Exploring the discursive construction of ethics in an introductory engineering course

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Abstract

Background: Engineering education must prepare students to assume professional and ethical responsibility for the societal impacts of technology, but most engineering students do not receive adequate ethics teaching. In fact, engineering education has been described as characterized by a “culture of disengagement” in which ethical and societal concerns are constructed as different from and less important than purely technical concerns.

Purpose/Hypothesis: This study explores how a culture of disengagement is discursively constructed and perpetuated in engineering education by analyzing the discursive construction of ethics and ethical reflection in an introductory engineering course in Sweden.

Design/Method: The study is based on extensive ethnographic data in the form of field notes, lecture recordings, interview data, and course documents. The data are analyzed using a discourse analytic approach rooted in discourse theory.

Results: The results illustrate five processes through which ethics and ethical reflection are articulated as not the responsibility of the specific field of engineering, irrelevant for the profession, of low quality and status, and not very important for the engineering degree.

Conclusions: The results contribute to understanding how a culture of disengagement may be perpetuated in engineering education. The results also point toward pedagogical tools and strategies that instructors and program managers can use to construct ethics and ethical reflection as an advanced skill that is an important and integral part of engineering and engineering education—and thus better prepare future engineers to become responsible professionals.

Keywords
discourse analysis, ethics, ethnography, first year (syn: freshmen, freshman), social responsibility, writing
1 | INTRODUCTION

There is broad international consensus that engineering education must prepare students to assume professional responsibility for the societal impacts of technology (Buckridge, 2011; Wang et al., 2015). Assuming this responsibility requires the ability to make “well-reasoned ethical decisions” in engineering practice (Beever & Brightman, 2016, p. 275) as well as commitment to ethical practice (Hess & Fore, 2018, but see also Abaté, 2011). However, a large body of research suggests that there is a lack of education in engineering ethics in many parts of the world (Colby & Sullivan, 2008; Polmear et al., 2019) and that existing ethics instruction is often ineffective (Barry & Ohland, 2012). For example, Shuman et al. (2004) found low levels of ethical reasoning among engineering students in the United States and no significant difference between freshmen and senior students. This result suggests that students’ ethical reasoning ability did not improve during undergraduate engineering education. Also in the United States, Finelli et al. (2012) suggested that engineering students’ level of ethical reasoning may be lower than that of students in other majors, and Lim et al. (2018) found that most students in their study “had difficulty perceiving the social and ethical aspects of engineering as important or appropriate topics in an engineering course” (p. 1). Stappenbelt (2013) found that almost one third of Australian engineering students do not believe that practicing engineers act ethically, nor that it is realistic to expect this behavior. Further, many practicing engineers in the United States experience that their education did not adequately prepare them to deal with ethical issues in the profession (McGinn, 2003). Finally, engineering students in the United States have been found to be less committed to social action than students in other majors (Sax, 2000), and their interest in understanding the consequences of technology appears to decrease over the course of their undergraduate studies (Cech, 2014).

However, there are also studies from the United States that suggest that teaching ethics in engineering education can be effective (Canary et al., 2012; Hess et al., 2019), that students are “willing and capable of discussing ethics” (Nieusma & Cleminski, 2018, p. 14), and that carefully integrating ethics with technical content can “tap into students’ motivation to do something meaningful” (Polmear et al., 2018, p. 17). Two literature reviews also suggest that the average effectiveness of ethics instruction in both science and engineering education has increased in recent years, suggesting an improvement over time (Lee et al., 2018; Watts et al., 2017). However, “there is still ample room for improvement” (Watts et al., 2017, p. 381). For example, in their meta-analysis of the international engineering ethics education literature, Lee et al. (2018) found that teaching ethics knowledge and skills tends to be effective (see also Canary et al., 2012), but teaching ethical attitudes and values may often be ineffective. Based on a systematic review of the literature of engineering ethics interventions in the United States, Hess and Fore concluded that “there is neither a consensus throughout the engineering education community regarding which strategies are most effective towards which ends, nor which ends are most important” (Hess & Fore, 2018, p. 551).

To better understand the diverging findings from previous studies, it is important to explore not only which strategies are effective but also why some strategies are more effective than others. Previous research points to the importance of the quality and characteristics of initiatives for ethics instruction initiatives (see, e.g., Bagdasarov et al., 2013; Thiel et al., 2013; Watts et al., 2017) and instructors’ competence in and enthusiasm about ethics in engineering education (Colby & Sullivan, 2008; Newberry, 2004). Other explanations focus on the influence of institutional and educational culture on students’ ethical development (Hess et al., 2019; Nieusma & Cleminski, 2018). For example, in 2004, Newberry argued that ethics content in engineering education seldom is on “equal footing” with technical content, leading students to conclude that ethics content is nothing other than “required distractions” in the technical curriculum (p. 348). More recently, Polmear et al. (2018) found that engineering faculty in the United States perceive a separation between technical and nontechnical skills and content in the engineering curriculum, creating “fundamental barriers” to ethics teaching and gives students “the impression that ethical and societal responsibilities are not an inherent part of engineering” (pp. 15–16). Similarly, Cech (2014) found that engineering students’ interest in contributing to social welfare declined over the course of their undergraduate studies. Cech (2014) concluded that engineering education and practice in the United States are characterized by a “culture of disengagement” where non-technical concerns are constructed as less important than purely technical concerns and where engineering students are taught “to distance themselves from public welfare considerations [such as ethics] in the process of becoming engineers” (p. 46; see also Allie et al., 2009; Downey & Lucena, 1997). Similarly, Tormey et al. (2015) reported that engineering students’ moral reasoning diminished during the second term of an engineering degree in Switzerland, despite the fact that the students received ethics instruction during that term. They concluded that “whatever positive effect [the course] may have had ..., it may have been more than washed out by the broader culture of the programme” (pp. 6–7) and that “courses addressing ethical issues may be swimming against the hidden cultural tide of the
programme as a whole” (Tormey et al., 2015, p. 2). They also suggest that many engineering programs are characterized by a “hidden curriculum” in which ethics is constructed as unimportant (p. 2).

In this paper, I report on results from an ethnographic study that aimed to explore how such a hidden curriculum and a culture of disengagement may be perpetuated in engineering education. I present results from a discourse analysis that aimed to explore how the concepts of ethics and ethical reflection are constructed in an introductory engineering course in Sweden.

2 | ETHICS IN ENGINEERING EDUCATION

There is currently no consensus on how the term “ethics” should be defined in research on engineering ethics education (Hess & Fore, 2018). In this paper, I use Herkert’s distinction between microethics and macroethics, where microethics is concerned with ethical questions that may confront individual engineers and macroethics with the societal impacts of technological development and engineers’ social responsibility (Herkert, 2001, 2005). In the United States, microethics tends to dominate, and macroethics has so far received little attention in research and practice (Polmear et al., 2019; Swan et al., 2019). In Western Europe, macroethics is often included in engineering education under the umbrella of sustainability education rather than ethics education (Bielefeldt et al., 2019; Lönnengren, 2017; Polmear et al., 2019). In the study reported here, the initial aim was to explore how societal concerns, that is, macroethics, are constructed in an engineering degree. However, macroethics was all but absent in the first-year courses in the program studied. This absence of macroethics during the first year of an engineering degree is common at universities in Sweden, as well as in other European countries, where the first year of studies is often characterized by a strong focus on mathematics and the basic sciences (see, e.g., Tormey et al., 2015). Therefore, this paper focuses almost exclusively on microethics.

Based on a review of the literature on engineering ethics education in the United States, Hess and Fore (2018) developed a coding scheme for three types of learning goals for ethical development in engineering education: ethical sensitivity/awareness, ethical judgment/decision-making, and ethical commitment/confidence. Similarly, Tormey et al. (2015) identified four elements that “combine to give rise to ethical behavior” (p. 4): moral sensitivity, moral reasoning, motivation to act morally, and character to withstand external pressures. The first two of these elements roughly correspond to Hess and Fore’s ethical sensitivity/awareness and ethical judgment/decision-making, and the last two correspond to ethical commitment/confidence. Tormey et al. (2015) argue that moral reasoning alone does not lead to ethical behavior if moral sensitivity and commitment are not well-developed. In this study, I therefore combine Hess and Fore’s three learning goals and Tormey et al.’s four elements of ethical behavior. More specifically, I use the term ethical reflection to denote an activity that foregrounds ethical judgment/decision-making but implicitly also draws on ethical sensitivity/awareness and ethical commitment/confidence. For example, students engaged in ethical reflection when they wrote an essay in which they were asked to identify an ethical dilemma that they might encounter in their future professional lives (i.e., demonstrating ethical sensitivity) and reflect about how they would act in such a situation (i.e., demonstrating ethical judgment and, at least indirectly, indicating ethical commitment).

