

A framework for discussing AI-assisted academic research and writing

Contents

A framework for discussing AI-assisted academic research and writing.....	1
Introduction.....	2
The human-AI writing continuum.....	13
Use examples.....	14
Stage 1: Developing research questions	14
Stage 2: Initial conceptual understanding.....	14
Stage 3: Research and note-taking	16
Stage 4: Organising ideas and outlining	19
Stage 5: Writing	22
Stage 6: Editing and revision	25

Introduction

Student: “Can I use ChatGPT to help me with my assignments?” Academic: “It depends on what you want to use it for, and whether you appropriately acknowledge any such use.”

Since generative AI tools can be (and are) used by writers to do more than simply provide answers to questions and write content in response to a prompt, it will be useful for academics to have a framework for discussing such uses with students and which uses may or may not be allowed for a given assignment, and how any such uses are to be acknowledged. A possible framework for meeting this need is provided below, followed by actual use examples.

To decide what uses may or may not be acceptable, [Matt Miller \(Dec. 17, 2022\)](#) has developed the following questions to consider when making pedagogical decisions:

- a. Which of the levels would you consider cheating?
- b. Which levels are relevant to our students’ future?
- c. Which levels would you use in your work as a professional?

While these questions are a good starting point, care is probably needed with regards to questions (b) and (c). Such care may be required because novice-expert studies show that novices need to progress through a series of stages to become experts (e.g. [Persky & Robinson, 2017](#)), and the same may also be true in regards to the use of generative AIs to support research and writing (cf. the fact that while computer algebra systems (CAS) have been able to solve calculus problems for 30 or 40 years, maths students still have to learn how to do calculus questions by hand, *for several very good reasons* (e.g. [Buchberger, 1990](#)), though CAS packages are used for more challenging project work.) Thus, careful thought and research will be needed to determine what uses of generative AI at what level of experience and expertise support rather than undermine students’ intellectual growth and growth in competence in their discipline. As [Geher](#) (January 26, 2023) recalls one of his graduate school advisors saying, “one’s ability to write and one’s ability to think are, at the end of the day, largely one-and-the-same.”

In the following table, in all cases, students could potentially adopt, adapt, or use as a foundation for their own thinking and writing, the output from an AI.

The acknowledgement column of the following table has been heavily influenced by [University College London’s resources](#) and the [UQ Library guide](#). See also the discussions in [The Future of Writing in a World of Artificial Intelligence #ChatGPT](#) by John Spencer (Feb. 20, 2023), [My class required AI. Here’s what I’ve learned so far.](#) (Mollick, Feb. 17, 2023), and the APA Style Blog, [How to cite ChatGPT](#) (Timothy McAdoo, Apr. 7, 2023).

Research-Writing Stages

Comments

Acceptable (✓) / Sample acknowledgement text
Unacceptable
(✗) Use

1. Developing a research question

(a) AI is used to suggest questions directly which can form components of the assignment or the main focus of the assignment.

See [Example 1](#) and [Fostering AI literacy: A teaching practice reflection](#) for an example of a process for refining potential PhD level research questions.
Being able to ask good questions is a valuable skill for both researching and writing. If students use such AI-generated questions to develop their own skills in question generation, and keep their eyes out for other important questions as they start their research, then such support could be pedagogically useful. If however students simply use AI to do their thinking for them, or fall into the trap of “confirmation bias” when researching AI-generated questions, then such use could be pedagogically harmful. Exercises where students have to add to or refine AI-generated questions on a topic may help address the potential pitfalls.

Following the [UCL guide](#):

“Description of AI use

ChatGPT was used to generate some possible questions for this assignment. The final question addressed is based on option 3, with adaptations being made as a result of what I learned from personal research on the topic. No other use of a generative AI was used in the production of this assignment.

Reference:

OpenAI, ChatGPT, 15 Feb 2023,
<https://chat.openai.com/APA>

Prompt: Suggest some possible research questions in relation to ...

AI Response:

...”

Similar to 1(a).

(b) A series of prompts are used to hone in on a possible research question.

Example: [Using generative AI to develop your research questions](#)

2. Initial conceptual understanding

(a) AI asked to explain the meaning of terms in the task description / marking rubric.

See [Example 2](#).

Although this use would not seem to require acknowledgement, asking students to include one may be useful to identify possible causes for groups of students heading in unexpected directions, and more generally, ways assignment tasks can be more clearly explained.

“ChatGPT was used to explain certain task requirements such as what constitutes a ‘critical analysis’.”

(b) AI asked to explain expectations around the assignment task.

See [Example 3](#).

There is a risk here that the AI will not (be asked to) take into account course requirements / aims and objectives and so may give misleading advice. Students may need to be warned about risks of asking for clarification from an AI rather than the lecturer or a course tutor.

“ChatGPT was used to explain certain task requirements such as what it means to ‘use a particular theoretical lens for analysis’.”

(c) AI asked for background on key aspects of the topic.

Since large language models (LLMs) are known to make factual errors and make things up (“hallucinate”), all background found in this way should be “fact checked” using authoritative / peer-reviewed sources before being used in an assignment. And once “fact checked”, the sources for the fact checking should be cited rather than the generative AI. However, use of the AI may still need to be acknowledged.

If information obtained from a LLM *is* used in an assignment, it should be referenced like a secondary source and personal communication. The reason for citing it as a “personal communication” is that generative AIs will (or may) give different answers to the same question on different days, both because randomness is built into how they work to achieve human-like speech and because they can “learn”.

However, students should also be encouraged to consult their lecture notes and textbook!

How to **cite** content obtained from a generative AI: <https://guides.library.uq.edu.au/referencing/chatgpt-and-generative-ai-tools>.

[How to acknowledge use of a generative AI](#) in the assignment process as recommended by University College London (UCL). This guide recommends three components:

1. Acknowledge use
2. Describe use
3. Reference use

Such an acknowledgement could be included at the end of an assignment (and not included in the word count), or incorporated into the “statement of academic integrity” included at the beginning of an assignment. Universities such as ECU have already moved to do the latter, with the statement having a check box (AI was / was not used ...) and a text box

(Description of how AI was used ...) (Miriam Sullivan, personal communication, 16/3/23).

3. Research and note-taking

(a) Finding sources

An AI is used to help students get started with a literature review.

- While ChatGPT 3.5 is unable to reliably produce sources (it “hallucinates”), in some cases asking it to “provide a list of some of the leading scholars in the field of Z” can provide a useful starting point for more traditional searches.
- Other AI tools do claim to be able to provide researchers with good quality literature review references (e.g. [Elicit](#)). However, since the algorithm used to produce such references is unknown, it is thus also unknown whether there is some possible bias in the references found, but the same issue is also present with Google Scholar.

(b) Understanding sources

Students use AI to help overcome the challenges of understanding text not written for students / non-experts.

