

CEE Guidelines for Use of Generative Artificial Intelligence

Generative artificial intelligence (AI) has the potential to greatly influence how scholarly work is conducted, including through author, reviewer, and editorial roles. These tools are new and rapidly changing, and our community is only beginning to understand how they can be used. As such, AI provides both opportunities and challenges. Based on our current understanding, we provide the following guidelines for AI use in *Chemical Engineering Education* (CEE). An overarching premise is our respect for manuscripts as each author's intellectual property.

Author Guidelines

Authors considering submission to CEE should be aware that the use of generative artificial intelligence (GAI)—large language models for generating unique text or image-based responses to user prompts—in published research is a rapidly evolving conversation. It is the view of CEE that communication in writing is a human endeavor, that GAI should be employed as a tool rather than a replacement for human researchers, and that the misuse of GAI can have serious ethical ramifications. As a human endeavor, it is expected that human authors are responsible for composing text for their manuscripts. GAI tools cannot be used to plagiarize, misrepresent, or falsify information in CEE submissions, and all authors are responsible for the validity, accuracy, and factuality of all submitted content. To be clear, authors are responsible for all the content of the manuscript that they submit to CEE.

There are at least three ways in which GAI could potentially be used in published research, and authors are asked to reflect on whether and to what extent their potential use of GAI engages with these uses.

1. GAI can be used as a **copyediting tool** to catch grammatical errors and suggest phrasing changes, as a human editor would do, and these tools are indeed embedded into many word processing platforms and software tools.
2. GAI offers the unique ability to **generate written or visual content on behalf of a human writer**, recognizing that the validity, accuracy, or factuality of this writing is not controlled (e.g., the potential to generate AI hallucinations).
3. GAI can potentially be used in the research process itself, such as in **course or curriculum development**, other forms of **data generation**, or in the **analysis process** after the data has been collected. CEE expects all use to be ethical, considering any potential federal requirements and institutional guidelines concerning the use of AI in human subjects research.

In consideration of the values and workflow of CEE, the use of GAI as a copyediting tool by the author prior to submission is permitted. Indeed, after a manuscript is accepted into CEE, it goes through both content editing steps and copyediting steps, both of which may often result in suggested edits.

As it relates to an author submitting a manuscript that contains content (either written, visual, or both) via GAI, it would be expected that such use is minimal and serves as an aid to framing a paragraph or subsection of something the author has already prepared, for example, rather than a large section (or sections) of a manuscript. In this way, GAI serves to help refine or organize sentences/paragraphs/ideas for the benefit of both the author and the reader.

Finally, the use of GAI in the research process should be explicitly communicated, used as a source that leverages the unique capabilities of GAI, and not used to falsify or misrepresent data sources. Likewise, GAI for data analysis may be a valuable tool for the author to use as one part of their overall analysis but should not replace the expertise of the author in drawing conclusions from data.

To make it clear how GAI was used in a submission, authors must disclose whether and to what extent AI tools were used in performing or communicating the work represented in their submission. This declaration is to appear in a separate section, titled "Statement on Artificial Intelligence" at the end of the manuscript. Copyediting uses (e.g., Grammarly, built-in grammar editors in Word) need not be disclosed. Disclosed uses could include data generation, data analysis, manuscript development, or substantive manuscript revision. This section should attend to the facets above, at a minimum, and any others the authors identify given that the use of AI is continually evolving. It is expected, if not very lengthy, that the prompts given to the GAI program are provided as well in this section. Authors using AI tools in their research must also describe this process in the Methods section of the paper, as applicable. (Note: authors are responsible for the entire content of their submission, including any errors of fact, potential violations of publication ethics, or copyright laws from using AI.) Should an author not use GAI in their manuscript (beyond simple copyediting, as described above), they should include the following sentence in the Statement on Artificial Intelligence section: "*We have not used generative artificial intelligence in this manuscript beyond simple copyediting.*"

Finally, when submitting the manuscript, authors will acknowledge the following (which will be built into the Submission process): "By submitting this manuscript, I confirm that I have adhered to appropriate ethical guidelines or approvals for the human subjects research conducted in this study, including taking into consideration any federal requirements and institutional guidelines concerning the use of AI in human subjects research."

Reviewer Guidelines (message will be sent to reviewers when they accept the review)

Consistent with CEE's Principles and Ethical Guidelines document, reviewers should not upload authors' manuscripts into any AI tools to conduct reviews since manuscripts are the authors' intellectual property and the review process is a confidential process. However, after drafting a review of the manuscript, a reviewer *may* choose to use AI tools to help smooth or revise their comments to the author (e.g., the clarity/conciseness of their wording). Regardless, any reviewer who chooses to use GAI tools in this way is ultimately responsible for the accuracy of the content and tone of the writing.