2.8

Written Communication and Reporting

Oscar P.J. van Putten[a] and Angeniet E. Kam[b]

[a] Delft University of Technology, the Netherlands, ORCID: 0009-0002-6046-7086;
[b] Delft University of Technology, the Netherlands, ORCID: 0000-0002-2635-7038.

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To prepare engineers for the writing tasks employers expect them to perform in academia and industry, writing should be embedded in engineering education. In this chapter we show how engineering programmes should design education in written communication. Since the launch of generative AI may impact education in writing, we also discuss how to deal with the influence of generative AI in engineering writing education. After defining written communication in engineering and discussing theories of writing and writing education, we present three evidence-based principles for the design of education in written communication: embedding writing in the discipline, using realistic, authentic genres, and applying active learning. In addition, we recommend that teachers in communicative skills collaborate with engineering teachers to develop writing education. Finally, we suggest the use of rubrics and mitigated criticism for practical and effective assessment of writing. We provide examples of study programmes that have applied these principles.

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1 Definition

1.1 Writing in engineering

Engineers spend 15 to 30% of their work hours on writing (Passow & Passow, 2017). Engineering alumni have rated communication skills to be highly important in their professional career — more so than was emphasised than during their engineering degree (Lattuca et al., 2014). Industry representatives expect a high level of writing skills from engineering graduates (Leandro Cruz & Saunders-Smits, 2019). Clearly, writing skills are indispensable for graduating engineers.

Leandro Cruz & Saunders-Smits (2019, p. 13) define writing skills in engineering fields as the ability to develop "*a logical, accurate, detailed, and organised report/paper without grammar mistakes and with accurate references*". This definition highlights six key components:

- *Logical* refers to the arguments presented. They should be clear and logically sound. Using incorrect phrasing or fallacious arguments reduces the credibility of the author and impedes a good understanding of the text.
- *Accurate* refers to the quality of information presented in a text. Accuracy goes beyond the use of factually correct information. In engineering writing, a clear, unambiguous choice of words is expected.
- *Detailed* refers to the amount, quality, and depth of content a text should cover. Texts should contain sufficient detail to cover necessary content, yet not so much detail as to distract from the main point.
- *Organised* refers to the order and grouping of information within a document. The format of technical documents should align with the readers' expectations and aid the presentation and processing of information.
- *Without mistakes* refers to the ability to write without language errors. Although the provided definition refers to grammar mistakes, this guideline also applies to errors in spelling and punctuation. Mistakes can cause confusion among readers.
- *With accurate references* refers to the need to incorporate and discuss sources in text. Writing is often based on work by others and should show credit where credit is due, thus supporting the strength of the claims in a text. In addition, referencing should follow specific formats that are common in engineering practice.

This definition focuses on reports and papers as writing genres. In this chapter, we focus on teaching these genres, as students will have to write these during their degree and in the engineering workplace. Though engineers should also be able to write memos, emails, safety instructions etcetera, these genres are either taught in secondary education or on the job. However, many strategies discussed in this chapter are applicable to teaching a wide range of genres.

1.2 Theories of writing

Several theories point towards the methods through which people write. These theories inform the way writing education is defined and designed.

First, writing is not a linear process. Flower and Hayes (1981) define a cognitive process theory on writing. Broadly, the writing process contains three phases: planning, writing, and revising. In practice, writers apply these phases in recurring fashion: they may revise sections before completing the text or return to the planning phase while writing. In addition, writing is a goal-oriented process, in which writers develop an understanding of a topic through writing and therefore adjust their goal throughout the writing process. Writing, therefore, is not just a way to communicate ideas, but also to develop ideas.

Second, writing is a socially situated activity, in which authors adapt their writing to their audiences and fulfil expectations readers have about genres: shared conventions in style, content, and form in texts with similar purposes. Genres are "*choices which represent effective ways of getting things done in familiar contexts*" (Hyland, 2003, p. 22). Writing conventions differ between settings and fields of study, for example:

- A design report will contain a high level of detail, technical language, and organization in chapters and sections. Conversely, an email is brief, contains natural language, and is organised in a more rudimentary form.
- In most science and engineering fields, it is unusual for writers to use personal pronouns in research papers, though this is becoming more common. Writers in mathematics, however, commonly use the personal pronoun 'I' in papers in which they present their proofs.
- Students of Life Sciences and Molecular Sciences will regularly write up their research results in lab reports, whereas architecture students will rarely have to write such a report.

More recently, the emergence of generative AI (GenAI) tools and Large Language Models (LLMs) such as ChatGPT, Claude, or Gemini has offered new methods to produce written text. Users supply these tools with a prompt, through which the tool generates an output. As such, LLMs can produce a large variety of texts faster than any human writer could and can support writers in planning and revising texts. There is no consensus yet on the use of LLMs in the writing process: their use is a controversial topic, and current research provides mixed perspectives on their efficacy. Section 2.2 discusses the current discourse around LLMs in writing education.