- One approach is to copy and paste difficult to understand text into ChatGPT’s text box and ask it to, “Explain the following text more simply / at the level of a 12 year old.” (See [Example 5](#).)
- This approach is also possible using the new, AI-powered Bing. See [AI in Your Web Browser is a GAME CHANGER | Microsoft Edge and AI Feature in Edge - A Productivity Booster to Try Now! for how it works](#).
- Apart from ChatGPT itself, other AI tools to help students and researchers understand difficult content in research papers are also appearing. For example, with the [SciSpace tool](#)¹ marketed as “Your AI Copilot”, one can highlight terms / formulas / text in research papers and ask the AI for simpler explanations. Two short instructional videos showing how, and how well, the tool works, have been posted by [Sparks](#) (Jan. 2023) and [Walker](#) (Jan. 2023). See also: <https://www.explainpaper.com/>

Acknowledgement:

I acknowledge the use of Elicit (<https://elicit.org/faq>) to find and understand references for this assignment.

Description of use of AI:

...

If parts of such explanations are used in an assignment, they need to be paraphrased or quoted in the usual way and [cited as a “personal communication”](#):

“This concept can be understood as meaning ‘...’ (Bing Chat, personal communication, April 2, 2023).”

OR, following the advice in the [APA Style blog](#):

“In relation to the question of X, Bing Chat’s (Microsoft & OpenAI, 2023) interpretation of <references> is that ... <Next comes your discussion of the implications in relation to the wider assignment goals>.” [Here, <references> are citations of the references Bing Chat cites.]

Associated reference list entry:

¹ The free version seems fairly limited in its capabilities though.

Microsoft & OpenAI. (2023). *Bing Chat* (March 14 version) [Internet search engine and large language model]. <https://www.microsoft.com/en-us/edge/features/bing-chat?form=MT00D8>

(c) Taking notes from sources: Note that such capabilities are built into the AI-powered Bing's an AI is asked to paraphrase or "Insights" function. summarise text.

While ChatGPT's capacity to paraphrase and summarise text could be useful in instructional sessions teaching students these note-taking strategies, there are risks that if students use the techniques in their assignment writing that they will not actually learn the material as well, and may be tempted to simply patch such paraphrases together rather than synthesise them.

Anyone uploading materials to Generative AI (e.g. [ChatPDF](#)) tools should be aware of the copyright restrictions on the materials they upload, and note the licensing of academic journals may restrict this use.

Summarising without first understanding also runs the risk of important limitations or nuances being missed (i.e. students getting an AI to summarise some text for them should be able to critically evaluate that summary).

(d) Getting answers to questions.

Students use AI as a research source.

While it might be a useful productivity hack for experts to ask a generative AI to produce a set of notes on a topic, it is highly problematic for students to do so. This difference arises because LLMs can make factual errors and make things up (“hallucinate”). While experts can “fact check” much AI-generated content using their personal knowledge base, students cannot, and may not, even if warned that they need to do so. One approach to addressing this issue is to treat generative AI content the way Wikipedia content currently is, that is, it is okay for getting started, but not okay to use in the final assignment as it cannot be considered as being “authoritative”.

However, even for getting started, using gen-AI may be problematic in that it may introduce easy to understand misconceptions which “stick better” in students’ minds.

Only acceptable for obtaining some general background not actually used in the assignment?

Asking students to nevertheless acknowledge such use may help lecturers identify common weaknesses in students’ background knowledge that it would be pedagogically useful to address in class.

“To help me get started with this assignment, X was used to provide an overview of ... This overview was used to guide my research and helped me to understand better some of the references I found, but no elements of this overview were used in my final assignment. All elements in my assignments which overlap with this overview come from the peer-reviewed sources I have cited.”

4. Organizing ideas and outlining¹

(a) An AI is asked to identify key themes from a set of notes which the student then uses to develop a framework for their assignment.

See [Example 8](#).

X was used to identify themes in the notes I had taken from the sources I had found. I then grouped and organised these themes into a logical order myself, and used or adapted some of the phrasing of the themes in my topic sentences.

Question: If a student quotes verbatim, the textual description of a theme as provided by X, are they required to acknowledge that with the use of quotation marks and an in-text citation? What if the theme is X just parroting back from the notes provided by the student?

(b) An AI is asked to suggest a possible outline for a piece of writing which the student adopts and/or adapts.

See [Example 7](#).

More students may be willing to do some serious planning if the initial hard work is done by an AI. Of course, the quality of the plan will depend on how well they define the task. The risk is that weak students may just accept an AI-generated plan rather than using it as a basis of higher-order thinking by themselves. Some approaches to addressing this risk could be to recommend students generate

X was used to provide an initial high-level outline for this assignment. The prompt used was, “...”, which produced the following output:

...

While much of this outline was used to structure my final assignment, several changes were made. These changes included adding paragraphs on A and B

multiple contrasting outlines or *require* students to explain how they refined any outline provided by an AI and allocating marks to the level of thinking exhibited by the revisions.

Beware confirmation bias if you don't ask for outline in terms of questions.

which my research revealed were additional issues, and some of the focus questions were altered to better meet the assignment requirements.

5. Writing

(a) Student provides structured and cited notes to an AI and asks for the notes to be converted into properly cited paragraphs which the students adopts and/or adapts. See [Example 9](#).

- (b) An AI is asked to transform or condense student-written content. [See also 6(e).]
- Examples include suggesting possible:
 - (i) titles for some writing or from an abstract
 - (ii) abstracts given notes from the article
 - (iii) social media content such as tweets from an abstract, or science communication text (“Explain to a 12 year old ...”)
 - Another possibility is to ask an AI to [“summarise” the text on an excessively wordy PowerPoint slide into “\(three\) bullet points”](#) (Stratvert, Feb. 2, 2023).
 - An AI could also be asked to [create an overview from the transcript of a Vlog post](#).

(c) Student has a “conversation” with an AI about a topic, refining their question prompts based on their assessment of the AI's responses, then identifies the best responses and compiles and edits these as needed. Any necessary fact-checking is

See a description of such an assignment and a discussion of how different sorts of prompt sequences led to results of considerable variation in quality: [“My class required AI. Here's what I've learned so far.”](#) (Mollick, Feb. 17, 2023).

“<Vlog overview> (Overview generated by ChatGPT based on transcript, 2/4/23.)” ([Source](#))

See the post by Mollick opposite for how he required students to document their use of ChatGPT. This is a case where documentation of the methods used would be necessary.

completed by the student using “traditional” methods.

(d) Student adopts without change, a piece of writing generated by an AI in response to a prompt.

