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PROGRAM PROFILE 2.

DISCIPLINARY TAs EXPLORING THE RECIPROCAL EFFECTS OF PROVIDING WRITING FEEDBACK IN PHYSICS

Hans Malmström and Magnus Gustafsson
Chalmers University of Technology

INTRODUCING THE WRITING CONTEXT

The TA-scaffolded communication, which is the focus of this description, is a writing task integrated in a mandatory first-year course in engineering physics. The course, "Tools of Engineering Physics", spreads across one and a half semesters of the five-year engineering physics program at Chalmers University of Technology in Sweden. The course is a modular introductory course, the purpose of which is to provide students with fundamental skills necessary for study and future engineering physics work. Module three of the course focuses on fundamental experimental methodology within a context of physics problem solving and is used also for the purpose of introducing students to a key genre in the engineering physics discipline: the laboratory report. During several experimental sessions, pairs of students are expected to plan and perform experiments of physical phenomena, perform basic dimensional analysis and physical modelling, and analyze the results. They then write a laboratory report based on their laboratory notes.

At the beginning of the course, staff from the university's Division for Language and Communication offer all students a lecture focusing on the laboratory report, the overarching purpose of which is to make students genre aware. Until 2017, Division staff met all student pairs for 30 minutes, offering them verbal as well as written formative feedback on a first draft of the laboratory report. Immediately before or after receiving the writing feedback, students received feedback on their experimental methodology (as articulated in the report and witnessed in the laboratory) from a physics doctoral student acting as a TA (there are usually five TAs involved, working a rotational schedule, usually as part of their departmental teaching duties).

Every year, while expressing their appreciation for the feedback, students complained that the back-to-back feedback sessions robbed them of valuable time in the laboratory, that the feedback overlapped, and that the messages from the TAs and from the communication specialists were not always aligned. What is more, several of the TAs expressed the view that it was odd to treat the methodology and the text as distinct from each other, stressing instead how they are two components on a continuum of learning physics.

This feedback and these insights led to a redesign of the feedback component of the course. It was decided that all of the feedback (addressing methodology as well as text) would be provided by the doctoral students, as credible and knowledgeable insiders of the physics community. The Division would continue to offer the writing-genre lecture; additionally, Division staff would train and support the doctoral students in giving formative writing feedback and be on hand during the writing and feedback process for any matters arising around the students' texts.

TRAINING THE DOCTORAL STUDENTS

The redesign and implementation of the new feedback component, including the training of the doctoral students, was informed by Dannels' situated communication pedagogy and Airey and Linder's understanding of disciplinary (physics) discourse (these theoretical frameworks are grounded within sociocultural theories of learning and arguably owe a particular debt to situated learning theory (cf. Lave and Wenger as well as Wenger). For the benefit of both the students receiving the feedback and the TAs providing it, the feedback sought to be reflective of "context-driven disciplinary instruction" shaped by and shaping "disciplinary knowledge construction" (Dannels 46). Dannels' conception of a situated communication pedagogy is readily compatible with Airey and Linder's understanding of disciplinary discourse; indeed, we talked to the TAs about situated communication as a dimension of "the complex of representations, tools and activities of a discipline" (28). Airey and Linder argue that "students need to become fluent in a critical constellation of the different semiotic resources—or modes of disciplinary discourse as we depict them—before they can appropriately holistically experience the disciplinary way of knowing that these resources/modes potentially give access to" (28). Achieving such fluency is an objective of the target course, and the formative assessment/feedback is intended to scaffold that objective.

The training (preceded by a pilot with a single TA the previous year) was set up to make the doctoral students aware of the long-term stakes involved in undergraduate student writing, notably that "genres are places where students

learn about the rhetorical contexts in which they are interacting" and that texts, e.g., lab reports, "stand as rhetorical representations of the discipline" (Dannels 147). Thus, it was important conveying that the students' writing in the first-year course amounts to a first step in the socialization into the engineering physics discipline, and that the writing is one dimension of the students' achieving discourse fluency (Airey and Linder).

The training was primarily text-oriented; we worked off samples of students' text from the previous year and discussed the extent to which, and how, the texts constituted exemplars of writing in the engineering physics discipline and how student writers did (or did not) embrace the rhetorical conventions of the genre and the disciplinary discourse. The TAs were asked to read and comment on two texts, as they would normally do, focusing on the articulation of the experimental methodology, but this time they were asked to comment also on any aspects of the writing making the text more or less credible as a text in the engineering physics writing tradition (the prompt was deliberately open). We then also read the texts, first without looking at the TAs' commentary, and then added our own commentary to the TAs', supplemented by "meta-commentary" relating to the TAs' observations. We subsequently met the TAs and worked our way through the text, the comments, and the meta-commentary in a systematic fashion. Division staff then accompanied the TAs for three of their first feedback sessions with students, offering constructive critique and a "debrief" after each session, and giving advice about additional perspectives on the texts/writing which could be included in the feedback.