1.3 Writing and linked competences

Overall, there are indications that academic writing abilities correlate with higher academic achievement (Kuiken & Vedder, 2021). Although the direction of this relationship is uncertain — whether good students become good writers, or vice versa — writing is unmistakably a competency that is linked to many other skills. Kruse (2013) identifies six domains to which writing competency is connected, which require a separate set of sub-skills:

- *Disciplinary knowledge.* Students cannot perform academic writing without a proper knowledge foundation. Similarly, students build knowledge through writing.

- *Process and procedural skills.* Writing is a process containing a diverse set of components, such as planning, research, idea generation, and revision. Students can only learn and apply these steps through practice.
- *Communication and discourse knowledge.* Students should be able to relate the contents of a text to its audience and the relevant discursive community.
- *Media use.* Writers use various media to produce and share text, that students should be aware of and should be able to use. In the past decades, text production has shifted from physical to digital means, and this shift is currently proceeding with the introduction of GenAI.
- *Genre knowledge.* Students should be aware how the various characteristics of texts relate to the functions of a text and the expectations of an audience.
- *Linguistic skills.* Students need language skills to write properly, both lower-order skills (spelling and grammar) and higher-order rhetorical skills.

1.4 Entry and exit levels for writing education

Study programmes can expect students who enter higher education to have sufficient competencies in the basics of writing: lettering, spelling, grammar, and basic composition skills such as dividing a text into sections and paragraphs. However, this is not always the case in practice; in such cases, remedial programmes for first-year students and writing centres can alleviate this issue to a certain extent (Kuiken & Vedder, 2021).

One notable difference in students entering engineering programmes is the difference between first- and second-language writers (L1 and L2 writers, respectively). The Common European Framework of Reference for Languages (CEFR) identifies different levels for language skills (Council of Europe, n.d.-a) and levels for written communication (Council of Europe, n.d.-b). Many universities in Europe ask of students that they have a near-native language entry level in their own language (C1 in terms of the CEFR) and end of secondary education level (B2 in terms of the CEFR) of English for English-language study programmes, if students do not have English as their first language.

University engineering programmes in Europe are regularly taught in English, especially master programmes. Even when studying in their own country, students often write in a non-native language. Although many sub-skills of writing carry over between L1 and L2 writing (Gonca, 2016), students writing in a second language may have more difficulty, especially in aspects related to language use. For example, in a first-year writing module, Eckstein and Ferris (2018) found that L2 students made more language errors, used a less varied vocabulary, and were less confident in their language skills compared to L1 students.

In terms of exit levels, the overarching *Framework for Qualifications of the European Higher Education Area* defines learning goals for communication skills for bachelor, master and PhD programmes in European higher education (Table 1.1). To receive accreditation, engineering programmes must integrate these learning goals into their curricula.

Table 2.8.1: Learning goals for writing education (Bologna Working Group, 2005, Appendix 8)

Level	*Learning goal*
Bachelor	Students can communicate information, ideas, problems, and solutions to both specialist and non-specialist audiences.
Master	Students can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously.
PhD	Students can communicate with their peers, the larger scholarly community, and with society in general about their areas of expertise.

These learning goals complement the definition of writing as provided by Leandro Cruz & Saunders-Smits (2019): students should be able to communicate information, ideas, problems, solutions, conclusions, and rationale in subjects related to their areas of expertise to specialists, non-specialists, peers, the larger scholarly community, and society at large.

2 Why teach written communication and reporting?

2.1 Writing in the engineering workplace

In workplace situations, engineering graduates will regularly provide written results of their work. As stated in section 1.1, engineers spend a substantial amount of time on written communication. Although there are differences between the genres engineers use, they frequently share an overarching goal: to explain complex information in a clear manner. Students entering the workforce feel better prepared if they are familiar with the genres used in their future professional career (Ford et al., 2021).

Nevertheless, employers indicate a gap between the expected and actual level of writing from engineering graduates. Kirkpatrick et al. (2012) found that 52% of industry representatives considered mechanical engineering graduates to have weak communication skills, versus 9% who considered them strong. By contrast, 20% of educators considered their graduates to have weak communication skills and 40% strong. Although this survey targeted American universities and engineers, it is conceivable that such a gap is also present elsewhere.

Two reasons are given for this poor preparation. First, many engineering programmes incorporate writing skills through a general writing module. As a result, students may become familiar with transferrable writing principles, such as paragraph use and spelling, and generic genres, such as emails. However, university writing assignments do not always reflect writing situations that practicing engineers encounter. Even educators may not be familiar with engineering genres, if they have a non-engineering background or have only worked in academia. As a result, graduating students are unfamiliar with the genres they must be proficient in. In addition, engineering graduates cannot always determine which writing skills taught in an educational setting are applicable in a professional setting (Donnell et al., 2011).