While one’s initial reaction might be that such use would never be acceptable, here are a few cases where it might be:

- See level 5(b) examples.
- In order to develop students’ critical thinking skills, and raise their awareness of the limitations of gen-AI, students may be asked to “critically evaluate the response they get to a prompt put to an AI.” Evidently, the response they get has to be quoted.
- Occasionally I see students doing courses such as organisational behaviour and education where they have to discuss a case from their professional experience, but the students do not have any relevant professional experience to draw on. In such cases, students have to either make something up or find a case from the literature they can use. Now, another alternative might be to get an AI to invent a suitable case to analyse.

Acknowledgement:

“As I have no professional experience as a ... to draw on for this assignment, ChatGPT was asked to generate a fictional case in relation to the assignment requirements. The prompt used was ... The output was used largely unchanged / a condensed version of this output has been included in section 2 of this report.”

In-text citation:

“2. Case description

(This case was created by ChatGPT, personal communication, April 9, 2023).

...”

6. Editing and revision

(a) Spell and grammar checks in a word processor or using AI.

None required?

AI was only used to correct spelling, grammatical, and punctuation errors. The prompt used with X was:

...

(b) “Low level” refinement of writing using tools such as Grammarly, though generative AI can also be used for this task.

(c) AI is asked for feedback regarding overall structure.

I.e. AI is asked to generate a “reverse outline” and asked for feedback. See [Example 14](#).

(d) Higher level refinement of a student-written draft: e.g. reorder ideas for better flow; add suitable topic sentences; checks against criteria; rewrite more succinctly so as to reduce the length by 250 words without losing any of the key ideas, ...

There is a risk with this approach that while the AI produced texts does read better, the revised text may in fact misrepresent or misinterpret the original intent in subtle ways (see [Example 11](#). Feedback can be both helpful and problematic in ways indicated in the example.

Prompt to ChatGPT: **You are an experienced, university level writing tutor. Please provide feedback on the following paragraph from an organisational behaviour essay exploring the ways managers can positively influence employee motivation and performance.**

"Regarding pay incentives and work performance, Miller and Estes (1961) have found that nine year old boys who were offered a monetary incentive performed significantly worse on a pattern matching exercise than boys who were not. In addition, Glucksberg (1962) found that undergraduates offered a monetary incentive took 50% longer on average to solve a creative problem-solving exercise than did undergraduates who were not offered an incentive; and Deci (1971) found that students who were not paid any money for writing headlines for their school newspaper continued to improve after instruction while those who were paid did not."

Response: Overall, the paragraph provides evidence from several studies that challenge the notion that pay incentives are always positively correlated with work performance. However, there are some issues with the paragraph that could be addressed to improve its clarity and coherence.

1. Use proper citation format: The citations for the studies mentioned in the paragraph should be formatted according to the appropriate citation style (e.g., APA, MLA, etc.) to ensure proper academic referencing.
2. Provide context for the studies: The paragraph mentions three studies, but it does not provide any context or background information about these studies,

X was used to revise paragraphs 3 and 5 to improve readability. An example prompt with output is as follows: ...

The revised text was carefully checked to ensure it was still factually correct and accurately conveyed the intended meaning, with any issues manually addressed by myself. An example of a correction made is as follows.

AI suggestion: ...

Revised text: ...

such as the sample size, methodology, and relevance to the topic of employee motivation and performance. Including this information would provide a better understanding of the studies and their implications.

3. Use clear language: Some of the language used in the paragraph, such as "performed significantly worse," "50% longer on average," and "continued to improve after instruction," could be further clarified. It would be helpful to provide specific details on how the performance was measured, what the results indicate, and what the implications are for the topic being discussed.

4. Connect the studies to the main argument: The paragraph mentions studies that challenge the notion that pay incentives always lead to improved performance, but it does not explicitly connect these studies to the main argument of the essay, which is about ways managers can positively influence employee motivation and performance. It would be beneficial to clearly articulate how these studies are relevant to the topic and how they support the main argument of the essay.

Here's a revised version of the paragraph that addresses these issues:

"Several studies have challenged the notion that pay incentives always lead to improved work performance. For example, Miller and Estes (1961) found that nine-year-old boys who were offered a monetary incentive performed significantly worse on a pattern matching exercise compared to boys who were not offered an incentive. Similarly, Glucksberg (1962) observed that undergraduates offered a monetary incentive took 50% longer on average to solve a creative problem-solving exercise compared to those who were not offered an incentive. Furthermore, Deci (1971) found that students who were not paid any money for writing headlines for their school newspaper continued to improve after

instruction, while those who were paid did not. However, it is important to note that these studies may have limitations in terms of sample size, methodology, and generalizability to the workplace context. Nevertheless, these findings suggest that the relationship between pay incentives and work performance may not always be straightforward, and managers should carefully consider other factors that may influence employee motivation and performance."

Comment: If such use is considered to be acceptable, students need to be made aware that the feedback so provided will not always be correct or useful, and so should only be taken as "things to think about / check". This is fine for experts, but research may be needed to determine if problematic feedback undermines the confidence of weak students.

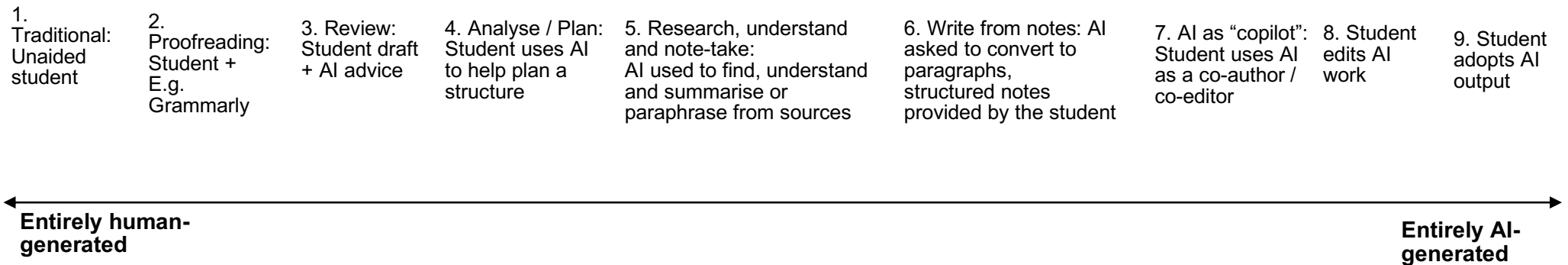
Example 12). Students therefore need to be made aware of the need to carefully check any text produced in this way and perhaps should also be asked to acknowledge that they have done so.

- Regarding oral presentations, one can also:
 - Ask for [suggestions for "better" slide designs](#).
 - Get [basic feedback on your presentation skills](#).
- Students commonly have problems keeping their assignments under the word limit. Especially when they are way over the word limit, gen AI could help condense student content while still keeping the key elements in a very time efficient way. Any such output would need to be checked for loss of key points or changes of meaning.
- Such use may undermine students' capacities to be able to succinctly address topics.

