

Graduate collective in earth sciences: Promoting network building among doctoral students

Caroline Welte¹

ETH Library, Rämistrasse 101, 8006 Zürich

Department of Earth Sciences (D-ERDW), Sonneggstrasse 5, 8092 Zürich

Adrian Gilli²

Department of Earth Sciences (D-ERDW), Sonneggstrasse 5, 8092 Zürich

Jordon Hemingway³

Department of Earth Sciences (D-ERDW), Sonneggstrasse 5, 8092 Zürich

Abstract

Doctoral students need to acquire a large skillset to meet the numerous and diverse challenges they face during their studies. Several factors can have a positive influence on how students navigate their doctoral projects independent of their supervisor's commitment. These include informal networks of doctoral students that are regarded as key components to scientific success. Although there are opportunities for building informal networks within individual research groups, few opportunities exist at the institute and department level. Several research groups within the Department of Earth Sciences (D-ERDW) gathered to launch the *Graduate Collective* in the spring semester 2022.

In a series of four seminars and ten workshops, we made use of the common thematic framework to provide 16 doctoral students with the tools and resources they need to navigate their graduate studies. Students worked closely together on the various topics in groups of different sizes, thus enabling them to build networks with co-students from related research fields. In addition, informal networking events were organized that allowed the students to deepen and stabilize their new connections with co-students. Students could earn 2 credit points for taking part in this course. We evaluate and reflect the effect of our course on network building based observations made during the course. Overall, the results underline our hypothesis that a teaching format installed between the department and group level enables participants to build networks of interpersonal support.

Introduction

In 2022, a new initiative was launched within the Department of Earth Sciences (D-ERDW) at ETH Zurich, Switzerland. A group of four lecturers designed a course—the *Graduate Collective*—with the goal of bringing doctoral students from their research groups together, as their networking opportunities had been greatly reduced during the lock-down period in 2020 and 2021. At D-ERDW, doctoral students have a range of opportunities for formal and informal networking. In this context, the students' research groups play a very important role. For

¹ caroline.welte@library.ethz.ch

² adrian.gilli@erdw.ethz.ch

³ jordon.hemingway@erdw.ethz.ch

example, students participate in group meetings and group retreats. Moreover, they are typically given the opportunity to visit seminars organized within the institute or across the department. All of the above constitute formal networking opportunities. Furthermore, several informal networking events are offered to doctoral students at D-ERDW, among them the annual “doctoral retreat”, the weekly “Friday beer”, and occasionally a self-organized “doctoral excursion”. A format combining formal and informal networking opportunities on a regular basis, i.e., more than once per year, for doctoral students is so far missing at D-ERDW.

With the Graduate Collective, a new format has been launched that aims at bringing together doctoral students from different research groups. Besides providing them orientation about tools and services available at ETH Zurich, the students developed new skills and competences beyond expert knowledge. Ten instructors were invited to explore the different topics with 16 students from four research groups in weekly classes during one semester. Due to the pandemic, many of these students had little interaction before and in some cases even students from the same group were lacking interpersonal relationships. The duration of each class was between two and three teaching units (1 teaching unit = 45 minutes). Students received two credit points for regular participation and completion of homework. Even though some doctoral students in their third year participated in the course, the focus was on students who were relatively new in their doctoral studies.

Comprehensive orientation programs for doctoral students can be an effective way to ensure that students are appropriately socialized (Taub and Komives, 1998). Such programs promote equity and inclusion as they can reduce dependence on supervisors by providing the same information to all students. This is especially important as supervision is a key factor for successful and timely completion of doctoral studies (Leonard *et al.*, 2006; Kiley, 2011; McCallin and Nayar, 2012; John and Denicolo, 2013), despite the fact that in reality large disparities prevail in the quality of supervision (Ives and Rowley, 2005; Dutt, 2020). Furthermore, comprehensive orientation programs create an ideal framework for networking and, specifically, for the formation of a supportive cohort (Cooke *et al.*, 2021).