Second, student and workplace writing have different goals. According to Paretti (2006, p. 189), student writing "*perform[s] knowledge so that teachers can evaluate concept mastery*". Workplace writing, instead, "*communicate[s] information so that audiences can take subsequent actions*". This requires authors to adapt their texts to the needs and understanding of their target audience. Even when writing assignments simulate real-life situations, the need to perform knowledge overshadows the need for audience adaptation.

This gap manifests itself in the quality of texts written. Conrad (2017) compared texts written by civil engineering practitioners and students. She found that practitioners value texts written in an unambiguous, predictable, and detailed way, with few grammar errors. This would make texts easy to read quickly and avoid liability concerns. By contrast, student texts were ineffective: they contained frequent grammar errors, unnecessarily complicated sentences, imprecise or inaccurate word choices, and a non-linear, incomplete organisation. According to Conrad (2017, p. 209), "*students sometimes knew they lacked knowledge … [but] many also had profound misconceptions about what made writing effective*".

Writing education, therefore, should aim to prepare students for any writing-related tasks they may encounter in the workplace. Section 3 discusses strategies to align student and workplace writing.

2.2 Influence of LLMs as a tool for writing

After the release of ChatGPT in November 2022, followed by other generative AI tools, discussion has emerged on the use of LLMs in writing assignments in higher education. LLMs can quickly provide convincing-looking texts, and students regularly resort to using these tools to help write their assignments. One might consider education in writing skills to become redundant, as students and engineers could outsource their writing to LLMs. However, AI-generated text cannot substitute human-written text. Concerns with LLMs in education fall into two categories: performance issues and learning issues. This criticism follows in part from studies or experiences in non-engineering fields but applies equally to engineering writing.

When it comes to LLM performance, there is ample criticism on the quality of AI-generated text. It often contains factually incorrect claims, non-existent references, fallacious argumentation, and an amplification of existing biases (Bender et al., 2021). In addition, LLMs can produce text in a vague and non-specific writing style that is unsuitable for most engineering-related genres (Kim et al., 2024). Without understanding the characteristics of appropriate writing, students may not notice these shortcomings and may fail to verify the accuracy of the provided claims and arguments, even if newer LLM versions may alleviate some of these issues.

While LLMs are a poor replacement for human writing, they can improve writing when used responsibly for specific writing tasks (Deng et al., 2025). Many educators fear that students outsource entire assignments to LLMs. However, students may also write assignments themselves and use LLMs only for part of the writing process. For example, they can use LLMs in the planning stage, by aiding with research or

brainstorming, and the revision stage, by improving the style of their written work or removing language mistakes. This way, weaker students could receive writing support without being dependent on staff or other students.

However, instructors need to properly support students when they are permitted to use LLMs. For example, proper prompt engineering is a prerequisite for desirable results. Students using LLMs produce higher-quality texts when using specific prompts, iterating their prompts, and critically evaluating the given output (Kim et al., 2025; Nguyen et al., 2024). Students who learn about the downsides of LLMs also adopt a more critical stance and reduce their LLM use, while still recognizing potential benefits (van Niekerk et al., 2025; see example 1).

It should be noted that studies about LLMs are subject to criticism (Bauer et al., 2025). These studies test writing in a controlled environment, such as writing a short essay, which is not reflective of the process of writing in an engineering classroom or company. Many studies are also methodologically flawed: there is no control group, or differences between AI-supported and non-AI-supported performance could be ascribed to other factors than AI use. Finally, and importantly, these studies only measure improvements in writing performance, not extended learning benefits.

This points towards a second, more fundamental criticism of LLMs: they potentially undermine student learning. University writing assignments often assess both writing skills and content learning. Writers develop ideas and critically reflect on their content while writing. These advantages are lost when they outsource writing to LLMs. Unlike performance issues, which newer versions of LLMs may alleviate, learning issues are an inherent part of using LLMs in writing education.

Research indicates that overreliance on LLMs leads to a reduction in skill development, creativity, critical thinking, and perceived ownership of texts. Fan et al. (2025) observed that students who used LLMs in the writing process produced higher-quality essays than students who did not. However, they did not achieve a better understanding of the content. In another study (Kosmyna et al., 2025), participants using LLMs to write essays used less cognitive load, had difficulty to quote a sentence from their work, and reported a lower perceived ownership of their work than participants using no additional tools or only search engines. These effects increased as they produced more essays. Therefore, if students consistently use LLMs to complete writing assignments, this indicates they may not have achieved the intended learning objectives.

As an early response to ChatGPT, educators sought to ban the use of LLMs in an educational setting, likening its use to plagiarism. However, such a measure is neither feasible nor productive. Students can easily circumvent AI bans and detection tools offer untrustworthy results (Corbin et al., 2025). There is a growing consensus that students would benefit from a more balanced view on LLMs as a writing tool. If students will have access to LLMs anyway, instructors should educate them on responsible AI use, for example by showing students how to use LLMs in a correct way when writing (see Example 1).