(e) AI is asked to reduce student-written content to meet a word limit requirement.

The human-AI writing continuum

It may also be helpful to view the uses outlined above as lying on a continuum from entirely human-generated content to entirely AI generated content as follows.²



² Adaptation of an approach Penny Wheeler took to summarise and present my thoughts on the continuum which I had previously laid out in a table with discussion.

Use examples

Stage 1: Developing research questions

Example 1. An approach to getting help brainstorming possible sub-questions for a topic.

Prompt to ChatGPT: **Generate ten research questions in relation to the claim that, “Graduate students bear as much responsibility as their mentors for ensuring they are well-guided through their degrees.”**

Response:

1. How do graduate students and their mentors perceive their respective roles and responsibilities in the mentorship relationship?
2. What strategies do successful mentor-mentee pairs use to ensure that the mentee is well-guided through their degree program?
3. How do graduate students’ expectations of their mentors’ guidance compare with the actual level of guidance they receive?
4. In what ways do graduate students’ needs for guidance change as they progress through their degree program?
5. How do cultural and personal differences between graduate students and their mentors impact the mentorship relationship and the mentee’s sense of being well-guided?
6. To what extent do graduate students rely on their mentors for guidance, and how do they seek guidance from other sources when needed?
7. How do mentor-mentee pairs navigate conflicts or misunderstandings that arise in the mentorship relationship?
8. In what ways do graduate students’ research interests and career goals influence their need for guidance from their mentors?
9. How do mentor-mentee pairs adapt their mentorship relationship as the mentee transitions from coursework to independent research?
10. What are the long-term effects of having a well-guided mentorship experience on graduate students’ academic and professional development?

See also [Fostering AI literacy: A teaching practice reflection](#) for an example of a process for refining potential PhD level research questions.

Stage 2: Initial conceptual understanding

Example 2. Understanding terms in marking rubrics.

Prompt to ChatGPT: **When lecturers say that the best assignments will provide “insight” on the topic, what do the mean by that?**

Response: When lecturers talk about assignments providing “insight” on a topic, they typically mean that the assignment should demonstrate a deep understanding of the subject matter. “Insight” implies a fresh, creative, or original perspective on the topic, rather than simply restating what has already been learned. The assignment should show that the student has a thorough grasp of the key concepts, theories, or arguments related to the topic and is able to apply that knowledge in a meaningful way.

For example, an assignment that provides insight might include an original argument or analysis of a current issue, a new solution to a problem, or a creative application of a theoretical concept. The goal of such an assignment is to encourage students to go beyond rote learning and to demonstrate that they have truly internalized and can apply their knowledge in a meaningful way.

In short, when a lecturer says that the best assignments will provide insight, they are looking for evidence of critical thinking, creativity, and depth of understanding.

Prompt to ChatGPT: **What do academics mean when they say your essay should have a strong argument?**

Response: In academia, a strong argument is a well-supported and well-structured claim that effectively presents the writer's perspective on a particular topic. This means that the argument is clear and concise, and is backed up by evidence and examples that support the writer's position. A strong argument is also logical and coherent, and is presented in a way that is easy for the reader to follow and understand. In short, a strong argument is a compelling and persuasive case that effectively presents the writer's point of view on a given topic.

Example 3. Understanding assignment requirements.

Prompt to ChatGPT: **What does it mean to analyse some aspect of politics, such as a particular government policy or the causes of some political event, using a particular "theoretical lens"? Please give a concrete example of how something could be analysed using two different theoretical lenses.**

Response: To analyze some aspect of politics using a particular theoretical lens means to examine it from the perspective of a particular theoretical framework or set of assumptions about how politics works. The choice of theoretical lens will shape the way in which one approaches the topic and the kinds of questions that are asked.

For example, let's consider the issue of income inequality in the United States. One could analyze this issue using two different theoretical lenses, such as Marxism and liberal democracy.

From a Marxist perspective, income inequality is seen as a natural outcome of the capitalist economic system, in which a small class of capitalists own and control the means of production, while the majority of workers are exploited and paid wages that are lower than the value of their labor. In this framework, the government policy solutions to address income inequality would be to redistribute wealth and resources from the rich to the poor, and to fundamentally change the structure of the economy to create a more equal distribution of power and resources.

On the other hand, **a liberal democratic perspective** might view income inequality as a problem of unequal access to opportunity and resources, which can be addressed through policies such as progressive taxation, social safety nets, and education and training programs to help people increase their earning potential. In this framework, the government's role is to ensure equal

opportunity for all, while preserving the basic tenets of a market-based economy.

As you can see, the choice of theoretical lens can have a significant impact on how we understand and approach political issues, and can lead to different policy prescriptions and outcomes.

Example 4. Provision of overviews of background ideas.

Prompt to ChatGPT: **What are some of the key concepts in the theory of feminist institutionalism?**

Response: Feminist institutionalism is a theoretical framework that seeks to understand how gender norms and power dynamics shape political institutions and policies. Some key concepts in feminist institutionalism include:

1. **Gendered rules:** Feminist institutionalism argues that political institutions are not gender-neutral, but rather are shaped by gender norms and biases. Institutions may have formal rules or informal practices that advantage or disadvantage women and men in different ways.
2. **Intersectionality:** Feminist institutionalism emphasizes the intersectionality of gender with other social identities, such as race, class, sexuality, and ability. These intersecting identities create complex and varied experiences of institutional discrimination and exclusion.
3. **Power and agency:** Feminist institutionalism recognizes that women are not passive victims of gender discrimination, but rather have agency and power to resist, negotiate, and reshape institutional norms and practices. Feminist institutionalists therefore focus on how women's agency can be mobilized to challenge gender biases in institutions.
4. **Policy outcomes:** Feminist institutionalism also examines how gender biases in institutions shape policy outcomes. Institutions may produce policies that perpetuate gender inequalities, or may create policies that promote gender equity and empowerment.

Overall, feminist institutionalism provides a critical lens for analyzing political institutions and policies through a gendered and intersectional perspective, and offers insights into how institutional change can promote gender equity and justice.

Stage 3: Research and note-taking

Example 5. Help with understanding difficult texts.

This is also possible to do with [Bing Chat and ChatPDF](#).

Prompt to ChatGPT: **Explain the following paragraph in simpler terms:**

“Intertextuality is another feature of postmodern aesthetics which seems to illustrate the erosion of 'originality' as a literary value. A novel like William Kennedy's *Legs* invokes both *The Great Gatsby* and *Gargantua* in its construction of the personality of the historical character Jack 'Legs' Diamond. Narrative perspective becomes dispersed and self-consciously unreliable, as in

D M Thomas's *The White Hotel*. ... Perhaps the greatest 'liberating' feature of postmodern writing, however, has been the mixing of writings and intertextual referencing: the multivocal, heterogeneous and heteroglossic nature of postmodern writing has broadened the scope of contemporary fiction."

