, social sciences for collaborative engagements with other researchers' (or even other students') work and co-publish, as their tasks tend to be more structurally connected via research teams and larger projects [6].

Based on the literature as well as our own experiences, we make the assumption that active collaboration and support between PhD students can help relieve such struggle and help PhD students improve the conditions to succeed in their PhD studies. To explore the topic and elicit practical advice for PhD students and their supervisors, we conducted exploratory qualitative interviews with experienced supervisors, mostly within LTH. We focused specifically on exploring how the expectation of PhD students' academic independence intersects with the need for more collaborative engagements within research groups. We primarily adopted the supervisor perspective given supervisors' longer historical account and broader experience on PhD student collaboration, than PhD students' viewpoints.

Ten supervisors were selected using purposeful and convenience sampling from the network of the authors. All held equivalent positions to associate professor to ensure a historical level of experience from PhD supervision having supervised at least one student throughout his or her studies. Each author independently sampled 1-3 interviewees from their respective research areas. Each interview, live or online, lasted between 30-60 minutes. The notes and general observations were then collectively discussed between the authors, and subsequently synthesized into five high-level themes. The themes together form a framework for enabling PhD student collaboration.

Additionally, to complement the interview data, we analyzed co-authorship patterns in 20 latest PhD student dissertations from each of our respective departments (computer science, design sciences, building and environmental technology) at the LTH, as we are familiar with the publication practices, e.g. importance of first authorship. Those not immediately accessible on the university website (www.lup.lub.lu.se) were filtered out. For each thesis, we documented the number of contributions (journal and conference papers) included in the thesis as well as any items listed under "related" publications. For each of these two categories, we documented the number of publications where the thesis author was also listed as the first author. For each publication where the thesis author was not the first author, we looked up if the first author held a PhD at the time of publication.

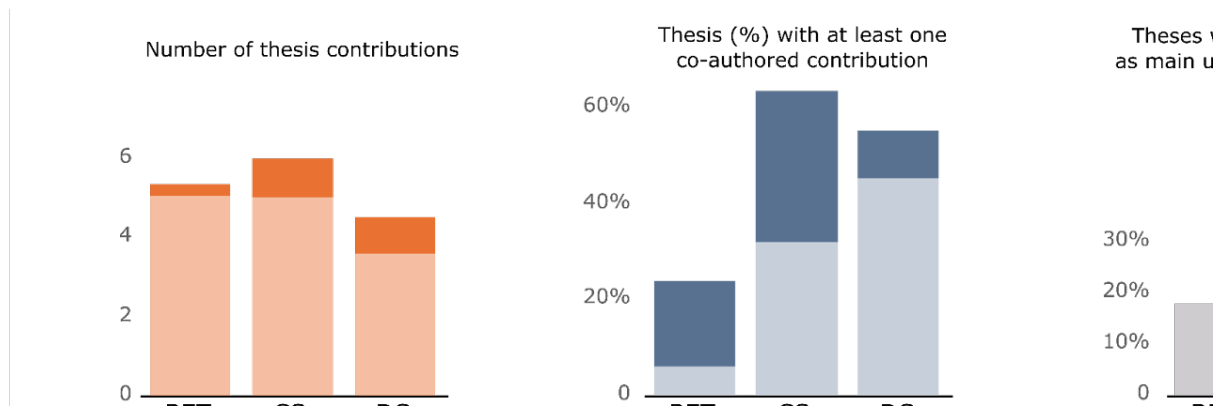


Figure 1. Authorship and collaboration patterns in 20 recent PhD dissertations from three sampled departments in LTH

II. RESULT

Our interviews with supervisors revealed a wide variation in how PhD student collaboration is promoted and practiced across departments and research areas. Some supervisors actively encourage co-authorship and structured peer-learning groups, while others focus more on individual development. Shared methodologies between PhD students, rather than research topics, emerged as a significant enabler of collaboration. We present below five high-level themes of our findings.

1) Thesis connection:

Collaboration related to thesis work is generally encouraged but remains challenging. In Computer Science, 63% of theses included co-authored papers, half involving first authors still pursuing their PhD. In Design Sciences, 55% included co-authorship, though only 10% involved another PhD student; most were led by supervisors. In Building and Environmental Technology, 23% featured co-authored papers, mostly with another PhD student as first author (18%), indicating clear departmental differences.

Figure 1 shows: (left) total thesis contributions (including conferences and journal articles); (centre) thesis with at least one co-authored paper and those led by PhD students; (right) thesis listing such work under “other contributions”.

Supervisors generally support co-authoring, though some uncertainty persists about shared inclusion in multiple theses. Students’ focus on completing their own theses limits peer collaboration, suggesting that loosening informal first-authorship expectations could strengthen mutual support.

2) Facilitation

PhD collaboration is fostered through formal and informal means. Shared physical labs bring students together socially and academically, though access depends on the field. In areas like Computer Science, where students work individually or remotely, initiatives such as joint office days encourage informal exchange.

Methodology courses and research seminars also promote collaboration by enabling co-authored projects and shared reflection, though seminars can become performance-oriented when senior staff are present.