In a meta-analysis of studies on engineering ethics education, Lee et al. (2018) found that effect sizes for the development of moral sensitivity and reasoning were medium high but effect sizes for moral commitment were generally low. Similarly, Newberry (2004) argued that moral commitment (described as emotional engagement) may be the most difficult objective to achieve in engineering ethics education. In fact, moral commitment may be particularly prone to being influenced by the institutional culture of an engineering program (Cech, 2014; Newberry, 2004). Thus, the analysis presented here may be particularly valuable for exploring why it seems to be so difficult to foster moral commitment among engineering students.

3 | THEORY AND METHODS

3.1 | Theoretical framework

The research presented in this paper is based on a social constructionist perspective. More specifically, I employ discourse theory (Laclau & Mouffe, 1985), which is one of a range of approaches for analyzing discourse. Jørgenussen and Phillips (2002) defined discourse as “a particular way of talking about and understanding the world (or an aspect of the
They further stated that discourse analysis, like all other social constructionist research approaches, is based on a relativist epistemology according to which we do not have direct access to reality. Rather, our access to reality is always through language. With language, we create representations of reality that are never mere reflections of a pre-existing reality but contribute to constructing reality. That does not mean that reality itself does not exist. Meanings and representations are real. Physical objects also exist, but they only gain meaning through discourse. (Jørgenssen & Phillips, 2002, pp. 8–9)

According to discourse theory, representations of reality are constructed through articulation, which Laclau and Mouffe (1985) described as “any practice establishing a relation among elements such that their identity is modified as a result of the articulatory practice” (p. 105). The term element refers to a word or a concept that is used in a given discourse, and articulation is the process through which several such elements are connected to one another. Through these articulatory connections, the range of meaning of each element is temporarily restricted. For example, if the word coffee is articulated with the word “cream,” the meaning of “coffee” is restricted to a type of drink (rather than, e.g., coffee beans) and the meaning of “cream” is restricted to liquid cream (rather than, e.g., whipped cream). Through such processes of articulation, certain discourses are prioritized over others. Further, articulation is often structured around certain elements that are more central than others. In discourse theory, these central elements are called nodal points. An important nodal point in this paper is “ethics and ethical reflection,” and the analysis below focuses on identifying elements that are related to this nodal point.

Articulation is always contingent on specific contexts and can, therefore, be changed. The concept of disarticulation is often described as the process of undoing an articulation and thus changing the meaning of a nodal point (Clarke, 2015). In this paper, however, I use the term to denote the process of articulating elements as different from other elements, that is, the process of constructing opposition among elements. I further use the term (dis)articulation when both articulation and disarticulation processes are present.

(Dis)articulation can occur through several steps, creating chains of (dis)equivalence (Figure 1). A chain of (dis)equivalence thus consists of a set of elements related to one another in a linear manner, that is, a nodal point is related to one or two elements (e.g., Elements A and B in Figure 1), which in turn may be related to other elements (e.g., Element C in Figure 1). The latter are then indirectly related to the nodal point. In a chain of (dis)equivalence, each element receives meaning through (dis)articulation with all other elements in the chain.

In this study, I also identified (dis)articulation relations that did not follow a single “chain” of equivalence, but rather an interconnected network of (dis)articulation which I call a network of (dis)equivalence. Finally, while some elements are clearly articulated, others may remain “vague, highly variable, unspecifiable” and thus “mean different things to different people.” In discourse theory, such elements are called floating signifiers (Chandler, n.d.; see also Mehlman, 1972). I will argue that, in this study, ethical reflection remains a floating signifier.

3.2 Research context

The study context is a 5-year engineering program in Sweden. The specific type of engineering program is omitted to protect participants’ anonymity, and the program is instead described in terms of its general characteristics. The program combines undergraduate and graduate studies, and students who finish the program are awarded a Master of Science Degree. Every year, approximately 60 students are accepted to enroll, but the dropout rate is considerable and only approximately 20 students graduate from the program every year. Female students are in a clear minority: typically, less than 10% of the incoming students are women. For students who complete the program, however, job
prospects are generally very good. In fact, many of the students who drop out toward the end of the program are recruited to the industry before finishing their degree.

This paper focuses on the first course in the program, a broad introductory course that is divided into two separate strands that run in parallel during four and a half weeks. The first strand covers topics such as group and project work, design methodology, study techniques, oral presentations, the future professional roles students can expect, and ethics. The second strand covers repetition of basic mathematics knowledge and skills. The course is given on a full-time basis, which means that the students are expected to study 40 h a week for the course, including lecture attendance, project group work, homework assignments, and studying for exams (in the mathematics strand). Since only the first strand covers ethics, only data from that strand are analyzed for this paper. The strand included 13 lectures, 10 seminars, a group project during which students developed computer games, and a written assignment in which students reflected on an ethical dilemma.

According to the course description, the ethics instruction in the course aims to develop the students’ ability to discuss their future professional roles, including moral/ethical concerns that may arise in the professional context. At the time of data collection, this instruction consisted of the following activities: First, the students attended a lecture in which two professional codes of ethics were introduced. During this lecture ([L6] in Table 1), students also discussed fictive ethics cases (e.g., related to automatization and intellectual property rights) in small groups and from different perspectives (e.g., as an employee or a customer). At the end of the lecture, the students were given a task description for an individual reflective essay that was due at the end of the course [EX]. For this essay, each student had to identify an ethical dilemma that they could expect to encounter in their future professional life. The students then had to apply at least one of the professional codes to the dilemma and discuss how they would act if they were faced with it. Second, the instructors organized a company fair for all students in the program [S3]. During this fair, the first-year students were to talk to representatives from different companies and ask them about their experiences with ethical dilemmas in the profession. Third, the students attended a guest lecture during which they discussed classical moral dilemmas

| Data source | Time | Data type | Identifier |
|-------------|------|-----------|------------|
| Lecture 1: Course introduction | 1st week of course | Audio-recording, Fieldnotes | [L1] |
| Lecture 2: CDIO-approach for project management (conceive, design, implement, operate) | 1st week of course | Fieldnotes | [L2] |
| Lecture 6: Ethics lecture by instructor from the engineering department | 2nd week of course | Lecture slides | [L6] |
| Seminar 3: Company fair | 2nd week of course | Fieldnotes | [S3] |
| Lecture 12: Ethics guest lecture | 3rd week of course | Audio-recording, Fieldnotes | [L12] |
| Examination 1: Deadline for submitting the ethics essay | 5th week of course | Written essays (n = 58) | [EX] |
| Seminar 9: Discussion of students’ future professional roles, including ethics | 5th week of course | Fieldnotes | [S9] |
| Interview Instructor 1 | 1 week after course | Audio-recording | [II1] |
| Interview Instructor 2 | 2 weeks after course | Audio-recording | [II2] |
| Seminar 10: Instructor gives oral feedback on the ethics essays | 2 weeks after course | Fieldnotes | [S10] |
| Documents: Instructor’s written feedback on ethics essays | 2 weeks after course | Written feedback (n = 58) | [EXF] |
| Interview Student 1 | 4 weeks after course | Audio-recording | [IS1] |
| Interview Student 2 | 5 weeks after course | Audio-recording | [IS2] |
| Interview Student 3 | 5 weeks after course | Audio-recording | [IS3] |
| Interview Student 4 | 5 weeks after course | Audio-recording | [IS4] |
| Interview Student 5 | 5 weeks after course | Audio-recording | [IS5] |
3.3 | Data collection

To collect data, I used an ethnographic approach (Atkinson & Hammersley, 2007), following the students to most of their lectures and seminars during the course. In some instances, I participated in group discussions or worked on mathematics problem sets together with them, but I primarily focused on observing and producing jottings, brief written notes taken during field observations that later serve as a memory support for constructing detailed fieldnotes (Emerson et al., 2011). To produce jottings, I used Melin’s system of stenography (Anon., n.d.), which allowed me to produce detailed notes, including shorter verbal quotes (Lönngren, 2020). I primarily focused on observing actions, addressing questions such as: What did instructors and students talk about and how? How did they relate to each other? Did they express (dis)agreement on certain topics? What types of student behavior and expressions were praised or scolded? I also took notes on, for example, physical settings; how students and instructors positioned themselves and moved in these settings; how they were dressed; and my own actions, experiences, and reflections during the observations. As soon as possible after each observed activity (typically by the next day), I expanded the jottings into digital fieldnotes, producing a more detailed description and adding personal reflections and preliminary ideas for analysis and interpretation (Emerson et al., 2011). The fieldnotes from the course cover approximately 47 h of observations.