Response: Intertextuality is a concept in postmodern literature that involves referencing other texts or works in a new piece of writing. It can involve characters, themes, or other elements from other works being incorporated into the new piece. This can lead to a sense that originality is not as important as it once was. An example of this is a novel that includes references to other works, such as "The Great Gatsby" and "Gargantua," as a way to add depth to a character. Postmodern writing also often includes a mix of different writing styles and references to multiple texts, which can make the writing more diverse and inclusive.

Comment: The final claim that it makes the writing "more diverse and inclusive" seems to go beyond what the original text claimed. Is this a valid extrapolation, and what does it even mean for such writing to be "more inclusive"?

Comment: The above response didn't address the "[n]arrative perspective becomes dispersed and self-consciously unreliable" part of the original text, so I queried further.

Prompt to ChatGPT: *Can you explain to me what the following means?* "Narrative perspective becomes dispersed and self-consciously unreliable, as in D M Thomas's *The White Hotel*."

Response: The phrase "narrative perspective becomes dispersed and self-consciously unreliable" refers to a literary technique in which the point of view or perspective from which the story is told becomes fragmented or multiple, and the reader is aware that the information being presented may not be trustworthy. An example of this technique can be seen in the novel "The White Hotel" by D.M. Thomas.

Comment: As the above response still did not seem particularly clear, I queried further. Note how ChatGPT can "understand" that queries are a continuation of previous prompts in the conversation.

Prompt to ChatGPT: *Could you explain that again, but at the level of a 12 year old?*

Response: Sure! When a book or story has a "dispersed and self-consciously unreliable" narrative perspective, it means that the way the story is told is broken up and not always trustworthy. The author wants the reader to know that they can't always believe what they are reading. This is like when a story is told by different people, and each person has their own version of the events, but none of them are completely true. An example of this is the book "The White Hotel" by D.M. Thomas.

Example 6. AI can help students learn how to paraphrase.

Prompt to ChatGPT: *Can you paraphrase the following text?* "Without the background skills, however, learning to read is fraught with difficulties and dangers. For example, one of the prerequisites is to be able to hear language accurately enough to distinguish between similar sounds, such as 'bad' and 'dad' or 'pop' and 'pot'.

Four-year-olds who are not good at these distinctions invariably turn into eight-year-olds who have serious difficulty with reading.”

Response: To be able to read well, it's important to have certain skills, such as being able to accurately hear and distinguish between similar sounds. If a child isn't good at this at four years old, they will likely struggle with reading when they're older.

Stage 4: Organising ideas and outlining

Example 7. Suggesting an outline.

Prompt to ChatGPT: Write an outline for an essay which addresses the claim that, "Graduate students bear as much responsibility as their mentors for ensuring they are well-guided through their degrees."

Response:

- I. Introduction
 - A. Definition of the role of graduate students and mentors in the academic process
 - B. Thesis statement: Graduate students and mentors both play a significant role in guiding and supporting the student's journey towards a successful completion of their degree.
- II. Background on the role of mentors in graduate education
 - A. Definition of a mentor
 - B. Responsibilities of a mentor towards graduate students
 - C. Importance of mentor-mentee relationships in graduate education
- III. Graduate students' responsibilities in their education
 - A. Taking initiative to seek guidance and support
 - B. Staying proactive and engaged in their academic and research work
 - C. Seeking feedback and advice from mentors and peers
 - D. Making informed decisions about their education and career goals
- IV. Joint responsibility of graduate students and mentors
 - A. Communication and collaboration between students and mentors
 - B. Shared goal of academic success and personal growth
 - C. Importance of mutual respect, trust, and open dialogue
- V. Challenges and solutions in balancing the responsibilities of graduate students and mentors
 - A. Time constraints and competing priorities
 - B. Miscommunication and misunderstandings
 - C. Addressing conflicts and disagreements
 - D. Strategies for maintaining a productive and supportive mentor-mentee relationship
- VI. Conclusion
 - A. Recap of the responsibilities of graduate students and mentors
 - B. Emphasis on the importance of a collaborative and supportive relationship
 - C. Final thoughts and call to action for both graduate students and mentors to prioritize their shared responsibility in ensuring a successful academic journey.

Comments: Risk of confirmation bias: only evidence which supports the AI's "views" on the points to be made is sought.

To address this potential issue, and consistent with my personal philosophy about how to develop effective plans, I recommend using the following alternative phrasing for the prompt.

Prompt to ChatGPT: Write an outline for an essay which addresses the claim that, "Graduate students bear as much responsibility as their mentors for ensuring they are well-guided through their degrees." Frame the outline in terms of questions to be addressed.

Response (partial): ...
 II. Background on the role of mentors in graduate education
 A. What is a mentor and what are their responsibilities towards graduate students?
 B. How important are mentor-mentee relationships in graduate education?
 C. What impact can a mentor have on a graduate student's academic journey?
 III. Graduate students' responsibilities in their education
 A. What actions can graduate students take to seek guidance and support?
 B. How can graduate students stay proactive and engaged in their academic and research work?
 C. What role do feedback and advice from mentors and peers play in a graduate student's education?
 ...

Further comments on generating outlines:

In many cases, to get the best results from ChatGPT, a more detailed prompt with the following elements is required.

Tell ChatGPT what persona it is You are an expert in molecular biology ...
to take on:

Indicate the genre of the piece of writing: ... writing a scientific review article for publication in an international research journal ...

Precisely specify the topic of the review: ... on the following topic: "The role of zinc toxicity as an antimicrobial response deployed by the innate immune system during infection: a possible source of novel therapeutics against infection to counter growing antimicrobial resistance."

And the expected key goals of the review: The goal of the article is to motivate the review, review what is known about the topic, and identify directions for potentially fruitful new research directions.

State what you want it to do: Suggest a possible outline for this review, framing the outline in terms of questions to address.

Example 8. Identifying key themes in notes.

Prompt to ChatGPT: Consider the notes below in relation to a university-level business management assignment on whether diversity is a help or hindrance to group performance. Please identify the main themes that come out of these notes that the assignment should address.