OBSERVED OUTCOMES

In addition to the positive outcomes observed for the undergraduate students (which is beyond the scope of this description), the redesign also had several positive effects on the doctoral students. We will mention three of these mutually supportive and overlapping outcomes here.

At a fundamental level, the laboratory report is a representation of the "language, mathematics. . . images (including pictures, graphs and diagrams) tools (such as experimental apparatus and measurement equipment), and activities (such as ways of working—both practice and praxis, analytical routines, actions, etc.)" of the discipline (Airey and Linder 27). Engaging with the undergraduate students' texts and providing the feedback on the text and the students' performance in the laboratory required the doctoral students to attend to and reflect on multiple modes of disciplinary discourse as they were articulated in the texts. The TAs could relate what they saw in the students' texts with the experience from their own reading and writing in the discipline, as expressed by two of the TAs

during a follow-up conversation:

> . . . you often thought of how you would have expressed that yourself.
>
> The feedback is an opportunity for thinking about how you express and behave [as a physicist and physics writer], both how I behave and write, and how others do it.

The reference to "behavior" above is significant. Discussions with the doctoral students revealed that their feedback, and therefore also the content of the reflections, frequently extended beyond the language domain to other modes of disciplinary discourse, for example, issues relating to the integration of visual information and formulae, striking a proper balance between text and visuals, making figures communicate visual content effectively, and the (sequential) location of critical and non-critical content within a text.

A second outcome attributable to the modified teaching role assumed by the TAs is how the feedback appeared to be beneficial for the doctoral students' own development of disciplinary literacy (in addition to that of the students'), i.e., their "ability to appropriately participate in the communicative practices of a discipline" (Airey 3). This positive dimension was cited by several of the doctoral students during the training and after the "joint" feedback sessions, as exemplified by these statements:

> By giving feedback, my ability to critically review a text is improved, something I have benefited from in my own writing.
>
> There is a great likelihood that my own writing develops as a result of reading and giving feedback on the texts of others.

The TAs are themselves doctoral students of the physics discipline, and they are, simultaneously, trying to come to terms with the conventions and expectations governing communication in the discipline. It is clear from the doctoral students' comments that what they are experiencing amounts to learning. Lave and Wenger remind us that "learning and a sense of identity are inseparable [and] that the development of identity is central to the careers of newcomers in communities of practice" (115). Arguably, it is reassuring if the doctoral students engage in tasks—such as feedbacking—which support their professional development and their emergent physics identity.

There is ample evidence to support a reciprocal effect of providing (rather than receiving) feedback on writing in the research literature. Thus, for example, both Aitchison and Maher et al. have noted how doctoral students engaged in peer feedback in writing groups are able to benefit from "extrapolating from

[another text], things that are relevant to their own writing" (Aitchison 911), and "[performing] effective critical reviews of [their] own [. . .] writing" based on their review of another scholarly text (Maher et al. 274).

In addition to creating a space for reflection and disciplinary literacy development, the tasks involved in reading, critiquing and feedbacking also address several of the graduate attributes for Ph.D.s in the Swedish context, many of which speak to an awareness of and ability to negotiate disciplinary discourse as defined above. Space prohibits a detailed account in this area, but four such attributes will serve as examples. First, a Ph.D. is expected to "demonstrate familiarity with research methodology in general" ("Local Qualifications Framework" 7). Obviously, overseeing, supporting, reviewing and critiquing the methodology of the students' experimental work will help build a strong fundamental understanding for the critical elements involved in research methodology. Second, several of the graduate attributes speak to the need for critical and analytical ability, e.g., "demonstrate the ability to . . . review and evaluate [scholarly work]." ("Local Qualifications Framework" 8). Scholarly work is standardly presented as text (journal publications, book chapters e.g.), and the skills practiced when providing feedback on students' writing—critical reading skills, a general ability to analyze and evaluate texts from a disciplinary discourse / "community" perspective, synthesis and presentation of criticism—arguably contribute to the TAs long-term academic and professional skills repertoire. Third, a Ph.D. must be able to "demonstrate the ability . . . to present and discuss research and research findings authoritatively . . . in writing and in dialogue with the academic community" ("Local Qualifications Framework" 6). On the assumption that feedback furthers the doctoral students' disciplinary literacy—and we have argued above that it does—then feedbacking is a task that directly addresses this attribute. Finally, Ph.D.s are expected to "demonstrate the capacity to . . . support the learning of others" ("Local Qualifications Framework" 8). There is ample support in the research literature for saying that the provision of feedback, whether on texts, experiments or other dimensions of disciplinary discourse, constitutes a critical component of teaching (e.g., Black and William); therefore, enabling TAs who are doctoral students to engage in feedbacking is a worthwhile endeavor.

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