Networks play a very important role for academic success and give researchers the opportunity to meet colleagues for the exchange of knowledge. According to Kreis and Nierobisch (2016), two types of networks can be distinguished—*formal* and *informal* networks, defined as:

- **Formal networks** can be described as those with an institutionalized framework, such as the members of an institute that have a common aim.
- **Informal networks** comprise personal contacts such as friends, acquaintances, and those that fit between formal and informal contacts.

Especially for young researchers, it is important for their future career to become part of such networks. Individual opportunities may open up, e.g., for a research collaboration or a next career step (Kreis and Nierobisch, 2016). Furthermore, networks among peers provide informal learning opportunities and support (Hasrati, 2005). In their study, Kreis and Nierobisch (2016) highlight that successful networking requires not only formal and informal networking opportunities, but also a positive attitude towards such activities.

After teaching the *Graduate Collective* for the first time in spring 2022, we reflect on the following question: *Which activities in our course are particularly effective in promoting network building among doctoral students?*

Conceptual Design of the Graduate Collective

The central focus of the *Graduate Collective* is to give learning and networking opportunities to its participants. Furthermore, a scholarly education was pursued through interaction

between students, faculty, and external speakers in a series of workshops and seminars (Figure 1). The similar background of the students allowed for teaching certain generic competencies in an efficient way, particularly scientific writing where each discipline has its own conventions. Intentionally, students from different levels were included to facilitate peer-to-peer learning. General skills, i.e., scientific writing, effective communication, and presentation techniques were taught in workshop formats. For the scientific writing, we collaborated with the Language Center of ETH Zurich and the University of Zurich. For presentation techniques and communication skills, external coaches were invited. An overview of organizational units available at ETH for different concerns was given by the respective representatives in seminars. Specifically, representatives from different units of the ETH Library and from the IT Services were invited. The program for the trial phase during the spring semester 2022 is given in Table 1. By creating the time and space where students can meet in person and work on multidisciplinary competences in various formats, we enabled them to learn and connect by forming a supportive group that will potentially last beyond the course.