- Mu & Gnyawali (2003)
 - Studied multimajor student groups
 - Such groups important because organizations expect graduates to be good team players and capable of working effectively in cross-functional teams.
 - Cognitive diversity can be beneficial
 - b/c reduces premature agreement and groupthink (Janis, 1982)

- thought to help the development of higher levels of skills and knowledge
- Cognitive diversity can be a problem:
 - b/c cognitive differences can be hard to understand and coordinate (Colbeck et al., 2000)
 - b/c students may find it hard to accept other views of reality can have equal validity (Gallos, 1989)
 - E.g. marketing students may prefer to focus on issues around customer likes and dislikes, while production engineers may prefer to focus on manufacturing efficiencies.
 - Tight time frames can also be a problem to coordinate many ideas. Students may prefer to come to a quick consensus rather than synthesise different views.
- Found teams with higher levels of “team psychological safety” (TPS) tended to develop higher levels of synergistic knowledge.
 - TPS = group members believe group environment a safe one for bringing in diverse viewpoints.
 - BUT, Sethi et al. (2002) found that too much social cohesion can be a problem
 - b/c candid debate needed for innovation, but highly cohesive groups suppress this in order to maintain relationships.
- Sethi et al. (2002)
 - Studied product development teams
 - Claimed managers believe that cross-functional diversity “provides the variety of perspectives and ideas essential to creative thinking.”
 - But they found that wasn’t necessarily the case.
 - Found too many ideas causes information overload which makes it hard for teams to solve problems and come to decisions.
 - Found management encouragement for teams to be “venturesome” produced the most innovative results.
- Harrison et al. (2002)
 - Claimed that “Managing diverse workgroups is one of the most difficult and pressing challenges in modern organisations.”
 - Found maximising differences in knowledge, skills and abilities important for creating effective teams.
 - BUT Sethi et al. (2002) found problems (see below).
 - Reported that both deep and surface level diversity can negatively impact team performance
 - b/c they can negatively impact team social cohesion (TSC) by evoking stereotypes, prejudices and biases (Fiske & Neuberg, 1990) and TSC was found to be important for team success
 - “Surface” = differences in age, sex and ethnicity
 - “Deep” = differences “values, attitudes, beliefs and personalities”
 - Found after sufficient collaboration, surface level differences become less crucial than personality difference and conflicts over organisational goals.
 - Found team social cohesion (TSC) important for success

- BUT note Sethi et al. issue above.

Response: The main themes that the assignment on whether diversity is a help or hindrance to group performance should address are as follows:

1. The importance of cross-functional teams in organizations and the need for graduates to be good team players.
2. Cognitive diversity can be beneficial as it reduces premature agreement and groupthink, which can help develop higher levels of skills and knowledge. However, cognitive diversity can also be problematic, as cognitive differences can be hard to understand and coordinate, and students may find it hard to accept other views of reality as having equal validity.
3. The role of team psychological safety (TPS) in the development of higher levels of synergistic knowledge. TPS refers to group members believing that the group environment is a safe one for bringing in diverse viewpoints.
4. The negative impact of too much social cohesion on innovation, as highly cohesive groups may suppress candid debate to maintain relationships.
5. The importance of managing deep and surface level diversity to create effective teams, as maximizing differences in knowledge, skills, and abilities is essential. However, deep and surface level diversity can also negatively impact team social cohesion by evoking stereotypes, prejudices, and biases.
6. The importance of team social cohesion for success, but with the caveat that too much social cohesion can stifle innovation.
7. The need for sufficient collaboration to overcome surface-level differences, which become less crucial than personality differences and conflicts over organizational goals.

Comments: A reasonable job, but missing the key idea of “management encouragement for teams to be ‘venturesome’ to produce the most innovative results”.

When asked to put the themes into a logical order for an essay, it largely stuck to the order above. While on the whole this order seems sensible, discussing the negative impact of social cohesion two paragraphs before introducing why it is desirable seems an odd choice, *indicating the need to use AI suggestions as a starting not end point.*

Stage 5: Writing

Example 9. Conversion of structured notes into a paragraph. (Something similar could be used to generate a possible abstract for a research paper.)

Comment: The structured notes below were simply copied and pasted from Word into the ChatGPT text box. While the indentation was lost, symbols for dot points were not and ChatGPT seemed to “understand” the hierarchical and grouped structure of the notes.

Prompt to ChatGPT: Turn the following notes into an essay paragraph:

ChatGPT:

- **Team Social Integration (TSI) or Cohesion**
 - Harrison et al. (2002)
 - Definition:
 - “the extent to which the team is cohesive and team members enjoy team experiences, have positive social interactions within the group, and are satisfied with coworkers” (p. 1033).
 - Found from a study of uni student teams that:
 - TSI a strong predictor of team performance

- BUT, demographic differences can trigger stereotypes which can negatively affect team social integration and hence team performance
 - BUT, frequent collaboration on tasks can reduce the impact of demographic differences
- *Sethi et al. (2002)*
 - Studied new product development teams
 - Found too much social cohesion can reduce innovativeness
 - because team members worry more about maintaining relationships instead of having the robust debates needed for innovation.
- *Uzzi and Spiro (2005)*
 - Studied Broadway musical teams
 - Success criteria = box office and critical success
 - Found:
 - less successful = completely new teams and teams which only included members who were comfortable working with each other.
 - most successful = mixture of creative talents who had built up a comfortable working relationship with each other and new team members.

Response: Team social integration, also known as cohesion, is a crucial factor in determining the performance of teams, according to Harrison et al. (2002). Their definition of team social integration, which they describe as "the extent to which the team is cohesive and team members enjoy team experiences, have positive social interactions within the group, and are satisfied with coworkers" (p. 1033), highlights the importance of positive social interactions and team satisfaction in achieving high levels of team performance. However, Harrison et al. also found that demographic differences within teams can trigger stereotypes and negatively affect team social integration, reducing team performance. This negative impact can be mitigated by frequent collaboration on tasks, which can help reduce the impact of demographic differences. [On the other hand,] Sethi et al. (2002) found that too much social cohesion within teams can reduce innovativeness, as team members may be more focused on maintaining relationships than on engaging in the robust debates necessary for innovation. Uzzi and Spiro (2005) studied Broadway musical teams and found that the most successful teams were those that had a mixture of creative talents who had built up a comfortable working relationship with each other and new team members, while teams that were completely new or only included members who were comfortable working with each other were less successful.

Comments:

This first yellow highlight goes beyond what the notes actually say: *anything produced by a generative AI needs to be checked!*

This second highlight illustrates that ChatGPT doesn't always link and signpost content as well as it could.

Comment: The part highlighted in green above indicates that ChatGPT did not understand the hypothesised link between the notes about Broadway musical teams and social cohesion. Consequently, I added some additional interpretation to the end of my notes and reran the prompt.

Prompt to ChatGPT: Turn the following notes into an essay paragraph:

ChatGPT: ...

- *Uzzi and Spiro (2005)*

- Studied Broadway musical teams
- Success criteria = box office and critical success
- Found:
 - less successful = completely new teams and teams which only included members who were comfortable working with each other.
 - most successful = mixture of creative talents who had built up a comfortable working relationship with each other and new team members.
 - If one can assume that completely new teams will have lower than optimal levels of TSI, longstanding teams are likely to have an excessive amount of TSI, and mixed teams are somewhere in the middle, then these results are consistent with the view established from the Harrison et al. and Sethi et al. studies that a certain amount of TSI aids team performance but too much is counterproductive.