Furthermore, learning about LLMs prepares students for their future careers. European companies increasingly use LLMs and other forms of generative AI (Eurostat, 2025) to increase productivity. For example, they may incentivize employees to automate repetitive tasks, to write emails or to write or revise reports using LLMs.

Most universities are introducing guidelines for the use of LLMs in assignments. There are no definitive answers on how higher education institutions should revise their education. However, Corbin et al. (2025) provide a useful framework by dividing measures into discursive and structural changes. Discursive changes rely solely on communicating rules on LLMs, such as banning their use for certain tasks or requiring students to declare LLM use. Structural changes constrain the format of assignments to limit inappropriate LLM use, such as changing to supervised writing tasks or combining written assignments with oral discussions. Corbin et al. (2025) argue in favour of structural over discursive changes. Discursive changes are easy to implement, but they can be ambiguous for students and are difficult to enforce. Structural changes are difficult to implement but improve assessment validity in the long term.

Example 1. Teaching the pitfalls of LLMs in a writing module

To inform students of the pitfalls of LLMs, van Niekerk et al. (2025) performed an intervention study at Noroff University College, Norway, through a series of two tutorials in an academic writing module. In the first tutorial, students from several computer science engineering-related degrees received an overview of ChatGPT, outlining how it could be used. They generated an essay and then filled in a survey on their intention to use the application for writing, based on seven writing-related characteristics they observed in the essay generated. In a second tutorial, staff presented the flaws and limitations of ChatGPT and asked students to evaluate their essays based on these characteristics. Finally, students reflected on the use of ChatGPT and filled in a post-intervention survey.

Students adopted a more critical stance after the second tutorial. They saw ChatGPT as less useful than before and reduced their intention to use it, especially with regard to providing accurate references and offering critical insight into a topic. However, students still maintained their intention to use the application for structuring text or rewriting text in a more formal tone, areas where it presented fewer problematic results.

The authors present several limitations. First, the intervention took place when ChatGPT was relatively new, and students had limited prior exposure. Students may currently have more experience with LLMs and may be more aware of their limitations when entering university. Newer versions of ChatGPT and other LLMs could have improved functionality. These factors could reduce the efficacy of such an intervention in the future and could require educators to regularly revise the assignment. Second, the study provides only a single snapshot of one intervention, without conclusive evidence that students will retain this learning throughout their study programme. Especially under short deadlines or poor time management,

"students may still be tempted to use ChatGPT to provide material for an assessment" (Van Niekerk et al., 2025, p. 9).

It should also be noted that such an intervention only demonstrates the issues in AI-generated text. It does little to highlight the cognitive benefits of writing on your own, such as an increase in skill development, critical thinking, and perceived ownership.

3 Forms of implementation

3.1 Evidence-based principles of writing education

Study programmes should develop their writing education by defining clear learning outcomes, designing learning activities that support this learning, choosing or developing learning materials that support students in their learning in the correct way and at the correct time, and designing assessment methods that reliably evaluate whether the learning outcomes have been achieved. The principles behind the design of education in complex skills, such as writing, are well-known and validated through research (Biggs et al., 2022; van Merriënboer et al., 2025). For engineering writing education, we summarize three main principles. Examples 2 and 3 explain how educational programmes incorporate these principles in practice.

First, writing education in engineering should be embedded within the discipline (Russell, 2007). Embeddedness means that writing in engineering should ideally concern subjects that students are already involved in. This helps students to become acculturated within their discipline. They should learn to write as engineers, more specifically as a mechanical engineer, civil engineer, architect et cetera. This means they should learn about the specific ways that these engineers express themselves, which they often learn best from their own lecturers in the discipline. Example 2 shows how this embeddedness was implemented in a second-year scientific writing module in Aerospace Engineering at Delft University of Technology.

Second, writing education in engineering should make use of realistic, authentic genres (Hyland, 2003). In engineering, specific kinds of texts are used, such as design reports. Moreover, students should become familiar with academic genres such as the bachelor and master thesis and research articles. This enables them to practice academic ways of critical reading, thinking, argumentation, and use of and proper citation of sources — skills they will later need in the workplace. Writing modules that do not incorporate these genres may not teach topics that are relevant to engineers or may even contradict writing conventions among engineers (Wolfe, 2009).

Third, writing education in engineering should make use of active learning (Biggs et al., 2022; van Merriënboer et al., 2025). Active learning is an important design principle: students cannot learn to write by listening to lectures or reading background materials on writing alone. They should practice the writing process to increase their proficiency and receive (peer) feedback about their efforts to be able to improve their writing.

Example 2. Embedded writing education in aerospace engineering education

Embedding writing education in engineering education can be realised by collaboration between communication teachers and teachers in the disciplines. That way, the teaching of writing can go hand in hand with engineering projects students are already involved in.

At Delft University of Technology, second-year bachelor Aerospace Engineering students (in groups of 10 students) engage in projects in which they develop simulations in Matlab or Python about real-world problems. They write a research paper about their results and follow five lectures about scientific writing to support them in this writing assignment. Students work in groups of ten to keep the module feasible for both students and lecturers, and to prepare students for working in group settings in their later career.