I also audio-recorded three lectures (~9 h) of the total of 13 in the first strand of the course. The recorded lectures include the very first lecture [L1], the guest lecture on ethics [L12], and a lecture on group work [n/A]. I chose the first lecture because it was a combined course and program introduction, and I expected that the instructors would, directly or indirectly, express what they expected from the students and what they considered to be important for succeeding in the program. The choice to record the ethics lecture is directly related to the focus of this study on ethics. The lecture on group work was chosen because I expected that the instructor would express expectations about how the students should interact with one another during their studies, but the data from this lecture did not contain relevant extracts for the analysis. Still, the three lectures together represent the breadth of the introductory course, both in terms of topics and lecturers.

In addition to observing and recording lectures, I conducted audio-recorded, semistructured interviews with five students [IS1-IS5] and two instructors [II1, II2]. The instructors were chosen because they were two of the three instructors directly involved in the ethics instruction in the course. To protect their anonymity, I refrain from disclosing their gender and disciplinary backgrounds. In total, 11 instructors were involved in the course, three of whom were female. To recruit students for interviews, I contacted two project groups with five students each (out of a total of 60 students in the class). I had previously observed and interacted with these groups during group meetings, and I, therefore, expected that these students would feel more comfortable to be interviewed than their classmates. Five students agreed to participate. One of these students was female, which roughly mirrors the gender distribution in the class as a whole. I conducted the instructor interviews 1–2 weeks after the end of the course and the student interviews approximately 1 month after the course (see Table 1). Finally, I collected a wide range of documents, such as course and program descriptions, lecture slides and handouts, task descriptions, student essays on ethical dilemmas (n = 58) [EX], and instructors’ feedback on those essays (n = 58) [EXF]. All data were collected and analyzed in Swedish. For this paper, I translated selected extracts into English after the analysis. This broad, ethnographic approach to data collection allowed me to triangulate across multiple data sources and classroom episodes during my analysis.
3.4 | Data analysis

In ethnographic research, it is common to engage in preliminary data analysis in parallel with ongoing data collection; as researchers reflect on their observations and experiences in the field, they gradually develop a clearer focus for further data collection (Atkinson & Hammersley, 2007). In this study, expanding jottings into fieldnotes provided a valuable opportunity for continuous, preliminary data analysis (Lönngren, 2020; see also Emerson et al., 2011). Similarly, detailed verbatim transcription of audio-data provided an opportunity to develop a thorough understanding of the data and to note initial ideas for coding (Braun & Clarke, 2006).

The data analysis proceeded through six stages. First, I conducted an inductive thematic analysis in which I used open coding to produce a broad understanding of the empirical material (cf. Braun & Clarke, 2006). This analysis was guided by a broad focus on how societal concerns are constructed in the course and resulted in identifying ethics and ethical reflection as important nodal points. Second, I retrieved all data excerpts that could be related to these nodal points. I intentionally searched for excerpts that related to both microethics and macroethics. However, as mentioned earlier, macroethics was almost completely absent in the material, and the further analysis, therefore, focused primarily on microethics. Third, I manually selected all data excerpts \( (n = 169) \) in which the nodal points ethics and/or ethical reflection were explicitly (dis)articulated in relation to other elements. This selection constituted the final data set for the detailed analysis. Fourth, I printed the final data set and color-coded nodal points, elements that were related to the nodal points, and linguistic features through which such relationships were constructed (e.g., “x is also y,” “x is not y,” “and,” “but”) among elements. Fifth, I drew a mindmap to visualize the identified nodal points, other elements, linkages, and oppositions (see Figures 2 and 3 for examples). Finally, based on this mindmap, I identified five articulatory themes that contribute to the discursive construction of ethics and ethical reflection in the course. These themes are described in the next section.

3.5 | Research quality and ethics

The research was guided by an understanding of research quality as procedural and integrated throughout all stages of the research and a focus on theoretical, procedural, communicative, pragmatic, and ethical validation (Sochacka et al., 2018; Walther et al., 2013) to ensure that “the research findings appropriately reflect properties of the social setting investigated” (Walther et al., 2013, p. 636). In line with the focus of this paper on ethics, particular attention was paid to ethical validation, which involves critical reflection about researchers’ own perspectives and motivations as well as caring for participants, coinvestigators (if applicable), and readers of research reports (Sochacka et al., 2018).

Throughout the project, I engaged in critical reflection about my own perspectives and motivations. For example, to test and challenge my interpretations of what I perceived to be dominant discourses, I actively searched for indications of competing discourses in the data. The ethnographic approach to data collection further allowed me to continuously ask participants for their own impressions of what happened in the field. I also asked colleagues to comment on
preliminary findings. I presented my work during two seminars with science education researchers, during one seminar with researchers who work with discourse analysis, and at three educational research conferences throughout the work with the study. Thus, I received feedback from approximately 60 researchers which I used to continuously revise the study design, analysis methods, interpretations of empirical abstracts, preliminary findings from different stages of the analysis process, and the final results. I also asked two of the teachers to comment on preliminary findings. The teachers agreed with my descriptions overall but felt that my description of one of the themes, writing about ethical reflection as inferior to scientific writing (see Results), was “a little harsh.” This comment led me to revise the description of that theme to better match the teachers’ experiences of what happened in the classroom.

Ethical validation through caring for research participants and readers took several forms in this study. First, data collection and management adhered to national (Vetenskapsrådet, 2017) and European (EPCEU, 2016) regulations and guidelines for research ethics and data management to protect the integrity of research participants. Oral informed consent was obtained from students for all field observations through both written and oral communication. No personal information (such as students’ names) was included in jottings or field notes. Written informed consent was obtained from teachers for all field observations and audio-recording of lectures (only teachers’ voices were captured in these recordings) and from both students and teachers for interviews. Second, to ensure that my presence did not disrupt classroom processes and/or social relationships—and thus negatively impacted participants or distorted research results—I negotiated the conditions for my presence and participation in the field with a wide range of stakeholders (students, teachers, the program director and student advisor, the deans of the department and faculty, and student union representatives). These negotiations happened over the course of several months before the start of data collection and allowed me to develop a deep understanding of the empirical context. Third, the research was motivated by a strong commitment to contribute to improving engineering education practice. Therefore, after writing a first draft of this paper, I met with two teachers to discuss the results. The teachers also asserted that they found value in the implications for practice from the research (see below). Another teacher asserted that being interviewed about their teaching in the course provided a valuable opportunity for professional development.

4 | RESULTS

I identified five articulatory themes that are particularly relevant for addressing the aim of this study, that is, to explore the discursive construction of ethics and ethical reflection: (1) Ethics as “something other” than the core subject area, (2) Ethics as irrelevant for the profession, (3) Ethics as common sense, (4) Writing about ethical reflection as inferior to scientific writing, and (5) Ethics and ethical reflection as “anything goes.” Each of these themes describes a dominant discourse through which ethics is constructed as unimportant for engineering education. In addition to these dominant discourses, competing (but currently marginalized) discourses are described that provide insights into how the dominant discourses could be changed to render ethics more central in engineering education.

The five themes are summarized in Figure 4. In the following sections, I describe the themes and illustrate them with excerpts from transcripts, fieldnotes, and documents. Additional excerpts for each theme are provided in the Appendix (Tables A1–A5). For excerpts from fieldnotes in running text, I use double citation marks; for verbal quotes within fieldnotes, I use single quotation marks. Italicized text indicates verbal stress and [...] indicates omissions from quotes. Square brackets indicate additions that I use to clarify the meaning of a quote. I use double round brackets to indicate nonverbal communication, such as laughter. “I” stands for “instructor,” “S” for “student, and “R” denotes me as the researcher. Finally, throughout the paper, I use the gender-neutral, singular pronoun “they” to protect the anonymity of the participants.

4.1 | Ethics as “something other” than the core subject area

In several data excerpts, ethics was articulated indirectly, that is, through disarticulation; ethics was described as “something other” than the core subject area of the engineering program. For example, one of the instructors said in an interview:
I: Engineering programs are supposed to be broad and include different subjects. [...] We have something we call general engineering courses and [...] you are not allowed to take [those courses] at our department [...] You have to do something other. And I’d like to see even more of something other ((laughs)). Because I think that many [of the students] graduate with very, very, very deep knowledge of [subject area], very specialized knowledge. But I’d like to cut that down a little and instead get in a little more about the outside world ((laughs)). Like business economics maybe, or law, or a course in philosophy or ethics, or on the history of technology. Something that helps them to understand their place in society. [II2]

The instructor here mentioned ethics as one example among a diverse set of subjects that all count as “something other” than the specialized courses in the core subject area that are taught at the department. Another factor that contributed to constructing ethics as something other was that the main ethics lecture in the course [L12] was given as a guest lecture by an instructor from a social science department. The impact of this
disarticulation of ethics from the core subject area may have been moderated by the fact that instructors from the engineering department were responsible for the other ethics lecture [L6] and the ethics essay [EX, EXF, S10].