Response: ... Uzzi and Spiro (2005) studied Broadway musical teams and found that the most successful teams were those that included a mixture of creative talents who had built up a comfortable working relationship with each other and new team members, while the least successful teams were those that were completely new or only included members who were comfortable working with each other. If we assume that completely new teams will have lower than optimal levels of team social integration, longstanding teams are likely to have an excessive amount, and mixed teams are somewhere in the middle, then these results are consistent with the view established from the Harrison et al. and Sethi et al. studies that a certain amount of team social integration aids team performance, but too much can be counterproductive.

Interestingly, ChatGPT did a far less impressive job when given a whole essay worth of structured notes and asked to write an essay using the notes. While it could discern what overall conclusion could be drawn from those notes, it organized each paragraph around single papers rather than different themes / sub-questions. Thus, topic sentences had the forms shown in the following example.

Prompt to ChatGPT: Use the following notes to write an academic essay with an introduction, body and conclusion, correct in-text citations, and a reference list. The topic is on whether or not diversity is a help or hindrance for work group/team performance.

<Copy of notes>

Response: ...

Mu and Gnyawali (2003) studied multimajor student groups and found that cognitive diversity can be beneficial in reducing premature agreement and groupthink (Janis, 1982) and in the development of higher levels of skills and knowledge. ...

Sethi et al. (2002) studied product development teams and found that managers believe that cross-functional diversity “provides the variety of perspectives and ideas essential to creative thinking.” ...

Comment: Somewhat better paragraphs could be obtained by asking ChatGPT to revise what it had written according to a provided criterion as follows.

Prompt to ChatGPT: Can you improve the body paragraphs of the essay by starting with thematic topic sentences rather than the findings of individual studies?

Response: ...

Body Paragraph 2: The Impact of Diversity on Team Social Cohesion Team social cohesion (TSC) is an important factor in the success of work groups and teams. However, both deep and surface level diversity can negatively impact TSC, as Harrison et al. (2002) found. Surface level differences, such as differences in age, sex and ethnicity, and deep level differences, such as differences in values, attitudes, beliefs, and personalities, can evoke stereotypes, prejudices, and biases (Fiske & Neuberg, 1990). This can make it difficult for teams to work together effectively. Additionally, as Sethi et al. (2002) found, too many ideas can lead to information overload, making it hard for teams to solve problems and make decisions.

Body Paragraph 3: The Importance of Team Psychological Safety and Sufficient Collaboration Team psychological safety (TPS) and sufficient collaboration are important factors in the success of work groups and teams. As Mu & Gnyawali (2003) found in their study of multimajor student groups, teams with higher levels of TPS tended to develop higher levels of synergistic knowledge. TPS is the belief that the group environment is a safe one for bringing in diverse viewpoints. However, as Sethi et al. (2002) found, too much social cohesion can be a problem, as it can suppress candid debate needed for innovation in order to maintain relationships. Additionally, as Harrison et al. (2002) found, after sufficient collaboration, surface level differences become less crucial than personality differences and conflicts over organizational goals.

...

Stage 6: Editing and revision

Key elements of prompts:

1. Genre
2. Section / purpose
3. Desired features

Example 10. Check if meeting assessment requirements as indicated in a rubric.

<p>Prompt to ChatGPT: Does the following paragraph include all the elements expected of argumentative writing in an academic context?</p>	<p>"Regarding pay incentives and work performance, Miller and Estes (1961) have found that nine year old boys who were offered a monetary incentive performed significantly worse on a pattern matching exercise than boys who were not. In addition, Glucksberg (1962) found that undergraduates offered a monetary incentive took 50% longer on average to solve a creative problem-solving exercise than did undergraduates who were not offered an incentive; and Deci (1971) found that students who were not paid any money for writing headlines for their school newspaper continued to improve after instruction while those who were paid did not."</p>	<p><i>Prompt engineering advice:</i></p> <p>Note how:</p> <ol style="list-style-type: none"> 1. The context was given: "in an academic context". 2. ChatGPT wasn't just asked, "is there an argument", because it would respond "yes" even if it has to <i>infer</i> what the argument might be.
--------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Response: The paragraph appears to include some of the elements expected of argumentative writing in an academic context, but it is missing some key components. In order to fully meet the expectations of argumentative writing in an academic context, the paragraph should include:

1. A clear and concise thesis statement: This is a statement that presents the main argument or claim being made in the paragraph. The paragraph does not include a thesis statement, so it is not clear what the main argument or claim is.

2. Supporting evidence: The paragraph includes some evidence in the form of findings from several studies, but it is important to ensure that this evidence is relevant and sufficient to support the argument being made.
3. Analysis and interpretation of the evidence: It is not enough simply to present the evidence; it is important to also explain how the evidence supports the argument being made. This can include discussing the implications of the evidence and how it relates to other research on the topic.
4. A conclusion: The paragraph should include a conclusion that summarizes the main points made in the paragraph and restates the thesis in light of the evidence presented.
5. Citations: The paragraph includes citations for the studies mentioned, which is important for academic writing in order to give credit to the original authors and to allow readers to access the original sources.

Comments

In this case ChatGPT did quite a good job, but in general its feedback may be a mixture of valid and useful advice, as well as very generic and sometimes irrelevant or incorrect advice.

Example 11. Feedback can be both helpful and problematic in ways indicated in the example.

Prompt to ChatGPT: You are an experienced, university level writing tutor. Please provide feedback on the following paragraph from an organisational behaviour essay exploring the ways managers can positively influence employee motivation and performance.

"Regarding pay incentives and work performance, Miller and Estes (1961) have found that nine year old boys who were offered a monetary incentive performed significantly worse on a pattern matching exercise than boys who were not. In addition, Glucksberg (1962) found that undergraduates offered a monetary incentive took 50% longer on average to solve a creative problem-solving exercise than did undergraduates who were not offered an incentive; and Deci (1971) found that students who were not paid any money for writing headlines for their school newspaper continued to improve after instruction while those who were paid did not."

Response: Overall, the paragraph provides evidence from several studies that challenge the notion that pay incentives are always positively correlated with work performance. However, there are some issues with the paragraph that could be addressed to improve its clarity and coherence.

1. Use proper citation format: The citations for the studies mentioned in the paragraph should be formatted according to the appropriate citation style (e.g., APA, MLA, etc.) to ensure proper academic referencing.
2. Provide context for the studies: The paragraph mentions three studies, but it does not provide any context or background information about these studies, such as the sample size, methodology, and relevance to the topic of employee motivation and performance. Including this information would provide a better understanding of the studies and their implications.
3. Use clear language: Some of the language used in the paragraph, such as "performed significantly worse," "50% longer on average," and "continued to improve after instruction," could be further clarified. It would be helpful to provide specific details on how the performance was measured, what the results indicate, and what the implications are for the topic being discussed.
4. Connect the studies to the main argument: The paragraph mentions studies that challenge the notion that pay incentives always lead to improved performance, but it does not explicitly connect these studies to the main argument of the essay, which is about ways managers can positively influence employee motivation and performance. It would be beneficial to clearly articulate how these studies are relevant to the topic and how they support the main argument of the essay.