At the start of the process, groups set up a team charter, including a division of tasks and guidelines on meetings and deadlines. The research paper is written in a group and graded as a group assignment but also contains an individual grading component. The writing module focuses on the general IMRaD (Introduction, Methods, Results and Discussion) structure of academic research papers. Students learn to perform literature research, to use academic sources, and to apply common reference styles for their discipline. They also practice with general structure principles (writing sections, subsections, and paragraphs) and with visualisation of the results in figures and tables. As supportive learning material, students use an e-book about writing in engineering that is available through the university library. Engineering and communication staff grade the texts with rubrics that focus on different criteria: the engineering teachers focus mostly on content aspects and the communication teachers on aspects that deal with writing. The writing grade counts as a partial grade in the engineering module.

Throughout the module, students write and submit parts of their paper, receive formative feedback from the engineering and communication teachers, and engage in peer feedback and self-reflection exercises.

Apart from designing modules that include the three design principles for writing, it is also important to design these modules in a learning trajectory. Stand-alone modules do not sufficiently foster knowledge transfer: students do not apply what they have learned sufficiently to other tasks after they have followed a stand-alone module (van Merriënboer et al., 2025). To make sure that transfer happens, students must have the opportunity to practice with different genres in consecutive years of their study programme, with increasing levels of difficulty. Example 3 shows how this was done in Mechanical Engineering and Civil Engineering programmes in Sweden.

Example 3. The writing programme at Chalmers University of Technology, Sweden

The Centre for Language and Communication at Chalmers University has been engaged in several learning trajectories that support professional and academic

writing for engineers. Gustafsson and Boström (2012) explain how these programmes are set up. Two specifically successful examples are the first and second year of the Mechanical Engineering and Civil Engineering programmes, leading up to the writing of an interdisciplinary BSc thesis (15 ECTS) in the third year of these programmes.

In the first years of these programmes, students engage in reporting their learning outcomes in two modules: 'Introduction to Mechanical Engineering', where students participate in a design project, and the introductory module 'Building in Society in Civil Engineering'. Both lecturers from the Centre and staff members of the department read and assess the reports.

In the second year of the Mechanical Engineering programme, students report about a more demanding design project. Summative assessment criteria for this project, in which criteria about writing are included, were set up in collaboration with lecturers of the Mechanical Engineering department. In the second year of the Civil Engineering programme, students engage in an advanced, writing-oriented module 'Building Economy and Organization'. In this module, focus is on critical reading and argumentation, and the requirements are more demanding.

Of course, it is possible to teach students writing using a standard method. Several online materials or textbooks are available that could support a writing component in engineering projects (e.g., *LabWrite* (North Carolina State University, 2004), *Writing scientific research articles* (Cargill & O'Connor, 2013), and *Writing technical reports for readers with little time* (Elling et al., 2012)). These textbooks are developed by knowledgeable writing instructors and are based as much as possible on evidence-based principles of writing instruction. However, they may not acculturate the students sufficiently in their specific discipline, because they are often generally applicable methods, that may be useful for students from different academic fields.

3.2 Writing in a group

Chapter 2.6 discusses teamwork in an engineering context. This section highlights specific points of attention for writing assignments in groups.

Many engineering programmes provide writing assignments as group projects. Multiple studies indicate that group projects improve student learning and motivation (e.g., Talib & Cheung, 2017). Projects let students combine the strengths and weaknesses of team members and provide internal peer feedback. In addition, group projects prepare students for real-world settings by teaching them to collaborate; an essential skill, as employers value teamwork highly in engineering graduates (Leandro Cruz & Saunders-Smits, 2019). Group writing assignments can also be more practical than individual assignments. Students can write longer, more substantial documents about subjects they could not otherwise familiarize themselves with. Furthermore, group projects can reduce grading time for lecturers.

However, to prevent the situation where some students take the lead while others lag behind, it is important to support the collaborative writing process. Instructors should

give students instructions to plan the writing process. Gimenez and Thondhlana (2012) highlight the importance of writing process planning, both in engineering practice and among students. This includes three aspects: setting expectations on practical matters; deciding on a consistent aim, structure, and writing style of a document; and the assignment and ordering of various writing sub-tasks.

Furthermore, an individual writing component, peer assessment, and reflective practice about writing can help demonstrate that all individuals contributed meaningfully to the group writing assignment. Individual assignments allow students to show their individual writing competency, for example by having them write a separate short piece or by having them provide insight into the individual contributions to the group writing assignment. In peer ratings, students assess other group members' contributions to the final product or their ability to work cooperatively (Oakley et al., 2004). This assessment may influence the final grade. Instructors can also ask students to reflect on their writing progress, to show how they planned their writing, give insight in their writing process, and how they used LLMs to improve their writing products.