However, students stated that they experienced the ethics components of the course as something that did not clearly relate to the rest of the course or the program. For example, students described the ethics guest lecture [L12] as “a nice change” from the normal course content [IS5] and the essay as a “tick-box exercise,” something one just had to get done before going back to what is really relevant [IS3]:

(ii) R: What did you think about [the ethics essay] that you had to write?
S: It felt like [...] it was just a tick-box exercise. Like it was just a check mark, a point on a list that you had to cross out. And then just like “oh look, our students in [subject area] need to be ethical!” “Well, just throw this at them [...!]”
R: Right. Can you pinpoint what it was that made you feel that way?
S: I think [...] it was quite badly integrated with the other assignments [in the course]. It really did not have anything to do with anything else [in the course]. [IS3]

In summary, ethics was constructed as something that is rarely taught at the department and, when it is taught, is not well integrated with content related to the core subject area. In that way, ethics was constructed as something that is not necessarily in the realm of responsibility of engineering.

4.2 | Ethics as irrelevant for the profession

Several of the instructors made a conscious effort to articulate ethics as important for the engineering profession. For example, in the ethics guest lecture, the instructor said:

(iii) I: [T]he faster we develop new technology, the more reason we have to reflect on the moral dilemmas that we are confronted with. Because we can do so much with new technology. [L12]

Unfortunately, during the company fair, the students met a very different message: Many of the company representatives constructed ethical dilemmas as essentially nonexistent in their line of business:

(iv) One of the students reads out questions from [their] notebook [...]. One of the questions is about ethical dilemmas, whether they [the company] face any and how they work with them [the dilemmas]. The older of the two company representatives (who had worked at the company for 15 years) says that they do not have to deal with ethical dilemmas because they develop their own products—rather than taking orders from customers. [...] The students nod, take notes, and continue to the next question. [...] [A few minutes later,] I ask them [the students] what they thought of the [company representative's] answer. One of them says [...] it seemed reasonable. [S3]

Later in the course, during a mandatory seminar on the students’ future professional roles as engineers [S9], the students discussed the company representatives’ answers to their questions. Several students uncritically repeated the representatives’ statements that most companies do not have to deal with ethical dilemmas since they develop their own products. Thus, many of the students seem to have accepted the company representatives’ construction of ethics as something that is not really needed in the profession. A few students, however, stated that ethical concerns “will be something we’ll talk about daily” and that they would not want to work for a company whose ethical values are in conflict with their own. Thus, at least some of the students constructed ethics as important for the profession—despite the company representatives’ disarticulation.

In other instances, students and instructors constructed ethical behavior as something that would be desirable for professional engineers but not always feasible. For example, in one of the student interviews [IS2], we talked about the ethical dilemma that the student had written about in their ethics essay: the case of Volkswagen, which in 2015 was accused of having manipulated emission data for diesel cars. The student reflected on how those responsible for the manipulation must have experienced the situation:
(v) S: [I] thought that those who had programmed [the emission testing system] must have known about it [the manipulation]; and that they had done something wrong, even if they did not want to.

R: Do you have any idea how you could have reacted yourself if you had been given such a task?

S: I do not know, really. [...] I think you'd do it because your bosses tell you to. But you do not want to anyways. [IS2]

In another interview [IS3], I talked with a student about how to deal with ethically questionable job assignments. The student said: “I won’t make a difference [...] I think I'll just see it as one of many projects that have to be completed. So I think I would do it, actually.” Even one of the instructors expressed that individual employees may not be able to influence what technology is developed and how:

(vi) I: If I do not want to develop this product and quit [working at the company], [...] somebody else will come and do it. [...] I think it's difficult to stop this kind of thing [the development of ethically questionable products] as an individual employee. Like, what could you actually do? [II2]

Thus, both instructors and students constructed ethics as not really actionable in the profession. Engineers should do what they are told to do: complete the projects they are given even if they do not think that doing so is ethically defendable. Some students seemed to perceive ethics as important for their future professional roles, but their “solution” to companies' lack of ethical commitment was to find a new job rather than actively trying to influence their employers to develop technology in more ethical ways.

4.3 | Ethics as common sense

During the first ethics lecture [L6], students were introduced to two professional codes of ethics which they later had to apply to an ethical dilemma in the ethics essay [EX]. The codes could have served as an analytic framework for reflecting on ethical dilemmas in a rigorous and structured way. However, they were introduced rather superficially:

(vii) I: [The instructor of the lecture] said they [the codes] could be a tool. But [the instructor] did not talk about them in depth because it was the last lecture of the day and the students had had lectures all day, so [they] shortened this lecture a little and said something like “read this [the codes] and complete the task [write the essay]” ((laughing)). [II2]

Thus, the opportunity to provide a framework for thinking about ethics seems to have been lost. In fact, during the same lecture, ethics was explicitly disarticulated from being something that one can approach analytically: on one of the instructor's presentation slides, ethics was defined as “formalized common sense.”1 Similarly, in the interviews after the course, one student described the professional codes of ethics as “mostly about common sense” [IS1] and another [IS3] suggested that one's personal ethics may be more important than what is written in the professional codes:

(viii) R: Do you think you'll use them [the codes of ethics] again at some point?

S: [...] No, I do not think so. I mean, you'll of course try to act ethically, but I think that you'll mostly stick to your own ethics rather than what some organization thinks you should do. There's a lot of overlap [between the codes and one's own ethics] [...], but I do not think I'll ask myself [...] “what do they think about this”? [IS3]

Thus, both students and instructors articulated ethics as common sense thinking that is based on personal values rather than analytic thinking. Ethics was simultaneously disarticulated from resting on carefully developed principles (the codes of ethics) that are worth learning and adhering to.
### 4.4 Writing about ethical reflection as inferior to scientific writing

In several data excerpts, I identified a network of interconnected chains of (dis)equivalence that articulated writing about ethical reflection as of inferior quality than writing about the core content of the program. This network consisted of seven (dis)articulation relationships that constructed: (a) writing in colloquial language as of low quality; (b) writing about personal topics as employing colloquial language; (c) ethical reflection as something that is personal; (d) writing about personal topics as different from scientific writing; (e) scientific writing as needed for writing in the core subject area; (f) scientific writing as employing formal language; and (g) writing in a formal language as an advanced skill that is needed to produce high quality texts.

As described previously, the students had to write an essay about an ethical dilemma that they thought they might encounter in their future professional lives [EX]. Once the essays were graded, I interviewed the instructor who was responsible for the grading. Asked about the grading criteria for the essays, the instructor explained:

> (ix) I: I've been very forgiving of their writing. I mean, [...] if I think they have used an awful lot of colloquial language, then I've commented on it. But I have not [...] corrected in their texts, like “this is wrong, and this is wrong, and this is wrong.” I've just said “this is worth thinking about.” [II2]

Expressions such as “an awful lot” and “this is wrong” clearly constructed writing in colloquial language as of low quality (Theme 4a). This articulation was strengthened in another extract from the same interview:

> (x) R: This issue with colloquial language [...], is that something you recognize from other tasks, lab reports, or anything like that?

> I: Yes, absolutely. And I have to say [...], I think it's okay in this sort of task. And that's what [another instructor’s name] said as well, during [their] introduction [to the task], that it's all right to write from an I-perspective and so on. Because this is a reflection, you are supposed to think about your concerns, so it's okay to talk about yourself and your concerns. But, in general, I think people write worse and worse. Like they use more and more colloquial language and they do not even notice that it's colloquial. [...] There was one [student] who had [written] “vårn” and “värat” and an awful lot of these kinds of expressions that, well, you do not write like that [in] formal [texts]. [II2]

In this excerpt, through expressions such as “I-perspective” and “your concerns,” the instructor also articulated ethical reflection as something that is personal (Theme 4c) and writing about personal topics as employing colloquial language (Theme 4b) by stating that colloquial language “is okay in this sort of task.” The instructor repeated Articulation 4b in the written feedback on one of the students’ essays:

> (xi) Your writing style is casual and easy-to-read, but in some parts it is more colloquial than formal. Your style is suitable for this specific report, but [in] more formal reports [you] would have to tighten up your language a little more. [EXF]

Students also noted that language quality did not seem to be an important assessment criterion for the ethics essay, as many of them did not receive any feedback on their writing:

> (xii) R: What did you think about the feedback you got [on the essay]? [...]  

