Article

Developing disciplinary discourse in a first-year engineering course: The DELNA initiative

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Introduction

Students entering university have to navigate diverse discursive norms which involve reading and adapting to new ways of constructing and organizing knowledge (D'Silva, 2021; Liu & Read, 2020). Often, the genres and conventions valued by members of the academic community remain unspecified (Lillis & Turner, 2001), and a subject specialist's tacit knowledge of disciplinary practices and expectations may not always be reflected explicitly in assignment instructions (McGrath et. al., 2019), which can be challenging for first-year students. As they grapple with disciplinary genres, students are challenged by their lack of ability to read discipline-specific texts, lack of motivation to read, and lack of strategic reading skills (Anderson, 2015). Additionally, Liu and Read report that post-secondary students from diverse linguistic backgrounds may struggle with "vocabulary, reading speed and the efficient use of reading strategies" (p.73).

Within the context of these challenges faced by incoming university students, the Diagnostic English Language Needs Assessment (DELNA) was designed in 2002 by The University of Auckland in collaboration with Melbourne University as a post-enrolment language assessment. Both universities have a diverse student body, linguistically and experientially, and needed a way to identify student academic language proficiency in order to better support their academic success (as a post-enrollment assessment, DELNA scores have no impact on a student's acceptance or placement in university programs). With a view to diagnose and support student's academic

language proficiency in the discipline of engineering, we administered an engineering-specific DELNA to first-year engineering students in a Canadian university and offered supporting resources as a follow-up to the diagnostic. The purpose of the assessment is to diagnose the academic literacy of incoming students while the follow-up pedagogical intervention aims to bring about an attitudinal shift in students who could benefit from support in developing their disciplinary language competency.

In this paper, we report on the administration of the DELNA to students in a first-year course and discuss the implementation of pedagogical support activities. Our purpose is to share our initiative as offering timely interventional support for students with a demonstrated need in the hope that other programs with linguistically diverse students can be inspired to facilitate a smoother transition into university.

Professional Language Development

Since engineering is a professional program in which specific discursive practices are valued, the term Professional Language Development (Kinnear et. al., 2016) was established to capture the discipline-specific communication practices common in the field, as opposed to an English-language deficiency label. No student begins their engineering program with the ability to read and write engineering language; the professional language and discourse practices must be learned, and the learning process can only occur if we explicitly focus on this need. The first year is when engineering students learn the basics of their professional language, not just the technical but the discipline-specific aspects of expressing their ideas in engineering terms. Therefore, reframing the issue as Professional Language Development acknowledges and supports the student's participation in learning engineering discourse, and subsequently their participation in the engineering profession.

DELNA Screening and Diagnostic

The DELNA consists of a screening and a diagnostic component. The online screening measures reading speed and academic vocabulary with a goal of gauging student's academic language competence. Students in two large first-year engineering design and communication courses write the engineering-specific DELNA screening in the first three weeks of classes. Students are encouraged but not required to sit the screening, in the same way that they are encouraged but not

required to take advantage of instructional support. The screening is administered via computer, and results are immediately available: Students receive notification of their results and information on the appropriate resources available to them within 48 hours. The results classify students into three bands:

- **Band 1** indicates that a student will require additional academic language support
- **Band 2** indicates that a student has a good foundation but will likely require some level of support
- **Band 3** indicates that the student has a solid foundation and is prepared to handle academic work

As seen in Table 1, 30% of the 2018 cohort placed into Bands 1 and 2. There was a substantial increase in the number of students in Bands 1 and 2 in 2019, and 2020 saw 44% of the class place into Bands 1 and 2, the highest we have encountered in comparison to previous years.

Table 1. The number of students screened and placed into Bands 1 and 2

Year	# of students screened	Band 1	Band 2	Total in Bands 1 and 2
2018 Fall	1113	200 (18%)	135 (12%)	30%
2019 Fall	903	227 (25%)	107 (12%)	37%
2020 Fall	985	282 (29%)	154 (15%)	44%

The diagnostic, which follows the screening, offers a fine-grained analysis of language abilities that need development. "It appears to identify clusters of students with particular needs, including some who need support with lexico-grammatical issues and word choice while others need support with the more complex elements of argumentation, concision, and inferencing" (Kinnear et. al., 2016 p.16). In order to keep it domain-specific, the first individual assignment in the aforementioned engineering design course was employed as the diagnostic and an analytic rubric exclusively designed with academic language dimensions was used to assess the results of Band 1 and 2 students. Fox and Artemeva (2017) found that using criteria specific to engineering "increased the usefulness and meaningfulness of feedback from the diagnosis in moving toward individual academic support" (p.166).