3.3 Feedback as support for the writing process

Whilst Part 3 of this handbook discusses various assessment methods in detail, this section highlights points of attention for giving feedback on written assignments. Scholars (e.g., Haswell, 1983) recommend focusing on one or two aspects of writing. Extensive comments on lower-order concerns, such as spelling and grammar, distract from the main goals of writing. Literature on the efficacy of error correction gives mixed results (Mao & Lee, 2020). For example, extensively marking all errors in a text is not only time-consuming, but also ineffective at improving students' writing abilities: they may not fix similar unmarked errors in their texts or may repeat errors in later writing assignments. Lecturers should keep in mind that they are not a reviewer or editor for their students but should guide their students towards becoming independent writers. Instead, instructors should comment on higher-order aspects, such as audience adaptation and organization. For individual students who struggle with writing assignments, writing centres can provide more personalised and extensive support, thus further reducing instructor workload (Ryan & Zimmerelli, 2010).

Instructors should also refrain from providing exclusively negative comments, which can be discouraging for students. Smith (2008) proposes two alternative methods of providing feedback on writing: rubrics and mitigated criticism. Rubrics (chapter 3.2) speed up the grading process compared to commenting on texts and increase reliability when grading multiple texts. In addition, for students they clarify what level they are at and what areas need more work. Mitigated criticism refers to the practice of providing both strong points and points of improvement. Although more time-consuming, this provides a more personal way of evaluating text and softens the blow that negative feedback could potentially have on students. Smith (2008) found that students vastly preferred either of these strategies over feedback that focused exclusively on the negative points. Taylor (2007) found that such strategies are also beneficial in engineering modules.

Peer review (Chapter 3.2) is another effective, time-saving method of feedback. This offers students an extra round of feedback on their work while limiting the workload for instructors. Students learn not only by receiving feedback, but also by giving feedback (Mulder et al., 2014). Instructors should teach students how to give constructive feedback and how to receive and process feedback. A good way to do this is to connect giving peer feedback to professional peer review processes as they are used in academia and industry.

4 Recommendations for implementation and learning

We would like to present six main takeaways for designing and executing writing education in engineering and for assessing writing.

1. Make sure that writing education is embedded in the engineering discipline, enabling students to become acculturated in their discipline as writers and to familiarize themselves with authentic, realistic genres that are important for their future workplace, be it in industry or in academia.
2. Stimulate cooperation between instructors in the engineering disciplines and instructors of communication. Engineering instructors are necessary to bring in knowledge about genres that are important for their specific field, to highlight the importance of writing in engineering, and to assess if students have acquired the necessary knowledge, as reflected in their writing. Communication instructors are necessary to bring in knowledge about general writing principles and pedagogical practices for the teaching of writing. Together, they can develop rubrics to assess student writing that cover both disciplinary content and writing proficiency.
3. Instead of standalone writing modules, develop well-aligned learning trajectories over different years of the curriculum, to make sure that students can practice regularly with new genres in learning tasks of increased complexity, to create confidence in their writing abilities over time.
4. In writing education, use active learning. Avoid lectures about the theory of writing. Give students the opportunity to practice with writing individually and in groups during lectures, and to improve their writing based on self-reflection and constructive peer and instructor feedback.
5. Assess the outcomes of writing education with well-designed rubrics. Refrain from detailed remarks that focus on mistakes only but make use of mitigated criticism that focuses on strong points that should be maintained and weak points that can be improved.
6. Do not ban the use of LLMs in the classroom, as this is hard to enforce and hinders discussion about the pitfalls of LLMs. Instead, redesign modules to take LLM use into account, and educate students on the responsible use of LLMs.

References

Bauer, E., Greiff, S., Graesser, A. C., Scheiter, K., & Sailer, M. (2025). Looking Beyond the Hype: Understanding the Effects of AI on Learning. Educational Psychology Review, 37(2), Article 45. https://doi.org/10.1007/s10648-025-10020-8

Bender, E. M., Gebru, T., McMillan-Major, A., & Shmitchell, S. (2021). On the dangers of stochastic parrots: Can language models be too big? 🦜 . In Proceedings of the 2021 ACM conference on fairness, accountability, and transparency (pp. 610–623). https://doi.org/10.1145/3442188.3445922

Biggs, J., Tang, C., & Kennedy, G. (2022). Teaching for quality learning at university. McGraw-Hill Education.

Bologna Working Group. (2005) A framework for qualifications of the European higher education area. Bologna Working Group Report on Qualifications Frameworks. https://web.archive.org/web/20191222001359/http://ecahe.eu/w/images/7/76/A_Framework_for_Qualifications_for_the_European_Higher_Education_Area.pdf

Cargill, M. & O'Connor, P. (2013). Writing scientific research articles. Strategy and steps. Wiley Blackwell.