> S: [I would have liked to get a little more feedback] on how I had written the text. Because now it was more like, yeah, your references were not so good. So I do not actually know if I’d written a good text, if it was formal and so on. [IS2]

Thus, in three steps of articulation (4a–4c), ethical reflection was constructed as something for which it does not matter much if it is of low quality.

I asked the instructor who graded the ethics essays whether the students receive any instruction or training for developing their writing skills anytime during the educational program. The instructor answered:
I: There used to be, actually in this course. There used to be an activity on scientific writing and that kind of things. [But this training on scientific writing had a negative impact on the ethics essay, which] turned out really weird because they [the students] thought they had to write it scientifically, so (laughs) they [the instructors who are responsible for the course] stopped doing that [activity]. [II2]

The instructor here articulated writing about personal topics as different from scientific writing (Theme 4d), that is, they disarticulated the ethics essay from scientific writing. A comment from one of the students, however, suggests the presence of a competing discourse through which the essay also could be understood as an exercise in scientific writing:

R: How did you experience writing this essay?
S: Well, it was kind of interesting, it was. It was also a way to review academic writing, references and those kinds of things. [IS4]

In fact, the instructor provided detailed feedback on students’ use of references, both in general feedback to all students and in individual feedback on five of the essays (9%) [EXF]. This feedback could have served to articulate the essay with scientific writing and high quality requirements. Unfortunately, the strong focus on references seems instead to have distracted both students and instructor from discussing the quality of ethical reflection (see Theme 5).

The instructor who graded the essays also articulated scientific writing as needed for writing in the core subject area (Theme 4e), for example to produce contributions to scientific conferences:

I: Later, at the graduate level, there is a course that we call “student conference in [subject area].” In that course they [the students] write scientific papers, they pretend to write for a conference. And then they get a lot of feedback and then they get instruction on how to write. [II2]

Similarly, one of the students articulated high-quality, scientific writing with technically specialized courses later in their engineering degree:

S: Later, in the other courses [in the program], we’ll have to write scientific analyses and reports and those kinds of texts, and then it’s very important that grammar and word order and everything is correct. [IS5]

In this excerpt, the student also articulated scientific writing as employing formal language (Theme 4f), that is, language that is grammatically and otherwise “correct,” rather than “casual and easy-to-read” (Excerpt xi). In Excerpts xv and xvi, an instructor and a student, respectively, also articulated writing in formal language as an advanced skill that is needed to produce high quality texts (Theme 4g): training for scientific writing includes explicit instruction and plenty of feedback that is only provided for graduate students and only advanced students are expected to produce scientific reports.

Taken together, these seven steps of (dis)articulation created a network of (dis)equivalence in which writing in the core subject area was constructed as advanced and of high quality, while writing about ethics was constructed as of inferior quality.

### 4.5 Ethics and ethical reflection as “anything goes”

Throughout the course, the nodal point “ethics and ethical reflection” remained rather ill-defined, that is, it remained a floating signifier (see theoretical framework) that is open for different articulations. This floating nature of ethics and ethical reflection became visible through a lack of clear quality or assessment criteria. For example, in the seminar during which an instructor provided oral and written feedback on the ethics essays [S10], the instructor welcomed the students and said: “I really enjoyed’ reading your texts. I think you’ve done a great job” (fieldnotes). The instructor
then talked about general concerns with how to write reports, stressing the importance of, for example, a “spacious layout,” a title page, a free-standing introduction, and correct use of references. The instructor particularly stressed the last point: how to “write references, that's something you really have to look into before writing your next report” (fieldnotes).

After a detailed treatment of how to write formal reports, the instructor concluded: “when it comes to reflecting, there really isn’t anything that's right or wrong.” Later, the instructor said that the students did not receive a lot of individual feedback on their ethical reflection because “it's hard to give exhaustive comments on something that is good” (fieldnotes). In other words, the instructor provided detailed quality criteria for formal aspects of the essay, but the quality of ethical reflection remained unarticulated. In fact, by stating that “there really isn’t anything that's right or wrong,” the instructor explicitly (though most certainly unconsciously and unintentionally) disarticulated ethical reflection from any type of quality criteria; reflection on an ethical dilemma is “good” as soon as it is performed—in any form.

Another situation in which the lack of quality criteria became obvious occurred during the mandatory seminar on future professional roles [S9] where students discussed company representatives’ statements about ethical dilemmas in the profession [from S3]. As a preparation for the seminar, students had received a list of questions that they should be able to discuss. This list included questions about company representatives’ views on important generic competences for the profession, characteristics of the specific branch of industry, and ethical dilemmas in the profession.

In one of the seminar groups, the students’ discussion came to a temporary halt. After a short silence, one of the students asked: “What else do we have on the list?” The instructor looked at the list and said: “Well, we have this [question] about ethics and [the question] about what the industry is like, what they [the company representatives] think about [economic] growth and things like that.” One student replied: “They seem to be very positive [optimistic] about growth. It will be easy [for us] to get a job” (fieldnotes). In this short exchange, the instructor provided the students with a choice to talk about ethics and/or the industry. The student who answered ignored the question about ethics and exclusively focused on the industry. Even during the remainder of the seminar, ethics was not discussed in any depth. Still, all students who were present during the seminar received a passing grade for their participation—that is, not discussing ethics was not a reason to fail. In fact, even students who did not actively participate in any of the discussions during the seminar, who seemed to be “on a different planet” [II2], received a passing grade. Thus, there was a lack of quality criteria for what constituted sufficiently deep discussion of ethics during the seminar, and there was no effective assessment of students’ ability to discuss ethical dilemmas.

Unfortunately, this lack of articulation of the quality of ethical reflection seems to have contributed to articulating ethical reflection as something that is not very important and does not need to be learned in engineering education. For example, when the instructor asked the students to discuss their essays with each other during the feedback seminar [S10], the students thought that “there wasn’t really a lot to talk about” because they had not “gotten any complaints ((laughs)) [...] on the essay” [IS1]. All of the interviewed students expressed that they would have appreciated more individual feedback [IS1-5], but they also said that the lack of feedback was okay “because it [the reflective essay] wasn’t very important either” [IS2].

5 | DISCUSSION

I have presented results from a study that aimed to explore how ethics and ethical reflection are discursively constructed in an introductory engineering course in Sweden. Based on a discourse analysis of ethnographic data, I have argued that five articulatory themes contributed to constructing, on the one hand, the core subject area of the engineering program as advanced, of high quality, and important; and on the other hand, ethics and ethical reflection as not the responsibility of the specific field of engineering, not needed and/or not actionable in the profession, of low quality and status, and not very important for the engineering degree. In this section, I describe the most important theoretical and methodological contributions of this research: articulating a need for an integrative analysis of personal and structural aspects of disengagement, and revising Cech’s (2014) description of ideological pillars of disengagement in engineering education. I also discuss limitations and important questions to address in future research.

5.1 | Need for an integrative analysis of disengagement

Previous literature has pointed to faculty and student disinterest as a barrier for effective ethics instruction (Colby & Sullivan, 2008; Hess & Fore, 2018; Newberry, 2004; Polmear et al., 2018), which would suggest that one reason for
disengagement could be personal disinterest. Other studies, however, suggest that many faculty and students are highly interested and engaged in improving engineering ethics education (Lee et al., 2018). The results from this study support the latter conclusion: students showed a high degree of engagement in the ethics lectures [L6, L12] and the instructors invested a lot of effort in designing and assessing the ethics instruction. These findings suggest that even when faculty and students are genuinely interested, ethics instruction may become ineffective due to unintended discursive construction of ethics as unimportant in the educational culture of engineering education. An important conclusion from these findings is, therefore, that investigating how a culture of disengagement may be perpetuated in engineering education requires an integrative analysis of how faculty’s and students’ personal interests and agency interact with structural and cultural constraints. In this study, such an integrative analysis was rendered possible through the use of ethnographic data collection and analysis methods that combined and triangulated field observations, document analysis, and individual interviews.

5.2 | Revising the ideological pillars of disengagement

In her influential paper on the culture of disengagement in engineering education, Cech (2014) suggested that this culture rests on three ideological pillars:

- the ideology of depoliticization, which frames any “non-technical” concerns, such as public welfare, as irrelevant to “real” engineering work;
- the technical/social dualism, which devalues ‘social’ competences such as those related to public welfare; and
- the meritocratic ideology, which frames existing social structures as fair and just. (p. 45, my italics)

The results presented in this paper illuminate five articulatory processes through which the first two of these pillars of disengagement, often unintentionally, can be perpetuated in engineering education.