Rationale for providing academic and professional language support

By using the DELNA to assess first-year engineering student's academic language proficiency, our goal is to support them in this foundational year and enhance their overall success in the program. The individual diagnostic revealed discrete elements of linguistic competence that "demand different instructional materials and strategies" needed for students to succeed (Kinnear et. al., 2016 p.5). In order to positively impact their university experience, Band 1 students require consistent academic language support. We recognized that some students may not require as much support in interpreting and comprehending the assignments or utilizing their professional language with confidence due to having more linguistic resources at their immediate disposal. Their cognitive load may not need to be dedicated to understanding the language and the concepts but instead focus more on using the language to make sense of and develop the concepts. Consequently, more focused pedagogical supports would assist students with learning the pragmatics of academic and professional language use, thereby affording them opportunities to use the language to understand and use engineering concepts. The study by Kinnear et. al., (2016) found that contrary to popular belief, lexico-grammatical issues were not the only deterrent to student success in the program. They recommend "more specific interventions and support activities, ideally, in collaboration with course instructors" (p.15), which is what we attempted to do in our program.

Workshops as a form of pedagogical support

To address the academic language needs of first-year engineering students placed in Bands 1 and 2, a course-based support was initiated in the form of workshops. The workshops were designed to be assignment-specific and skill-based and were framed from a "visible pedagogy" approach in which "what is to be learned and assessed is made clear to the students" (Hyland, 2003 p.26). These workshops were held outside of the scheduled class times and presented to students as a resource through email. Over the years, the one-hour workshops have evolved to reflect changes in the assignments and the needs of students.

Assignment-specific workshops

Assignment-specific workshops aimed to scaffold the learning process of interpreting and meeting assignment expectations while situating them within the larger framework of the course. At least six workshops were offered each semester. In doing so, we hoped to provide a timely and valuable intervention for students willing to utilize supports offered to address their academic and professional language development. Two examples of the workshops described below address engineering-specific genres.

One assignment-specific workshop focused on the Executive Summary, a genre common in disciplines such as business and engineering. The executive summary in this course accompanied a collaboratively written Project Requirements report (PR) directed toward a fictional client. Although students were acquainted with writing a summary, they had to navigate an engineering genre with specific discursive and stylistic variations. Sales (2006) discusses this challenging genre as "one of the most difficult documents that engineers have to write at work" (p.219). A total of 40 students attended this workshop from 2019-2021 (See Table 2).

Another assignment-based workshop focused on the Conceptual Design Specifications (CDS) assignment, which is the final version of the PR. In this course, the CDS was a collaborative document produced by a team of 5-6 students iteratively over the course of a semester. From an engineering perspective, it represents "an attempt to describe the design for those who will later use the specifications to convert them into the product itself" (Sales, 2006 p.93). A total of 50 students attended the CDS workshops from 2018-2021 (See Table 2).

Workshops in 2018 and 2019 were delivered in-person; however, 2020 and 2021, they were delivered remotely (See Table 2). Attendance at the workshops varied. For instance, a total of 310 students attended the exam preparation workshops from 2018-2021; however, only 50 students attended the CDS workshops from 2018-2021.

The midterm and final examination represent individual assessments, whereas the Executive Summary and CDS constitute team tasks. As indicated in Table 2, the midterm and final exam preparation workshops consistently received a higher number of students. One possible explanation could be the importance students place on exams as indicators of individual academic performance. Matoskova et.al., (2017) argue that students respond to stressors such as exams by using various coping strategies, including problem-focused coping strategies through which "students try to reduce exam related stress and meet academic demands by using personal and

social resources such as investing effort, asking for instrumental help, finding out more information about the exam, or making up a list of priorities for tackling the exam" (p.18). Particularly in the case of Band 1 and 2 students who are in the process of developing their academic language proficiency and overall academic competence, the stressors could be higher.

Table 2: Student's response to some assignment-specific workshops

Workshops	Students who attended in person	Students who attended in person	Students who attended online
	2018-2019	2019-2020	2020-2021
Midterm Prep	78	113	---*
Executive Summary	---*	10	30
CDS	9	19	22
Final Exam Prep	45	44	30

*No workshops were offered

Skill-based workshops

In contrast to assignment-specific workshops, skill-based workshops focused on relevant discursive skills within engineering, which include reading and interpreting instructions, structure, and organization in writing to fulfill different rhetorical needs (e.g. relating evidence to claims as justification, providing instructions, integrating visual representations with precise descriptions, etc.) such as argumentation, concision, revision with a specific purpose and audience in mind, documenting information in an engineering notebook, and team communication. At least four skill-based workshops were offered each semester from 2018-2021.

The first discipline-specific skill-based workshop, "Documenting and Recording in the Engineering Notebook," aimed to equip novice engineering students with genre specific conventions. The notebook is one example of a complex and unfamiliar discursive practice that first-year engineering students often grapple with. Through the workshop, students had the opportunity to practice the skills of observing and documenting information spontaneously while

making important decisions of what to include in the notebook (D'Silva, 2021). The workshop systematically explained valued practices in documenting observations, thus enabling students to gain a higher-level perspective of the academic task at hand. A total of 76 students attended the notebook workshops from 2019-2021 (See Table 3).