Conrad, S. (2017). A comparison of practitioner and student writing in civil engineering. Journal of Engineering Education, 106(2), 191–217. https://doi.org/10.1002/jee.20161

Corbin, T., Dawson, P., & Liu, D. (2025). Talk is cheap: why structural assessment changes are needed for a time of GenAI. Assessment & Evaluation in Higher Education, 50(7), 1–11. https://doi.org/10.1080/02602938.2025.2503964

Council of Europe (n.d.-a). European language portfolio — global scale. https://rm.coe.int/CoERMPublicCommonSearchServices/DisplayDCTMContent?documentId=090000168045bc7b

Council of Europe (n.d.-b). CEFR Descriptors. https://www.coe.int/en/web/common-european-framework-reference-languages/cefr-descriptors

Deng, R., Jiang, M., Yu, X., Lu, Y., & Liu, S. (2025). Does ChatGPT enhance student learning? A systematic review and meta-analysis of experimental studies. Computers & Education, 227, 105224. https://doi.org/10.1016/j.compedu.2024.105224

Donnell, J. A., Aller, B. M., Alley, M., & Kedrowicz, A. A. (2011). Why industry says that engineering graduates have poor communication skills: What the literature says. In 2011 ASEE Annual Conference & Exposition. https://peer.asee.org/18809

Eckstein, G., & Ferris, D. (2018). Comparing L1 and L2 texts and writers in first-year composition. TESOL Quarterly, 52(1), 137–162. https://doi.org/10.1002/tesq.376

Elling, R., Andeweg, B., Swankhuisen, C. de Jong, J., & van der Linden, K. (2012) Report writing for readers with little time. Noordhoff.

Eurostat (2025). Use of artificial intelligence in enterprises. Retrieved 1 July 2026 from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Use_of_artificial_intelligence_in_enterprises

Fan, Y., Tang, L., Le, H., Shen, K., Tan, S., Zhao, Y., Shen, Y., Li, X. & Gašević, D. (2025). Beware of metacognitive laziness: Effects of generative artificial intelligence

on learning motivation, processes, and performance. British Journal of Educational Technology, 56(2), 489–530. https://doi.org/10.1111/bjet.13544

Flower, L., & Hayes, J. R. (1981). A cognitive process theory of writing. College Composition & Communication, 32(4), 365–387. https://doi.org/10.2307/356600

Ford, J. D., Paretti, M., Kotys-Schwartz, D., Howe, S., & Ott, R. (2021). New engineers' transfer of communication activities from school to work. IEEE Transactions on Professional Communication, 64(2), 105–120. https://doi.org/10.1109/TPC.2021.3065854

Gimenez, J., & Thondhlana, J. (2012). Collaborative writing in engineering: Perspectives from research and implications for undergraduate education. European Journal of Engineering Education, 37(5), 471–487. https://doi.org/10.1080/03043797.2012.714356

Gonca, A. (2016). Do L2 writing courses affect the improvement of L1 writing skills via skills transfer from L2 to L1? Educational Research and Reviews, 11(10), 987–997. https://doi.org/10.5897/ERR2016.2743

Gustafsson, M. & Boström, T. (2012). Multi-disciplinary, multilingual engineering education writing development: a writing programme perspective. In C. Thaiss, G. Bräuer, P. Carlino, L. Ganobcsik-Williams, & A. Sinha (Eds). Writing programs worldwide: Profiles of academic writing in many places (pp. 377–388). The WAC Clearinghouse. https://wac.colostate.edu/docs/books/wpww/book.pdf

Haswell, R. H. (1983). Minimal marking. College English, 45(6), 600–604. https://doi.org/10.58680/ce198313616

Hyland, K. (2003). Genre-based pedagogies: A social response to process. Journal of second language writing, 12(1), 17–29. https://doi.org/10.1016/S1060-3743(02)00124-8

Kiefer, K., Palmquist, M., Carbone, N., Cox, M., & Melzer, D. (2000-2021). An introduction to writing across the curriculum. The WAC Clearinghouse. https://wac.colostate.edu/resources/wac/intro

Kim, D., Majdara, A., & Olson, W. (2024). A pilot study inquiring into the impact of ChatGPT on lab report writing in introductory engineering labs. International Journal of Technology in Education, 7(2), 259–289. https://doi.org/10.46328/ijte.691

Kim, J., Yu, S., Lee, S.-S., & Detrick, R. (2025). Students' prompt patterns and its effects in AI-assisted academic writing: focusing on students' level of AI literacy. Journal of Research on Technology in Education, 58(3), 638–655. https://doi.org/10.1080/15391523.2025.2456043

Kirkpatrick, A. T., Danielson, S., & Perry, T. (2012). ASME vision 2030's recommendations for mechanical engineering education. In 2012 ASEE Annual Conference & Exposition (pp. 1–9). https://doi.org/10.18260/1-2--20969

Kosmyna, N., Hauptmann, E., Yuan, Y. T., Situ, J., Liao, X. H., Beresnitzky, A. V., Braunstein, I. & Maes, P. (2025). Your brain on ChatGPT: Accumulation of cognitive

debt when using an AI assistant for essay writing task. arXiv preprint https://arxiv.org/abs/2506.08872