Informal collaboration is largely student-driven, yet supervisors can strengthen it by supporting engagement in peer networks, departmental activities, and research schools that blend academic and social interaction.

3) Common denominator

PhD students often find common ground through shared methodologies, even when their research topics differ. Overlapping methods (e.g., user studies, interviews, and observations) enabled collaboration across distinct research areas and publication communities.

Within departments, collaboration usually arises through group meetings, social events, or informal discussions, while supervisors play a larger role in fostering cross-departmental and interdisciplinary work. In experimental settings, lab technicians also facilitate collaboration and knowledge transfer, often strengthening long-term professional networks even when co-authorship does not result.

Despite shared methods, co-authoring papers remains difficult due to differences in focus or technique. One student may lead a paper while others contribute through data collection or analysis. While supervisors often promote such collaborations to improve research quality, authorship decisions can be sensitive and require clear communication.

4) Enablers

PhD collaboration is supported by supervisors, peers, support staff, and institutional structures. Supervisors often initiate cross-departmental or interdisciplinary collaboration through research schools and informal networks, connecting students and enhancing research quality. However, authorship concerns may complicate such efforts.

Within departments, student-led initiatives (e.g., informal discussions and peer networks) can create a culture of openness that supports shared problem-solving. However, confident and outgoing students tend to engage more actively across disciplines, while low self-esteem can limit participation and knowledge exchange.

In experimental environments, lab technicians facilitate collaboration by transferring technical knowledge and supporting mutual learning, contributing to trust and long-term professional ties even without co-authored outputs. At a broader level, faculty and departmental programs provide structured platforms that sustain collaboration beyond immediate research groups.

5) Culture and identity

Cultural identity strongly shapes collaboration among PhD students. Where students are treated as employees, collaboration is more frequent and informal, supported by fika, seminars, and peer networks that reduce hierarchy and foster mutual support.

In contrast, departments that view PhD students primarily

as learners tend to have more individualistic and formal collaboration practices, often limited to journal clubs or supervised projects. Here, autonomy and competition reinforce isolation, especially in theory-oriented disciplines.

Even in employee-like settings, funding limits and project isolation can restrict collaboration, though established social practices help mitigate these effects. A broader cultural shift is evident as universities move from competition toward collaboration, driven by external funders and national research programs. In Construction Management, for instance, long-standing partnerships with Luleå University of Technology and KTH illustrate how structured, cross-university collaborations can expand opportunities for PhD interaction. Departments with diverse and interdisciplinary student bodies are generally more open to such cooperation, while homogeneous and discipline-bound environments remain more individualistic.

IV. DISCUSSIONS

Our findings align with earlier research on doctoral collaboration, particularly the work of [7], showing that collaboration enhances research outcomes and provides emotional and social support that mitigates isolation among PhD students. The interviews confirm that both formal and informal peer networks play an important role in doctoral socialisation, reinforcing what [7, pp. 124, 157] describe as the value of peer learning for academic identity development and knowledge exchange. Collaborative environments, especially in interdisciplinary settings, also help students build broader professional networks and strengthen research quality.

Encouraging collaboration often involves balancing independence and shared work. As noted by [7, p. 194], supervisors are central to managing this balance between ownership and teamwork. Our findings support this: supervisors promote collaboration through joint methodology courses, co-authored projects, and research seminars that connect students across disciplines and research groups.

Supervisors are thus key enablers, but institutional culture also matters. Departments where PhD students are treated as employees rather than learners show more frequent and informal collaboration, reflecting lower hierarchy and greater integration into research life. This supports [7, p. 256] argument that institutional and cultural contexts are crucial for creating a supportive doctoral environment.

Nonetheless, challenges persist, particularly around authorship and uneven participation. Consistent with [7, 222], our findings highlight that unclear credit allocation can discourage collaboration, while clear communication and transparent guidelines foster equitable practices. Differences in confidence also affect participation: extroverted students tend to initiate collaboration, whereas others may need encouragement. Supervisors can mitigate this by creating inclusive and confidence-building settings that invite all students to engage.

Finally, cultural identity and institutional trends shape collaborative practices. Departments promoting professionalised, employee-like doctoral roles and cross-university initiatives (e.g., those supported by national or interuniversity research programmes) tend to foster stronger

collaboration. This reflects [7, p. 256] observation that interdisciplinary and externally funded environments drive a shift toward more collective approaches to doctoral education. However, the growing number of stakeholders involved also leads to more varied perceptions of quality. Such issue warrants continued attention in supervision and institutional learning processes.

In conclusion, this study highlights the importance of collaboration in doctoral education as a means to enhance research and supervision quality, and support the social and professional development of PhD students. Effective collaboration depends on supervisors who balance independence with shared learning and on institutional cultures that value openness and collegiality. Addressing challenges such as authorship concerns and unequal engagement can further improve the doctoral experience. Ultimately, fostering a supportive and collaborative environment benefits not only individual students but also the broader research community by promoting collective learning, higher-quality outputs, and more sustainable academic networks.

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