Towards Super Supervision

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Abstract—**During the fall term of 2023 we were seven PhD supervisors from the division of Computer Vision and Machine Learning at the Centre for Mathematical Sciences who gathered weekly to discuss questions related to our role as supervisors and important aspects of PhD supervision. Each such meeting was centered around a pre-determined topic, e.g. "what makes a good first research project", and minutes were taken and distributed among the participants. We think our discussions have been valuable for us and our students, and that our experiences may be relevant for other teachers and supervisors as well. It is therefore the aim of this reflective text to describe these "Super supervision meetings", how they were organized, what topics we discussed, how our discussions relate to ideas in the research supervision literature, and, finally, the impact the meetings could have on our supervision practices.**

Index Terms—**PhD supervision, collegial learning**

I. Introduction and Motivation

Successful training of doctoral students and supervision is a key ingredient in a strong research environment. A large portion of the research that is being produced in academic institutions is done by PhD students, jointly with, or under the supervision of senior researchers.

A doctoral student's performance is often discussed retrospectively and typically focuses on the quality of obtained research results, papers published etc. In the division of Computer Vision and Machine Learning (CVML), at the Centre for Mathematical Sciences (CMS), we want to create a culture of open discussion around methods for supervision. We find that pedagogical and didactic discussions on teaching and learning methods in undergraduate studies are frequently occurring within CMS. In contrast, supervision of doctoral students is rarely discussed (at least not proactively), beyond the yearly Individual Study Plan (ISP) meetings and the half time evaluations, and the supervisor is more or less left alone to design suitable activities and projects.

PhD supervision has the end goal of turning the student into an expert in their field as well as an independent researcher. This is a long time commitment, typically five years or more. Moreover, every student is different and as supervisors, we may only go through the entire process a few times in our careers. This makes it difficult for the individual supervisor to develop a level of personal experience sufficient to cope with the various situations that can arise along the way toward the students thesis defence. At the same time, there are many risks for all parties involved; failure to complete doctoral studies is not only a disaster for the student but may also reduce the supervisor's chances of obtaining further funding, which can be devastating in an early career. Hence, we argue that developing a culture around supervision where we can draw on each other's knowledge and experiences is equally important in doctoral studies as in undergraduate teaching. Our response to this need was to start a series of collegial meetings among the PhD supervisors at CVML, where various aspects of supervision were discussed in an informal environment. We hope this will be a support to us supervisors, and indirectly to student progress, by helping to avoid common pitfalls and achieve a well-structured PhD education. This report describes our initial experiences from these meetings.

II. The Super Supervision-Meetings

The *Super supervision*-meetings is our name for the ongoing series of discussion meetings that were organized at CVML throughout the fall of 2023. These meetings gathered six to seven PhD supervisors from the division, with quite a large span in terms of experience; from postdocs that have only had their first experience as assistant supervisors to full professors with several finished PhD-students behind them. Each meeting, which lasted around an hour, focused on a specific topic related to PhD student supervision and the role of the supervisor. The topics were chosen by the participants themselves, based on the challenges they had perceived in their own supervision context, and announced well before the meeting. The format was a casual round-table discussion where each participant was allowed to present his or her own experiences or ideas related to the particular topic. At the end of each meeting, the discussion was summarized and a set of conclusions were formulated in the form of best practice rules or suggestions for the topic in question.

A. Examples of discussed topics

In the following paragraphs, we will illustrate some concrete examples of the subjects we have explored, shedding light on the types of questions we have delved into and the underlying motivations for these discussions. Additionally, throughout our meetings, we have made an effort to formulate certain best practices, although it is essential to emphasize that these guidelines are not the central emphasis of our gatherings.

- **How to set up a first project**
  We discussed ways for a successful first research project. The motivation for the topic was that the first project could be hard, since the student is new to research and the student and the supervisor do not know each other, but it is also important, to make the student feel confident in the research environment, to reduce anxiety and imposter syndrome [1]. Topics discussed were how much work should remain at the start of the project, the advantages and disadvantages of having an arranged project versus

higher risk, support versus independence, and how much work should be done together. One suggestion was that the supervisor has a "recipe" for all the steps that should be done, from the start to a published paper, but where the students perform all the steps themselves. We discussed this in the context of scaffolding [2] and specifically related to contingency (the teacher should calibrate the support to the individual student), fading (the teacher should gradually remove the support) and transfer (the student should gradually take control of the project).