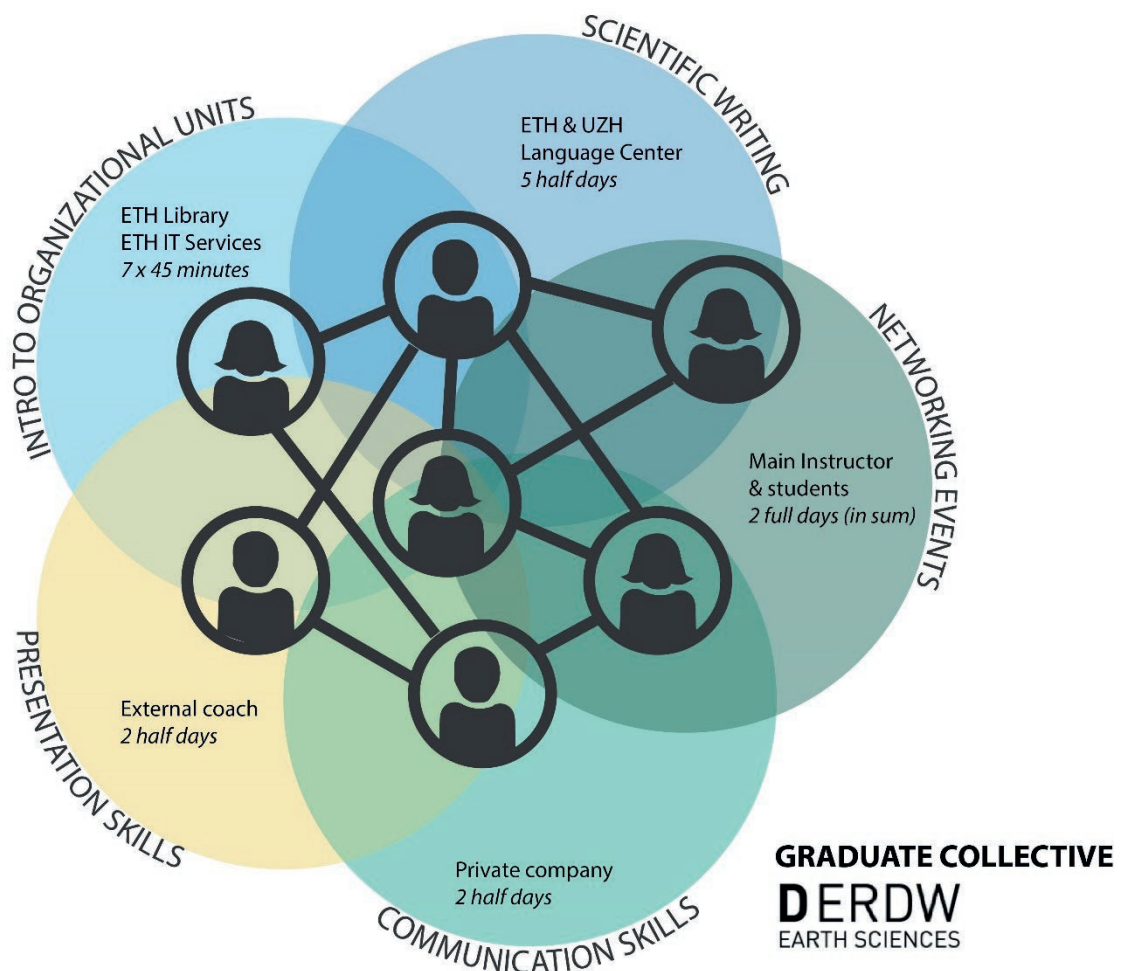


Figure 1: Overview of workshops, lectures and other activities taught in the Graduate Collective 2022

Activities promoting the formation of networks

In short, the formation of formal and informal networks was promoted through the following measures:

- **Regular meetings** during one semester served as a foundation of new networks, as students had the opportunity to see and learn about each other on a recurring basis.
- Promoting a “**safe space**” (Holley and Steiner, 2005) through interactive getting-to-know games, especially in the beginning of the semester. In the communication skills workshop, students had the chance to exchange personal experiences. These activities

facilitate interaction between participants, e.g., because common interests or issues are revealed.

- By working together on topics that affect all doctoral students equally, a **sense of community** can develop that makes later interactions between the participants more likely.
- The workshop format classes, in particular the scientific writing and the communication skills, fostered interaction on the **partner and group work** level.
- **Peer reviews** were conducted as part of the scientific writing workshop. This provided additional training in writing skills, and a sense that students can support each other also beyond this course.
- The communication skills workshop not only provided the tools necessary for **peer coaching**, but also practiced and applied the methods among themselves.
- **Informal activities** enabled deepening of already existing and formation of new networks between the participants. This comprised a group hike organized by the main lecturer and a visit to the laser tag facility organized by the students.

Methods

During the first iteration of the *Graduate Collective*, we did not employ quantitative methods for the evaluation of the course. The reflections are instead based on:

- observations of the main lecturer
- exchange with co-lecturers (e.g., during breaks, after class, and in the form of emails after the semester)
- oral exchanges with students (e.g., during breaks or after lecture and in discussions during class and randomly with several participants after the semester)

The following two criteria were used as indicators of success in promoting networking among students:

1. Quantity of interaction between students in class,
2. Quality of interaction among students in class and beyond the course.