Here's a revised version of the paragraph that addresses these issues:

"Several studies have challenged the notion that pay incentives always lead to improved work performance. For example, Miller and Estes (1961) found that nine-year-old boys who were offered a monetary incentive performed significantly worse on a pattern matching exercise compared to boys who were not offered an incentive. Similarly, Glucksberg (1962) observed that undergraduates offered a monetary incentive took 50% longer on average to solve a creative problem-solving exercise compared to those who were not offered an incentive. Furthermore, Deci (1971) found that students who were not paid any money for writing headlines for their school newspaper continued to improve after instruction, while those who were paid did not. However, it is important to note that these studies may have limitations in terms of sample size, methodology, and generalizability to the workplace context. Nevertheless, these findings suggest that the relationship between pay incentives and work performance may not always be straightforward, and managers should carefully consider other factors that may influence employee motivation and performance."

Comment: If such use is considered to be acceptable, students need to be made aware that the feedback so provided will not always be correct or useful, and so should only be taken as "things to think about / check". This is fine for experts, but research may be needed to determine if problematic feedback undermines the confidence of weak students.

Example 12. Suggested revisions need to be checked for the introduction of misconceptions.

In the following example, while the response is more readable, it introduces a misconception.

Nevertheless, the response could still help the writer come up with an improved version which is correct.

Prompt to ChatGPT: *How can I make the following sentence easier to read without losing any of its elements?* "To achieve the best sensitivity and specificity, uniform fat suppression, minimal artifacts, and high spatial and temporal resolutions are all important in breast DCE-MRI to allow accurate measurement of dynamic contrast enhancement (6)."

Prompt engineering advice: "Without losing any of its elements" was included in the prompt as simply asking for something to be made "easier to read" may result in some elements or technical language being dropped.

Response: Accurate measurement of dynamic contrast enhancement in breast DCE-MRI requires achieving the best sensitivity and specificity, uniform fat suppression, minimal artifacts, and high spatial and temporal resolutions (6).

Comment: This revision implies that "uniform fat suppression, minimal artifacts, and high spatial and temporal resolutions" are things to achieve *in addition to* achieving "the best sensitivity and specificity". However, they are not *additional things to achieve*, but rather *how* the best sensitivity and specificity is obtained. Nevertheless, it is relatively easy to correct the suggested revision:

"Accurate measurement of dynamic contrast enhancement in breast DCE-MRI requires achieving the best sensitivity and specificity through uniform fat suppression, minimal artifact generation, and high spatial and temporal resolutions (6)."

Example 13. Improving flow in a paragraph.

Prompt to ChatGPT: The following paragraph from a chemical engineering research paper is meant to explain how a rough surface was added to a pristine

Prompt engineering advice: Note how the prompt provides:

quartz sand filter. It is the opening paragraph of a section with the heading, "3.1 Coating Mechanism". Please suggest how it can be improved while still keeping it suitable for a chemical engineering journal. Explain any changes you make. "Dopamine hydrochloride can react with the Tris-buffer solution to form polydopamine (PDA) particles. PDA is rich in active groups (-OH, -NH₂), making it a versatile platform for secondary reactions [29], especially the formation of ligands with metal ions that can generate a nuclear/shell structure of PDA/metal oxide [30]. PDA particles react with ZnO and with the hydroxyl groups on the surface by a condensation reaction. As a result, the ZnO particles are coated on the surface of the quartz sand filter, and the roughness increases."

1. Context:
 - a. Genre the excerpt is from
 - b. Title and purpose of section
2. Style guidelines:
 - a. "Improved while keeping it still suitable for a chemical engineering journal".
 - b. Might have specified things like "improve flow".

Response: Here's a possible improved version of the paragraph:

"The addition of a rough surface to a pristine quartz sand filter was achieved through a coating process that involved the use of polydopamine (PDA) particles. Specifically, dopamine hydrochloride was reacted with a Tris-buffer solution to form PDA particles rich in active groups, such as -OH and -NH₂. PDA particles were then used to react with ZnO particles via a condensation reaction that occurred through the hydroxyl groups on the surface. This resulted in the formation of a nuclear/shell structure of PDA/metal oxide on the surface of the quartz sand filter, leading to an increase in surface roughness."

Explanation of changes:

- The opening sentence was revised to clarify the main objective of the section (i.e., explaining the coating mechanism).
- The subsequent sentences were reordered to provide a clearer and more concise flow of information.
- Unnecessary citations were removed and the reference to the nuclear/shell structure was rephrased to improve clarity.
- The language was simplified and technical jargon was defined (e.g., "condensation reaction").

Comment: While the revised paragraph is easier to read, it is critical that authors check that ChatGPT has not introduced any misconceptions with the revisions and that the rewrite is still technically correct.

Example 14. Feedback on overall structure.

Prompt to ChatGPT: Please provide a reverse outline in terms of the focus question of each paragraph for the following essay. Please identify any paragraphs which have an unclear focus, unclear topic sentence, or appears to be ununified.

"<Copy of diversity and group performance essay.>"

Response: Here is a reverse outline with a focus question for each paragraph:

- I. Introduction
 - What is the essay about, and what is its focus question?
- II. The importance of cognitive diversity

Comments:

- A reasonable job, but the essay actually had 8 paragraphs not 5 (5 is a common format for essays in US education).

- What is cognitive diversity?
 - Why is cognitive diversity important for high group performance?
 - How can cognitive diversity hinder group performance?
- III. Challenges of diversity in group performance
- What are the other types of diversity that can pose significant challenges to high group performance?
 - How can surface-level differences negatively impact team social cohesion?
 - How can deep-level differences negatively impact team social cohesion?
- IV. Maximizing positive impacts and minimizing negative impacts of group diversity
- What are the things that groups and their managers can do to maximize potential positives and minimize potential negatives?
 - What is the relationship between team social cohesion and team psychological safety?
 - Why is excessive team social cohesion undesirable?
- V. Conclusion
- What is the main point of the essay?
- The essay appears to have a clear focus question for each paragraph, and the focus is unified and coherent throughout the essay.
- However, paragraph II could be improved by providing a clearer topic sentence that more explicitly states the focus question.
- Additionally, paragraph IV could be clearer in terms of how exactly group managers can foster team psychological safety and team social cohesion.
- ChatGPT also has different ideas about how to outline than I do, and so its outline is a hybrid of the way it likes to outline and the way I requested.
 - I disagree with this comment.
 - This is a valid point.