- **How to foster group cohesion and identity among the PhD-students**

  The next meeting focused more on how to develop the research environment in which the supervision occurs. In particular, how to create cohesion in the research group and reinforce a group identity among the students. We discussed both how to accomplish this, e.g. via regular group meetings to discuss the current progress and issues, by organizing social activities outside the office, or having students collaborate more on research projects, etc. More practical and logistical issues were also brought up, for example room assignments. If the research group (students and their supervisor) sit close together it allows more for spontaneous discussions and opportunities for supervision to occur between regular meetings. We also discussed the potential drawbacks. For example, the risk of homogenization of the research directions in the group coming from too close collaborations between students.

- **Student-supervisor communication**

  How to ensure good communication was discussed in the following meeting. As illustrated in Fig. 1, there are different types of communication but we strive to have communication on equal terms. For example, we discussed to what extent we should formalise the supervision meetings (notes, agenda, follow-up, slide deck), how to encourage spontaneous meetings, and the balance between critique and positive feedback. We also discussed different communication channels (Teams, Slack, email, etc), placement (physical, rooms, proximity to supervisor, open doors), social activities (personal vs private vs professional) and other communication venues (journal club, division meetings, social activities on division level). Finally, we also brought up what to do when communication fails or has problems. Suggestions were to use smaller more concrete steps in the research and be gentle when progress is an issue.

III. DISCUSSION AND CONCLUSIONS

A. Supervision theory and background

One of the motives for setting up these meetings was to foster an open environment for discussing supervision, and also to work with collegial knowledge transfer. Many good ideas for how to achieve this are described in Boyer's "Scholarship Reconsidered" [3]. Here he introduces the *scholarship of teaching*, which is one of four equal pillars that he argues should constitute the basis for academic work. We have not formalised our conclusions from these initial meetings, but we
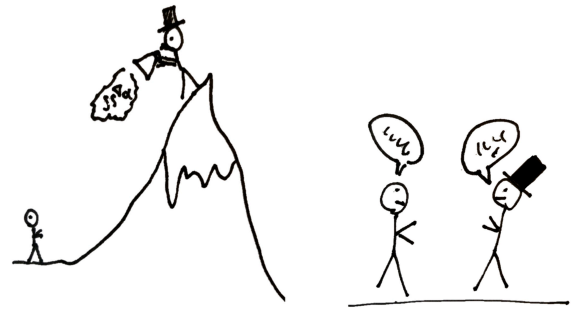

Fig. 1. Two versions of student supervisor communication. Left: The supervisor acts as a knowledgeable "guru" and instructs the student. Right: The supervisor and student have discussions on equal terms.

believe that we can in the future also connect our discussions and conclusions to ideas from the pedagogical and didactive literature.

Teaching based on projects has very large elements of problem-based learning [4] which in turn has many benefits and can often engage students and promote a deep approach to learning. Projects are arguably also the closest the students come to a real work situation for a typical engineer, during their education. This is also true for the typical PhD-projects that we have at CVML. Even though the level of the projects varies, much of the basic principles are the same.

There is much general work done on project supervision and guidance. A typical danger is if the students do not ask for help when they need it, and one does not identify that they are having problems. Then, valuable time and momentum in the project might be lost. However, the opposite poses much more risks, where you offer too much help and guidance so that the student learning turns passive. In a theoretical context this balance on guidance can be phrased using Vygotsky's idea of Zone of Proximal Development (ZPD) [5]. This is also directly connected to the how to use scaffolding in supervision [6], [2].

We have tried to keep these ideas present throughout our discussions, for the various practical topics that we have covered.

B. Conclusions

After a few months of super supervision-meetings we can conclude that the meetings have been developing for us as supervisors, giving us insights into other's situations, new ideas and a context for collegial learning. This also gives more opportunities to discuss problems and other matters outside the scheduled meetings. Furthermore, together we can collaborate in finding support and ideas from the pedagogical research. Hence, we will continue with these meetings forward, to develop as supervisors and to give the PhD students their best possible education. We also recommend that supervisors at other divisions create similar contexts for these types of discussions and development.

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