| Week | Format | Genre | Topic |
|------|---------------------|--|---|
| 1 | Workshop & Homework | General | General introduction with interactive “getting to know” and networking activities |
| 2 | Seminar | Intro to organizational units / information competencies | Introduction to scientific writing |
| 3 | Workshop & Homework | Scientific Writing | Introduction: reading, grammar, resources |
| 4 | Workshop & Homework | Scientific Writing | From plan to draft, structure of a paragraph |
| 5 | Seminar | Intro to organizational units / information competencies | Introduction to IT Services and data management |
| 6 | Excursion | Informal networking Event | Hike |
| 7 | Workshop & Homework | Scientific Writing | Writing the introduction |

| | | | |
|----|---------------------|--|--|
| 8 | Seminar | Intro to organizational units / information competencies | Introduction to ETH Library, Searching literature, Tour to Earth Science Library |
| 9 | Workshop & Homework | Scientific Writing | Writing the discussion and conclusion |
| 10 | Workshop | Communication skills | The language of Change I |
| 11 | Excursion | Informal networking Event | Laser Tag |
| 12 | Workshop & Homework | Scientific Writing | Writing abstracts and choosing titles |
| 13 | Workshop | Communication skills | The language of Change II |
| 14 | Seminar | Intro to organizational units / information competencies | Reading and Reference Management |
| 15 | Workshop | Presentation skills | Students could choose from a list of topics |
| 16 | Workshop | General | Synthesis & reflections* |

Table 1: Program for the Graduate Collective 2022. Note that this is the schedule as it was originally planned. During the course of the semester, we hosted two sessions of “Ethics in Science”.

*The Earth Science Department participated in the pilot phase for this course that will be introduced for all ETH Departments eventually. For this trial period, integrating it into the Graduate Collective was an efficient solution, even though, in the future, this will be a stand-alone course. *The synthesis could not take place in this semester because of the “Ethics in Science” course.*

Reflections and discussion

Effectiveness of different activities in promoting student networks

In this section, different levels of activity are analyzed with respect to how much interaction they promoted among the Graduate Collective participants.

The **ice-breaker activities** of the first lesson, in particular the “speed dating”, where students were asked to exchange about professional and private aspects about themselves, led to intensive interactions among the participants. Through this task, students had the chance to find out about common interests and to arouse curiosity about each other. We hypothesize that this provided points of contact for later conversations, i.e., further networking opportunities, and laid the foundations for a trustful environment. Students also confirmed that they found these activities particularly helpful for overcoming social barriers and getting engaged with co-students. Some even stated that they would have liked to see more such activities.

We assume that **regular meetings** alone, even in a steady group of individuals, are not particularly effective in promoting networks. However, in combination with other activities, we observed that they contributed to fruitful conditions for networking. For example, even though the ice-breaker activity promoted a high degree of interaction, this was limited to a short period of time. We argue that since this first event was part of a series of activities, the potential for building networks was optimally utilized in this combination.

One important factor contributing to active discussions and interactions is to create a **safe space**, as it forms the basis for students to share their views and experiences (Holley and Steiner, 2005) in front of a group. Numerous co-lecturers confirmed that they found the classes in the Graduate Collective very lively. Most notable, the “Ethics in Science” workshop required a fairly high degree of trust among the students as they were asked to prepare and present role plays about ethical dilemmas in front of the class. This activity was very successful when conducted within the Graduate Collective. In contrast, as the lecturer of the “Ethics in Science”

pointed out, in a second run as a stand-alone class (2 x 3h), the level of interactivity was significantly lower.

During the four seminars, topics relevant to all students such as plagiarism, pros and cons of different literature management tools, and IT security lead to lively discussions and ultimately fostered a **sense of community** in the group. Students experienced that their concerns often apply to others as well and that for things that challenged them, some of their peers might have simple workarounds.

Partner and group work was a major part of the scientific writing workshop series. In numerous exercises, students were asked to share experiences and exchange ideas. Homework throughout the course was frequently corrected in a peer-reviewing process, either through one or two co-students, sometimes with the instruction that at least one of the referees had to be from a different research group. The lecturer confirmed that his classes greatly benefitted from the safe environment that had been created through the regular meetings and on top from the similar research themes of the students. Not only was a high number of interactions observed between participants in class, but conversations also continued during breaks outside class.