First, ethics as “something other” than the core subject area echoes previous descriptions of ethics as separated from technical content in engineering education (Polmear et al., 2018; Polmear et al., 2019) and illustrates how this separation can be constructed in the classroom. The absence of macroethical concerns in the present study raises the question whether macroethics may be particularly prone to being perceived and constructed as different from technical content.

Second, ethics as irrelevant for the profession resonates with findings from a survey study of practicing engineers in which many participants indicated that they “never felt that they had been confronted with an ethical or moral dilemma regarding how their work impacted people, society, and/or the environment” (Bielefeldt & Canney, 2016, p. 2). This theme illustrates how well-intended ethics teaching, such as bringing together students and professionals to talk about ethical dilemmas in the profession, may contribute to constructing ethics as irrelevant rather than highlighting its importance for the profession.

Third, ethics as common sense resonates with Haws’ (2001) critique of engineering ethics education that does not include teaching of ethical theory. According to Haws, failing to teach ethical theory is problematic since “the wide variety of different ‘ungrounded’ perspectives might lead young engineers to the conclusion of ethical relativity—that everyone’s ethical ‘opinion’ is of equal value, and that they should therefore just do what they feel morally justified in doing (in an uninformed way)” (p. 227). Such an understanding of ethics as “simply a matter of opinion” (Tormey et al., 2015, p. 4), that is, common sense, is in stark contrast with the strong focus on rigorously tested theories and methods in teaching technical content.

Fourth, writing about ethical reflection as inferior to scientific writing illustrates how different quality criteria for different forms of writing may contribute to perpetuating the social/technical dualism. This theme has not been described in previous research in engineering education.

Fifth, ethics and ethical reflection as “anything goes” supports previous suggestions that it is important to assess ethics learning. For example, Colby and Sullivan (2008) argued that not assessing ethics modules in the same way (e.g., in terms of quality criteria or type of assessment) as teaching about technical content “sends a message that ethical issues are not important and that standards of quality do not apply to the explication of those issues” (p. 333). This, in turn, may explain why many student and faculty perceive ethics as “fluff,” that is, not very difficult, not requiring any specialized knowledge, and mostly about common sense and personal opinions (Colby & Sullivan, 2008; Newberry, 2004; Polmear et al., 2019; Sundar Sethy, 2017). Unfortunately, the lack adequate assessment of ethics learning that was found in this study is not unique for the present context but seems to be a more pervasive problem in
engineering ethics education: according to a review of the engineering ethics literature in the United States, “many articles minimally described their assessment of students’ learning of ethics” (Hess & Fore, 2018, p. 560), indicating that assessment may not have been prioritized in the initiatives that are described in these articles.

In describing these five articulatory themes, I noticed that it was difficult to analytically uphold the distinction between Cech’s first two ideological pillars: each of the five themes illustrates both processes of depoliticization and of constructing a technical/social dualism. For example, ethics as “something other” than the core subject area illustrates how ethics is constructed as social rather than technical, thus reconstructing the technical/social dualism. But since ethical concerns are also always political (i.e., they involve competing values and interests), this theme also illustrates the reproduction of depoliticization. In fact, I argue that social concerns always also are political. Therefore, the first ideological pillar, the ideology of depoliticization, is already included in second pillar, the technical/social dualism. Thus, this study makes a theoretical contribution by suggesting that it may be sufficient to explore disengagement in terms of two ideological pillars: the technical/social dualism and the meritocratic ideology.

5.3 | Limitations and further research

While I collected data from a large portion of all classroom activities in the course, I cannot rule out that I missed episodes in which ethics and ethical reflection were constructed in other ways than those described in this paper. The results in this paper should, therefore, not be interpreted as an exhaustive description of all forms of discursive construction of ethics and ethical reflection in engineering education, but a description of five themes present in this specific empirical material. Importantly, since macroethics was almost completely absent in this empirical material, the results may, therefore, not be directly applicable to the discursive construction of macroethics. Future research should explore articulatory themes through which macroethics is constructed in engineering education.

Further, the data for this study were collected at a specific time and in a specific context, and the results are not necessarily generalizable. However, the pervasiveness of the ideological pillars of the culture of disengagement in different national and disciplinary engineering education contexts (Allie et al., 2009; Cech, 2014; Lönngren, 2017; Ramírez et al., 2012) suggests that also the articulatory themes identified in this paper may be observable in and relevant for other engineering education contexts.

As mentioned previously, the theme writing about ethical reflection as inferior to scientific writing has not previously been described in engineering education research. Considering that individual written assignments are one of the most common activities in engineering ethics instruction (Haws, 2001; Hess & Fore, 2018), it seems imperative to further explore this theme and develop strategies for articulating writing about ethical reflection as requiring high quality writing and high levels of writing skills—on a par with what is required in writing about technical content.

More research is also needed to explore through which articulatory processes Cech’s third ideological pillar, the meritocratic ideology, may operate in engineering education. Informed by the observation that it was difficult to uphold an analytic distinction between the first two pillars in this study, future research should also explore whether and how the third pillar can be analytically applied in empirical research and whether there may be additional pillars that have not yet been identified. Thus, future research should systematically explore whether an in-depth understanding of the technical/social dualism and the meritocratic ideology satisfactorily explains the reproduction of the culture of disengagement in engineering education or whether the description of the ideological pillars should be further revised.

6 | IMPLICATIONS FOR PRACTICE

Discursive articulation is always contingent, and temporal and it can, therefore also be changed, for example by strengthening competing discourses (Laclau & Mouffe, 1985). The results described in this paper indicate competing discourses that instructors and educational institutions can draw on to change the discursive construction of ethics in engineering education.

6.1 | Instructors

To avoid constructing ethics as something other than the core subject area, ethics needs to be not only taught in dedicated ethics courses but also integrated throughout the entire educational program (Nieusma & Cleminski, 2018).
Ethics should also be taught by engineering faculty rather than (only) as guest lectures (Davis, 1993). Integrating ethics throughout the program could, for example, be achieved through the method of “microninsertion” through which “small units of ethics” are integrated into technical courses (Davis, 2006, p. 717). Unfortunately, Hess and Fore (2018) found that microninsertion of ethics content is today rarely used in engineering education, at least in the United States.

Instructors can also attempt to construct ethics as an analytic activity rather than primarily based on “common sense.” As described in the Results section, at least some of the students in this study described the professional codes of ethics as a tool for analytic reflection, but one of the codes was also experienced as very general and unspecified and, thus, not suitable as an analytic tool. Rather than exclusively relying on professional codes, instructors could also teach ethical theory, the lack of which has been described as “probably the greatest single weakness in engineering ethics instruction” (Haws, 2001, p. 225). Instructors can also use existing frameworks for ethical reflection and decision-making (see, e.g., Beever & Brightman, 2016; Samuellson & Lindström, 2017) to construct ethical reflection as a structured, analytic activity. A stronger focus on analytic thinking could also contribute to clarifying that the quality of ethical reflection is not dependent on which opinions are expressed but rather on the process of how one arrives at those opinions, that is, “ethical discourses should be disentangled from perceptions of moralizing” (Nieusma & Cleminski, 2018, p. 14; cf. the instructor’s comment that “there really isn’t anything that’s right or wrong” in ethical reflection [S10]).

Similarly, instructors can reduce the risk of constructing ethics as “anything goes” by adopting a structured pedagogical approach for ethics instruction, such as Hess et al.’s (2019) approach to “enhancing the ethical reasoning of engineering students” through “scaffolded, interactive, and reflective analysis,” SIRA (Hess et al., 2019, p. 82), or Fore and Hess’s (2020) approach to “ethical becoming” (p. 1).

Instructors can also take measures to reduce the risk that professional engineers construct ethics as irrelevant for the profession when they meet engineering students. In this study, company representatives told students that they seldom encounter ethical dilemmas because they develop their own products. I discussed this question with the instructor who held the ethics guest lecture [L12]. They suggested that the problem may not have been that ethical dilemmas do not occur in the engineering profession or that professionals do not experience such dilemmas; instead, the problem may have been that “ethics” and “ethical dilemma” are very abstract terms and that professional engineers may not automatically connect such terms to their everyday work experiences. The instructor suggested that the students “surely would have gotten [more meaningful] answers” to their questions if they had been instructed to ask more concrete questions [II1]. For example, instead of asking the very abstract question “Do you encounter any ethical dilemmas in your work?,” the students can be instructed to ask specific questions such as “To what degree do you consider user integrity when you develop this type of [product]?” The instructor suggests that company representatives then would answer something like “that’s very important” [III1], that is, they would construct ethics as relevant for the profession.