Kruse, O. (2013). Perspectives on academic writing in European higher education: genres, practices and competences. Revista de Docencia Universitaria, 11(1), 37–58. https://doi.org/10.4995/redu.2013.5591

Kuiken, F., & Vedder, I. (2021). The interplay between academic writing abilities of Dutch undergraduate students, a remedial writing programme, and academic achievement. International Journal of Bilingual Education and Bilingualism, 24(10), 1474–1485. https://doi.org/10.1080/13670050.2020.1726280

Lattuca, L. R., Terenzini, P. T., Knight, D. B., & Ro, H. K. (2014). 2020 Vision: Progress in preparing the engineer of the future. https://deepblue.lib.umich.edu/bitstream/handle/2027.42/107462/2020%20Vision%20FINAL.pdf?sequ

Leandro Cruz, M. L., & Saunders-Smits, G. N. (2019). Transversal competency level of engineering graduates dictated by European Industry. In 2019 ASEE Annual Conference and Exposition Proceedings. https://doi.org/10.18260/1-2--33464

Mulder, R. A., Pearce, J. M., & Baik, C. (2014). Peer review in higher education: Student perceptions before and after participation. Active Learning in Higher Education, 15(2), 157–171. https://doi.org/10.1177/1469787414527391

Mao, Z., & Lee, I. (2020). Feedback scope in written corrective feedback: Analysis of empirical research in L2 contexts. Assessing Writing, 45, Article 100469. https://doi.org/10.1016/j.asw.2020.100469

Nguyen, A., Hong, Y., Dang, B., & Huang, X. (2024). Human-AI collaboration patterns in AI-assisted academic writing. Studies in Higher Education, 49(5), 847–864. https://doi.org/10.1080/03075079.2024.2323593

North Carolina State University (2004). LabWrite. https://labwrite.ncsu.edu/

Oakley, B., Felder, R. M., Brent, R., & Elhajj, I. (2004). Turning student groups into effective teams. Journal of Student Centered Learning, 2(1), 9–34. https://www.researchgate.net/publication/242350622_Turning_student_groups_into_effective_teams

Paretti, M. C. (2006). Audience awareness: Leveraging problem-based learning to teach workplace communication practices. IEEE Transactions on Professional Communication, 49(2), 189–198. https://doi.org/10.1109/TPC.2006.875083

Passow, H. J., & Passow, C. H. (2017). What competencies should undergraduate engineering programs emphasize? A systematic review. Journal of engineering education, 106(3), 475–526. https://doi.org/10.1002/jee.20171

Russell, D.R. (2007). Rethinking the articulation between business and technical communication and writing in the disciplines: Useful avenues for teaching and research. Journal of Business and Technical Communication, 21(3), 248–277. https://doi.org/10.1177/1050651907300452

Ryan, L. & Zimmerelli, L. (2010). The Bedford guide for writing tutors (5th ed). Bedford/St. Martin's.

Smith, L. J. (2008). Grading written projects: what approaches do students find most helpful? Journal of Education for Business, 83(6), 325–330. https://doi.org/10.3200/JOEB.83.6.325-330

Silyn-Roberts, H. (2013) Writing for science and engineering. Papers, presentations and reports. Elsevier.

Talib, T., & Cheung, Y. L. (2017). Collaborative writing in classroom instruction: A synthesis of recent research. The English Teacher, 46(2), 43–57. http://meltajournals.com/index.php/TET/article/view/93

Taylor, S. S. (2007). Comments on lab reports by mechanical engineering teaching assistants: Typical practices and effects of using a grading rubric. Journal of Business and Technical Communication, 21(4), 402–424. https://doi.org/10.1177/1050651907304024

van Merriënboer, J. J. G, Kirschner, P. A., & Frèrejean, J. (2025). Ten steps to complex learning. A systematic approach to four-component instructional design. (4th Ed.). Taylor and Francis. https://doi.org/10.4324/9781003322481

van Niekerk, J., Delport, P. M. J., & Sutherland, I. (2025). Addressing the use of generative AI in academic writing. Computers and Education: Artificial Intelligence, 8, Article 100342. https://doi.org/10.1016/j.caeai.2024.100342

Wolfe, J. (2009). How technical communication textbooks fail engineering students. Technical Communication Quarterly, 18(4), 351–375. https://doi.org/10.1080/10572250903149662

AI statement

During the preparation of this work Angeniet Kam made use of Elicit at the beginning of the writing stage, to see which suggestions it gave for literature about writing (instruction) in engineering. Any sources it generated that seemed interesting were then accessed directly and no text that was generated by the AI was used for the chapter itself.

Contributor statement

Conceptualisation	Oscar van Putten, Angeniet Kam
Investigation	Oscar van Putten, Angeniet Kam
Writing – original draft	Oscar van Putten, Angeniet Kam
Writing – reviewing and editing	Oscar van Putten, Angeniet Kam