At least in one case, this resulted in an interaction of very high quality, i.e., a new scientific collaboration. The case is described in the following (names and details are change): Two doctoral students (Grace and Nina) from the same department, but different research groups meet during the first class of the *Graduate Collective*. During one of the workshops they work together on a task. Afterwards, they are asked to **peer-review** each other's assignments. Based on this experience they start having informal conversation during the breaks of the following classes. They discover that there is an overlap in their doctoral projects. Grace has knowledge on geological samples that is of great value to Nina. On the contrary, Nina is very skilled in programming and can help Grace with her data evaluation.

A comparably small number of doctoral students participated in the voluntary **fun activities**. Originally, three such events were planned. The first activity was chosen by the students through a survey and organized by the lecturer. Even though the event allowed intensive interaction and building sustainable networks, it can hardly be considered successful as only two students participated. The students were allowed to organize the second event on their own and only had to adhere to the financial guidelines as well as the instruction that the participants had to come from at least three different groups. Six students participated in in this second event.

In the two sessions focusing on communication skills students reflected on the principles of communication and learned, in small groups, the basics of peer-coaching. The level of interaction among participants was high as students were very engaged and active. Like for other classes towards the end of the semester, the number of participants was rather low, with eight (first session) and five (second session).

What are ideal networking opportunities for doctoral students?

Pilbeam, Lloyd-Jones and Denyer (2013) identified three main factors that facilitate the formation of networks among doctoral students: physical presence, shared experience, and common purpose. The challenge is to create opportunities where all three aspects can develop. In this section, the characteristic of ideal networking opportunities are discussed.

- Organizational programs offered through the institution (e.g., institute or department), such as comprehensive orientation programs, have been shown to effectively develop doctoral student networks (Pilbeam, Lloyd-Jones and Denyer, 2013). They provide the ideal framework to foster physical presence and, if suitable teaching content is offered, this can further result in shared experiences and common purpose.

- Face-to-Face interaction has been identified as a crucial component for successful networking (Pilbeam, Lloyd-Jones & Denyer, 2013).
- Non-formal networking opportunities aimed at fostering personal relationships can lead to innovative research collaborations (Kreis & Nierobisch, 2016, p. 157)
- Overcoming full schedules: doctoral students typically have very full agendas (e.g., Shin et al., 2018, p. 66). Combined with the large supply of further training and other courses at ETH Zurich, it is challenging for them to set priorities. This most likely explains the small number of students attending the voluntary “fun” excursions. Furthermore, a relatively high proportion of students frequently missed classes due to field or lab work, but also because they attended conferences. To create ideal networking opportunities for doctoral students, we hypothesize that students need to be educated about the importance of peer networks to their own careers. We also hypothesize, and in some cases have observed, that they are more engaged in the course when they feel supported or even encouraged by their supervisor.

Considerations for future teaching

For the second pass of the *Graduate Collective*, a few adaptations based on our experience from the pilot phase will be made. The course will be opened to the entire Department of Earth Sciences for two reasons: (i) to keep the number of students involved at the same level, i.e. 15 - 20, the group of doctoral students addressed must be expanded, and (ii) more students will have the chance to benefit from this program. After careful evaluation of the time investment made by students to pass the course, the amount of credit points will be increased from 2 to 3. At the same time, participation in the fun activities will be made mandatory and will have to be organized by the students. In the first lesson, we will dedicate time to increase the awareness about the importance of networks among doctoral students and how programs like the *Graduate Collective* can foster them.

To enable more interaction between the students outside of class, we plan to create a common channel (e.g., on WhatsApp) where participants will be asked to share reflections on their experiences as doctoral students. Every month, students will create two posts: one on their individual experience and one in pairs with a colleague from the course. By doing this, students will be more likely to meet outside of class and to interact even more. Through the shared experiences, we also intend to increase the shared experience and common purpose. A suitable format is the “visual expression of transitions to doctoral studies”, where photographs from experiences of the doctoral students with captions are shared within a social media channel (Elliot et al., 2020, p. 83 and p.90).