Another workshop, "Reading and Interpreting Instructions," utilized assignment instructions from the course to equip students with strategies for reading with the purpose and audience in mind. The assignments are deliberately written to reflect professional engineering discourse and the use of terminology, common collocations, register, and even format to model professional engineering communication. Lillis and Turner (2001) found that students in higher education struggled with understanding assignment expectations and the scope of the assignment requirements: "conventions are treated as if they were 'common sense' and communicated through wordings as if these were transparently meaningful" (p.58). By calling attention to nuances of the instructional language used in assignments, students learn how to gauge assignment expectations. A total of 116 students attended the "Reading and Interpreting Instructions" from 2018-2021 as seen in Table 3.

The "Reading and Interpreting Instructions" workshop received the highest response among all skill-based workshops. Studies have shown that post-secondary students tend to struggle with academic reading (Anderson, 2015; Liu & Read, 2020). Specifically, Liu and Read's study revealed that discourse-structure knowledge constitutes a crucial skill in academic reading and that "unfamiliarity with the structures of texts in the target language has the potential to hold back comprehension" (p. 87). Within this context, the "Reading and Interpreting Instructions" workshop focused on demystifying disciplinary language and understanding underlying discursive assumptions.

All workshops allowed for small group interactions that clarified assignment instructions and helped to make tacit academic expectations and discipline specific expressions explicit. The lack of familiarity with specific engineering genres tends to motivate first-year engineering students to seek knowledge about these "community-generated and community-maintained" (Hyland, 2009, p.12) discursive practices. Thus, the workshops functioned as a resource for students seeking to develop valued post-secondary literacy skills.

Table 3: Response to skill-based workshops

Workshops	Students who attended in person	Students who attended in person	Students who attended online
	2018-2019	2019-2020	2020-2021
Documenting and Recording in the Engineering Notebook	---*	48	28
Reading and Interpreting Instructions	85	11	20

*No workshops were offered.

In-course support: Discourse Experts (DE)

In addition to the workshops, we offered in-course support for students in Bands 1 and 2. The first-year engineering design course currently includes Discourse Experts (DE), a specialized group of instructors who focus solely on guiding students in their development of professional and communication competencies. Commonly known as communication instructors, the DEs bring diverse disciplinary knowledge to the teaching process and specialize in professional communication. They function as the non-expert audience, thus allowing students to practice presenting complex technical information in a simplified manner while communicating with experienced communicators. Through immersion in various engineering communication and design courses over time, the DEs gain familiarity with valued discursive practices in the field. In an effort to work with the current structure of the course, we provided each DE with a list of Band 1 and 2 students in their respective tutorial sections and encouraged them to proactively reach out to students with discourse-specific guidance. Logistically, online and remote meeting options in place due to the pandemic made it convenient for DEs to meet with the students. We noticed that the proactive approach employed by the DEs increased students' awareness of the various resources to improve their academic and professional language proficiency. By establishing an ongoing rapport with the students who demonstrated a need for support, the goal was to motivate students to prioritize their language development and select and utilize resources to support their academic needs (Read & Randow, 2013).

Evaluation of outcomes

Early intervention in first-year programs has been shown to improve overall academic success (Read & Randow, 2013), and by providing pedagogical support to first-year engineering students who placed into DELNA Bands 1 and 2, we have been able to intervene in a timely manner to assist the development of students' skills in disciplinary discourse. Through sharing the responsibility to address their academic and professional language needs, the students will hopefully develop the confidence to participate more successfully in their programs. However, because participation in support activities is not mandatory and engineering undergraduates are constrained by busy schedules, some students will miss out on these post-diagnostic supports. While personal motivation is a key factor in taking that first step to access resources, some pressure might be needed (Read & Randow, 2013), which could come in the form of mandating participation in follow-up activities and working consistently with DEs to improve proficiency.

One of our future goals is to increase genre instruction in the first-year engineering design course. Scale and organizational complexity have created some roadblocks in an efficient implementation of some of our interventions, however as the structure of the course continues to evolve, there has been a more deliberate effort to collaborate with and integrate the Discourse Experts. Another goal is to roll out the DELNA screening in the summer instead of the fall to facilitate the logistics of team formation in the first-year design course. This will allow us to better support students who place into Bands 1 and 2 by organizing resources within the course well in advance. Currently, support workshops modelled on those offered in the first year are being introduced into second- and third-year engineering courses with the aim of developing students' understanding of the nuances of their professional language. Our next step is to further integrate other stakeholders, such as librarians and the Engineering Career Centre, in the process of recognizing the role of the DELNA assessment and document its positive impact on enhancing the academic and professional language needs of engineering students.

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