Instructors can also strive to involve companies that take an active stance for the importance of ethics in their operations and/or prepare company representatives to expect questions about ethical dilemmas when they meet students during the company fair. These types of measures may be particularly important in light of Bielefeldt and Canney’s (2016) findings that many engineering education alumni “indicate that their undergraduate experience did not at all/not very well prepare them to recognize and deal with unethical behavior” (p. 3).

Another approach can be to design ethics instruction such that it involves direct interaction with stakeholders. For example in engineering design courses, stakeholder interaction has been found to trigger ethical reflection as it raises concrete ethical dilemmas that students need to address as an integral part of their design project (Corple et al., 2020).

To avoid articulating writing about ethical reflection as inferior to scientific writing, instructors can explicitly discuss reflective writing as a different literary genre (Bakhtin, 1986) from technical or scientific writing—with different (but equally high) requirements for linguistic quality. These requirements should be made explicit, for example by providing a rubric.

Providing students with explicit assessment criteria can also contribute to reducing the risk of constructing ethics as “anything goes.” One reason for the lack of adequate assessment of ethics learning in many engineering degrees may be that engineering educators feel ill-prepared to assess learning related to sustainability and ethics (Lönngren & Svanström, 2015). However, instructors do not necessarily have to develop their own assessment tools—rigorously developed and tested rubrics are freely available for assessing ethical learning. For example, Shuman et al. (2005) have developed an assessment rubric that can be used to assess the quality of five components of ethical reflection: identifying a dilemma; appropriate use of facts; analysis; use of multiple perspectives; and resolution of the dilemma. Even ethics learning during mandatory seminars should be assessed. In the course described in this paper, the instructors...
can, for example, devote a minimum discussion time to ethics content during the seminar on the students’ future professional roles [S9]. In that way, they can ensure that discussions about ethics are not avoided or trivialized.

More generally, engineering instructors can draw on a wide range of freely available Web resources to further develop their ethics instruction, including a diverse range of case studies, course syllabi, professional codes of engineering ethics, and online journals and newsletters (Herkert, 2005). Using such resources and the measures suggested in this paper, instructors can actively work toward constructing ethics and ethical reflection as advanced, of high quality, and important. Unfortunately, most of the resources available today focus on microethics (Herkert, 2005; Swan et al., 2019). Therefore, much work remains to be done for both researchers and educators in developing engineering ethics education such that it truly contributes to dismantling the culture of disengagement in engineering education and to educating future engineers to become socially and environmentally responsible professionals.

6.2 | Educational institutions

Teaching ethics is challenging. Therefore, educational institutions need to support instructors in changing the discursive construction of ethics in engineering education. Educational institutions can contribute to constructing ethics as important by providing continued professional development for engineering instructors about ethics in general and ethics instruction for engineering students in particular. Professional development can for example focus on micro-insertion of ethics content into technical courses, ethical theory, frameworks for ethical reflection, pedagogical approaches for ethics teaching, reflective writing, and assessment of ethics learning as described above.

Institutions should also dedicate more resources to ethics instruction. This would allow instructors to, for example, provide substantial feedback on ethics assignments. Adequate reward structures would also support instructors in developing their ethics instruction; since it is common that student feedback on course evaluations for ethics courses is more negative than for technical courses (Newberry, 2004), instructors may currently be punished rather than awarded for taking the trouble and risk to integrate ethics in their courses.

Finally, institutions can contribute to constructing ethics as important for the profession by demanding a discussion of ethical concerns that may arise in engineering projects that are carried out in collaboration with the industry. For example, institutions could require that students who conduct industrially based Bachelor or Masters’ projects include a chapter on ethics in their report.

7 | CONCLUSION

In this paper, I have discussed how ethics and ethical reflection were discursively constructed as unimportant in an introductory engineering course in Sweden. I have described five articulatory themes: (1) Ethics as “something other” than the core subject area, (2) Ethics as irrelevant for the profession, (3) Ethics as common sense, (4) Writing about ethical reflection as inferior to scientific writing, and (5) Ethics and ethical reflection as “anything goes.” Based on these themes, I have argued that, in the context of this course, the core subject area of the engineering program was articulated as advanced, of high quality, and important. Ethics and ethical reflection, in contrast, were articulated as not the responsibility of the specific field of engineering, not needed and/or not actionable in the profession, of low quality and status, and not very important for the engineering degree. However, the results also point to concrete measures through which instructors and educational institutions can contribute to constructing ethics and ethical reflection as advanced, of high quality, and important—and thus to educating future engineers to become socially and environmentally responsible professionals.

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ENDNOTES

1 The Swedish expression used is formaliserat bondförnya, which verbally translated would be “formalized farmers’ wisdom.”

2 Vår and vår are colloquial forms of the Swedish pronouns vär and vär, both of which are translated to English as “our.”

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**APPENDIX A: Additional Empirical Excerpts**

**TABLE A1** Data excerpts for Theme 1: Ethics as “something other” than the core subject area

| Excerpt                                                                                                                                                                                                 | Interpretation                                                                                                                                  | Data type       | Data item |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------|
| I talks about different topics that are related to the engineering program that the students are enrolled in: “[Type of systems,] that’s about how such systems are connected to each other and how the function in society. You’ll learn a little about that [during your education], but it’s mainly something they do at our sister department, the social science department that’s called [name of department].” | Societal concerns (including ethics) are dealt with at a nonengineering department.                                                              | Audio-recording | [L1]      |
| I: We have so little on ethics throughout the entire education, even during PhD studies. [There’s this attitude] that, like, technology is technology and it’s true or false and there is not really much to have an opinion about. | Ethics is not discussed in the department; ethics is different from technology.                                                                  | Audio-recording | [II2]     |
| I: [Name of I1s department], that’s a pure social science department. And [name of engineering department], we often call them our sister department [...]. And [name of engineering program], that’s the technical and natural science subject. So if we, [name of I1s department], study the development and use of [type of technology] in society, organizations, and even on the level of individuals, we do it from more of a social science perspective with social science theories and so on. And [name of engineering department], they [...] focus more on the technology in order to make the development of technological artefacts more effective. | The social science department deals with social science questions (including ethics) and the engineering department deals with technological questions. | Audio-recording | [II1]     |
| I about a student who approached [them] during the ethics lecture: "[They] tried all the time with this kind of engineering approach [...] that is to divert the discussion away from being about a problem of moral philosophy and turn it into an engineering problem. And the engineering problem, that’s of course the question of how we can prevent the situation from occurring in the first place, with the help of different kinds of technological solutions [...]. And I wanted us to [focus] on questions of moral philosophy and [they] thought that was difficult because – I think maybe [they] had this idea, already from the first term, that as an engineer, you solve practical questions and not philosophical questions, maybe. [...] [And] I just assume that these students seldom deal with [questions of moral philosophy], that that’s something that is a little on the side of their normal idea about what they are supposed to learn as engineering students.” | Engineering problems are different from problems of moral philosophy; engineering approaches are not compatible with problems of moral philosophy. | Audio-recording | [II1]     |
| R: This ethics essay that you had to write, what did you think of that? S: It was interesting; because ethics, that’s actually very interesting. And like, how would I react in this situation and things like that, so it was an interesting assignment. Maybe not so relevant for the course, but it’s nice to have a change [from the normal course content] every now and then. | Ethics is different from what the students normally do.                                                                                          | Audio-recording | [II5]     |
TABLE A2  Data excerpts for Theme 2: Ethics as irrelevant for the profession (and not valued)

| Excerpt                                                                                                                                                                                                 | Interpretation                                                                                          | Data type | Data item |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----------|-----------|
| “[The instructor talks about project goals and introduces the acronym SMART(a) with the help of a PowerPoint slide. The instructor says that the acronym stands for the principle that project goals should be Specific, Measurable, Important\(^a\), Realistic, and Time-Bound.] The last point on the list [on the PowerPoint slide] is “accepted,” but this word [which represents the letter “a” in the acronym] is written in parentheses. The instructor explains the parentheses, stating that ‘it depends a little’ – ideally, a project goal is accepted by everyone who is affected by the project, but in reality, we often care ‘more or less about whether it really is accepted.’”\(^b\) | In technological development projects, it is not necessary to respect all stakeholders' interests.        | Fieldnotes | L2        |
| “One student talks about a company where new employees watch an animated film about ethics and then that’s it, then they do not talk more about ethics. Another student asks: ‘Do you think that larger companies’ make more ethical statements? Another student responds: That depends on what they work with of course. One student says: ‘It’ looks good if they make ethical statements, even if they do not actually care about ethics.’” | Engineering companies do not really care about ethics.                                                   | Fieldnotes | G9        |
| “One of the students asks: Do you think that [betting companies] take a lot of ethical responsibility? Another student says: ‘They only just stay away’ from doing anything illegal.” | Engineering companies do not care about ethics, only about not breaking the law.                        | Fieldnotes | G9        |
| “One student says: ‘Maybe one should think about how it could affect your career’ in the [type of engineering] industry if you'd work many years for a betting company. ‘Maybe you should think about your values.’ If you work on weapons, it might be difficult to later get a job at a company that takes a stance against weapons. Another student says: But there is a lack of engineers, so I think the companies would employ you anyways. ‘Maybe there are not so many possibilities in the [type of engineering] industry’ [...] to take ethical positions into account when you hire new employees.” | Even if engineering companies would care about ethics, they could not demand that their employees care about it. | Fieldnotes | G9        |

\(^a\)In Swedish: Angelägen.