Conclusion & Outlook

A total of 16 students from four different research groups enrolled in the first run of our course. Four professors supported the new format and funding was received for two semesters. The analysis of the quantity and quality of interactions among students based on observations from lecturers and conversations with students indicate that the *Graduate Collective* fosters networking among doctoral students. In particular, the regular face-to-face meetings coupled with sharing experiences and working on common topics created numerous excellent networking opportunities. The initiative was presented at the ETH Learning & Teaching Fair 2022, where it attracted great interest. From this, we conclude that we have hit the right time with our course and can fill a gap in the offer of the Department of Earth Sciences at ETH Zurich for doctoral students. By offering education about the benefits of networks to the entire institution—from students to professors—the acceptance and engagement in a course like our *Graduate Collective* can be increased.

Acknowledgement

The Graduate Collective was supported by the “Projektförderung Doktorat,” an ETH program to support initiatives for doctoral students and the respective funding was granted for two semesters.

The authors would like to thank Tim Eglinton, Cara Magnabosco and Heather Stoll for their support in building this course. We would also like to thank the students from the Graduate Collective in spring semester 2022 for the numerous discussions and valuable insights in their doctoral experience. We greatly appreciate the engagement of the representatives of different organizational units from ETH Zurich and other lecturers that made the first pass of the Graduate Collective a great success: Simon Milligan, Christine Bärtsch, Andreas Müller, Fabienne Stalder, Anja Harder, Julian Dederke, Florian Lirken, Cornelia Künzle and Deborah Otuyelu. Two anonymous reviewers and the editors helped to improve this manuscript substantially, which is greatly acknowledged.

Bibliography

- Cooke, M. *et al.* (2021). First-year graduate courses foster inclusion. *Nature Geoscience*, 14(8), pp. 539–540. Available at: <https://doi.org/10.1038/s41561-021-00800-6>.
- Elliot, D.L. *et al.* (2020). *The hidden curriculum in doctoral education*. Springer.
- Hasrati, M. (2005). Legitimate peripheral participation and supervising Ph.D. students. *Studies in Higher Education*, 30(5), pp. 557–570. Available at: <https://doi.org/10.1080/03075070500249252>.
- Holley, L.C. & Steiner, S. (2005). Safe space: student perspectives on classroom environment. *Journal of Social Work Education*, 41(1), pp. 49–64. Available at: <https://doi.org/10.5175/JSWE.2005.200300343>.
- Ives, G. & Rowley, G. (2005). Supervisor selection or allocation and continuity of supervision: Ph. D. students' progress and outcomes', *Studies in higher education*, 30(5), pp. 535–555.
- John, T. & Denicolo, P. (2013). Doctoral education: A review of the literature monitoring the doctoral student experience in selected OECD countries (mainly UK). *Springer Science Reviews*, 1(1), pp. 41–49.
- Kiley, M. (2011). Developments in research supervisor training: causes and responses. *Studies in Higher Education*, 36(5), pp. 585–599.
- Kreis, Y. & Nierobisch, K. (2016). Networks - the socialization of academics. *Journal for Higher Education Development*, 11(5), pp. 145–162.
- Leonard, D. *et al.* (2006). Review of literature on the impact of working context and support on the postgraduate research student learning experience. *New York, NY: The Higher Education Academy* [Preprint].
- McCallin, A. & Nayar, S. (2012). Postgraduate research supervision: a critical review of current practice. *Teaching in Higher Education*, 17(1), pp. 63–74.
- Pilbeam, C., Lloyd-Jones, G. & Denyer, D. (2013). Leveraging value in doctoral student networks through social capital. *Studies in Higher Education*, 38(10), pp. 1472–1489. Available at: <https://doi.org/10.1080/03075079.2011.636800>.
- Shin, J.C., Kehm, B.M. & Jones, G.A. (2018). *Doctoral education for the knowledge society*. Cham: Springer.
- Taub, D.J. & Komives, S.R. (1998). A comprehensive graduate orientation program: Practicing what we preach. *Journal of College Student Development*, 39, pp. 394–398.