\(^b\)Note that the letter A in English versions of the SMART acronym often stands for “achievable”/“attainable,” “accurate,” or “approved.” Note also that “approved” is roughly synonymous with “accepted”; thus, at least in some versions of the acronym, accepted is included as an important part of the acronym rather than as a voluntary add-on as is done in the data excerpt.
## Table A3 Data excerpts for Theme 3: Ethics as common sense

| Excerpt | Interpretation | Data type | Data item |
|---------|----------------|-----------|-----------|
| I: And this seminar [about professional roles], we'll talk more about that later, [but] there we are going to discuss a little about what a [type of engineering] engineer is and [...] what kinds of problems there may be. The essay has to do with ethics and morality, to think about what responsibility do I have [as an engineer]. [...] A little about those kinds of questions maybe. | Ethics and ethical reflection are described in vague terms (“discuss a little,” “a little about those kinds of questions maybe”) that remind of everyday thinking rather than rigorous analysis. | Audio-recording | [L1] |
| [From fieldnotes]: “One student says: If we have an algorithm that is optimized to minimize the number of deaths, we do not need anyone who decides how the car should behave in different situations. Because the whole point is that we should minimize the number of deaths and then it does not matter who decides how the car should behave.” | There is one single correct and obvious solution to the ethical dilemma. | Fieldnotes, audio-recording | [L12] |
| [From audio-recording]: L: No, but [...] what moral rules should be applied in different situations? Someone needs to decide on that, do not they? [From fieldnotes]: “The student says: No, you just follow the rule that says ‘minimize the number of deaths.'” | Ethics codes are not used in the profession. | Audio-recording | [IS1] |
| [We talk about the professional codes of ethics that the students used for their ethics essays.] S: I do not think I would have discovered them [the codes of ethics] without [...] this course. | Ethics codes can be useful, but they are not necessary; it is not necessary to know the content of professional codes by heart. | Audio-recording | [IS1] |
| R: Do you think that you'll have to look at the codes in your future work? S ((with intermittent laughter)): Yes, I think so. But I do not know if [...] the first thing I'll think about when I encounter a problem will be to check what [they say] in the professional code. But I think it's a good thing to have in the back of your mind. I mean, it's not bad to know about them, but I do not think I have to learn all items [in the code] by heart. | | | |
### Table A4 Data excerpts for Theme 4: Writing about ethical reflection as inferior to scientific writing

| Excerpt                                                                 | Interpretation                                                                 | Data type       | Data item |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------|-----------------|-----------|
| R: But you have not graded [the essay, other than on a pass/fail bases]? | The formal requirements for the ethics essay are very basic.                    | Audio-recording | II2       |
| I: No, I have not. [...] Of the fifty-eight [students] that handed in, I think that fourteen have to hand in again. And then it’s either because they have forgotten [to do] the second half of the task or because they have not written any references at all. That’s the most common problem. And I think that they at least have to write one reference ((laughter)). That’s where I draw the line. And then they are allowed to misspell and they are allowed to do all those kinds of things, but they have to at least have one reference. | Fewer resources are allotted to assessing the ethics essays than other assignments in the program. | Audio-recording | II2       |
| I: Normally when I correct assignments, I give a lot more feedback, individual feedback. But I realized that the time I had been given to do this [to assess the ethics essays] would not be enough for that [giving as much individual feedback as the instructor normally does]. So I thought I had to find a way to give feedback quickly. | Language quality is not important in the assessment of the ethics essays. | Written documents | [EXF]     |
| [Out of 58 students who handed in the ethics essay, nine (16% of the essays) received written feedback that the language in their essays was informal or that the essays contained grammatical or spelling errors. However, the instructor did not require revisions or fail students due to language issues.] | The formal requirements for the ethics essay are more lenient than for assignments in other (more technical) courses in the program. | Fieldnotes      | [EXF]     |
| I: In later courses [in the program] they will not even look at your assignment if you have handed it in with the wrong [file format, so this [the instructor's comment on file formats] is just to make it clear that there was a requirement [to use a specific format]. But this is not anything you have to change this time [for this assignment]. | Scientific writing is important for later courses in the program, that is, for the core subject area. | Audio-recording | IS1       |
| R: What courses do you think you’ll want to choose as your electives later in the program? [...] |                                                                                   |                 |           |
| S: Didn’t they have something like academic writing [...]? I feel like that could maybe be useful if there's gonna be a lot of reports and things like that. |                                                                                   |                 |           |
TABLE A5  Data excerpts for Theme 5: Ethics and ethical reflection as “anything goes”

| Excerpt                                                                                                                                                                                                 | Interpretation                                                                                                                                                                                                 | Data type     | Data item |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------|
| R: When [name of course leader] asked you [to hold this guest lecture about ethics], did they have any requirements for intended learning outcomes or anything like that? I: No, quite the opposite. They said [...] that they wanted to have something [on social implications of technological development]. [They asked:] “If you would do that [hold a lecture on that] ((laughter)), what would you do?” And at that time I had just had ((laughter)) this lecture in a [different] course and I said I could talk about this. And I showed them, well, we scrolled through the slides a little. They said ‘yeah, that’ll be perfect, so let us do it like that.’ ((laughter)) | There are no required learning outcomes related to ethics and no specific content that has to be covered; it is important that the students get some kind of “ethics time,” but it is not important what that time is filled with. | Audio-recording | [I1]      |
| I: But I also thought that, well, this is the first time they have to sit down and reflect, so I tried not to fail too many, you know?                                                                                                                                 | Any kind and level of reflection is good enough to pass the ethics assignment.                                                                                                                                  | Audio-recording | [I2]      |
| R: But you have not graded [the essay, other than on a pass/fail bases]? I: No, I have not. [...] Of the fifty-eight [students] that handed in, I think that fourteen have to hand in again. And then it’s either because they have forgotten [to do] the second half of the task or because they have not written any references at all. That’s the most common [problem]. And I think that they at least have to write one reference ((laughter)). That’s where I draw the line. And then they are allowed to misspell and they are allowed to do all those kinds of things, but they have to at least have one reference. | The formal requirements for the ethics essay are very basic.                                                                                                                                                   | Audio-recording | [I2]      |
| “Your dilemma may be a dilemma for a manager who has assembled a work group that is not well-balanced when it comes to competences that are represented in the group, but there is no ethical dilemma from what I can see.” To complement: “It would be nice if you could clarify the ethical dilemma (not a requirement).” | Not having described a clear ethical dilemma is not a reason for failing the assignment.                                                                                                                                 | Written document | [EXF]  |
| [Out of 58 students who handed in the ethics essay, only (47%) received any kind of feedback on their chosen dilemma and/or their reflection about the dilemma. At the same time, 30 students (52%) received individual feedback on language, form, and/or references. Four students (7%) failed for reasons related to their ethical reflection, either because the instructor could not identify an ethical dilemma in the text or because the student had not used the professional codes of ethics in their reflection.] | The quality of ethical reflection was not very important.                                                                                                                                                  | Written documents | [EXF]  |
| S: But, I mean, the requirements were also just like, ‘address all parts’ of the assignment. And that also like, okay, sure ((laughter)) R: ((laughter)) But there were a few [students] who did not do that, were not there? S ((with intermittent laughter)): Yeah, they obviously had not read [the task description]. | Students could only fail the ethics assignment if they had not actually read the task description.                                                                                                           | Audio-recording | [IS2]    |