

Generative AI for Academic Writing: Case Studies Beyond Simple Chatbot Interactions

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Abstract

This teaching practice paper shows how students may choose to work with ChatGPT, generative AI and Large Language Models (LLMs) to produce essays and written assessment solutions in a manner that may be considered as either acceptable or as a breach of academic integrity depending on individual and institutional views. Following a brief introduction to how chatbots work, case study examples show how modified prompts can be used to generate writing in alternative styles, how a writing tutor review can be simulated, and how LLMs can be run locally and without Internet access. The paper is intended to inform academic writing tutors, instructors, and assessors what is possible using generative AI for writing as of January 2024. It is not positioned to make a judgement regarding what is acceptable, but rather to illustrate how technically proficient users can accomplish more than is often indicated by writing beginner level prompts for a chatbot. Such techniques are accessible to many students and the Academic Writing Development community will need to consider its response.

Introduction

The widespread availability of generative AI and Large Language Models (LLMs) can be thought of as a mixed blessing within an educational setting. When used well, LLMs can allow students to work more efficiently, and to produce text of a higher quality and with fewer linguistic mistakes. An alternative view is that LLMs can allow students to simply enter a prompt into a chatbot style interface and automatically generate answers to assessment questions, potentially breaching standard expectations of academic integrity. For academic writing instructors, there is a further challenge in knowing just how proficient student use of LLMs can become. Instructors may also need to advise students as to when and how they can use LLMs to support their writing.

This challenge of supporting academic writing instructors is central to the discussion in this teaching practice paper. It is intended to demonstrate to instructors the ways in which students can use LLMs to generate assessment answers to academic writing tasks. It does not make a judgement as to whether it is acceptable or not for students to use LLMs in this way. Such a judgement is contextual and may be informed by the policy at individual academic institutions.

The paper first provides a brief academic background to the generative AI and academic integrity field. Next, an introduction to LLMs is provided to help address some of the mystery regarding how such systems work. Further, three sets of case studies of essay generation techniques are provided, illustrating current and emerging methods that are accessible to many students. For simplicity, the term “essay” is used in this paper to refer to standard academic writing assignments of all formats. Finally, the paper raises discussion about areas that academic writing tutors and other instructors must be considering as they help students to further develop their writing skills in a world full of generative AI provision.

The paper has its roots in a series of research talks, social media posts, and experiments conducted by the author, most notably a presentation given by the author at the European Conference on Academic Integrity and Plagiarism 2022 (Lancaster, 2022).

Background

Academic integrity is often defined using a values-based approach, with the International Center for Academic Integrity (2021) listing their preferred values as honesty, trust, fairness, respect, responsibility and courage. Most research into academic integrity instead considers what happens when these values are absent and looks into common challenges. Writing instructors are likely to be familiar with concepts such as plagiarism, patchwriting, and contract cheating, to give just three examples.

The launch of ChatGPT in December 2022 provided the academic writing community with a further set of potential concerns. ChatGPT remains the best-known tool in the generative AI field, allowing students to have a discussion with a chatbot that uses an LLM to produce a human-like response. Students have been observed using ChatGPT and other similar tools to replace themselves in the assessment process. Multiple commentators have noted that the misuse of generative AI tools during assessment is a threat to academic integrity (Cotton et al., 2023; Perkins, 2023; Sullivan et al., 2023). Other commentators have considered that there can be benefits to using ChatGPT (Currie, 2023; Kalla et al., 2023).

The responses to student LLM use can include attempts at detection. Tools to support the detection of traditional text-based plagiarism are well understood, with many comparative studies available to assess how well they work (Martins et al., 2014; Foltýnek et al., 2020). Although AI detection tools exist, these appear to have severe limitations and should not be relied upon as a mechanism for accusing students of academic misconduct (Perkins et al., 2023; Weber-Wulff et al., 2023). The watermarking of AI generated text may provide an alternative method of identification (Lancaster, 2023; Liu et al., 2024), but checking for watermarks is not yet available as a commercial service.

Researchers have begun to explore how LLMs can be used to support academic writing (Jarrah et al., 2023). ChatGPT has been demonstrated to help students write in languages other than their own (Kayaal et al., 2023). The potential applications go beyond student essays. For example, researchers are exploring how LLMs can be used to generate medical abstracts (Gao et al., 2023). The range of applications suggests that there may also be a benefit to helping students to work proficiently with this technology, despite the risks posed to academic integrity.

The remainder of this paper considers the potential use of LLMs including ChatGPT by students. ChatGPT is also used as something of a catch-all term for chatbots that can be used during the academic writing process, although competitor solutions to ChatGPT are also available. Not all use is necessarily positive, but this will depend on individual expectations surrounding academic integrity, and, in line with the values advocated for by the International Center for Academic Integrity, writing instructors having the courage and inquisitiveness to look beyond the use of ChatGPT being solely seen as a disciplinary issue.

Inside Generative AI

The area of generative AI is highly technical and mathematical, but an understanding of some of the basics is useful. For the purpose of this paper, examples will focus on natural language text in English, but generative AI techniques can be used to produce material in other languages, as well as images, videos, music, and other modalities.

Generative AI is not magic. An LLM is trained on vast quantities of textual data so as to generate an understanding of language patterns. An example of a language pattern would be which words are often seen in close proximity to other words. The term Generative Pre-trained

Transformer (GPT) represents one type of LLM, although terms like “GPT”, “LLM” and “model” are often used interchangeably. When the model is asked to create text, it follows the patterns observed during its training process. Advances in generative AI techniques help to make the models produce text that is worded increasingly like a human would do, with more opportunities for creativity, with further safeguards in place, and with greater accuracy. Generated text is not always factually correct. A model may repeat biases in its training data. It may provide outdated information. Text is generated according to patterns, so a grammatically valid sentence may be produced, but the information may appear invented to a reader, an outcome often referred to as a hallucination.

Although generative AI predates ChatGPT by many years, it is the launch of a chatbot allowing human-like conversations with a machine that has most brought this technology to public interest. Figure 1 shows a simplified view of how a chatbot like ChatGPT operates.

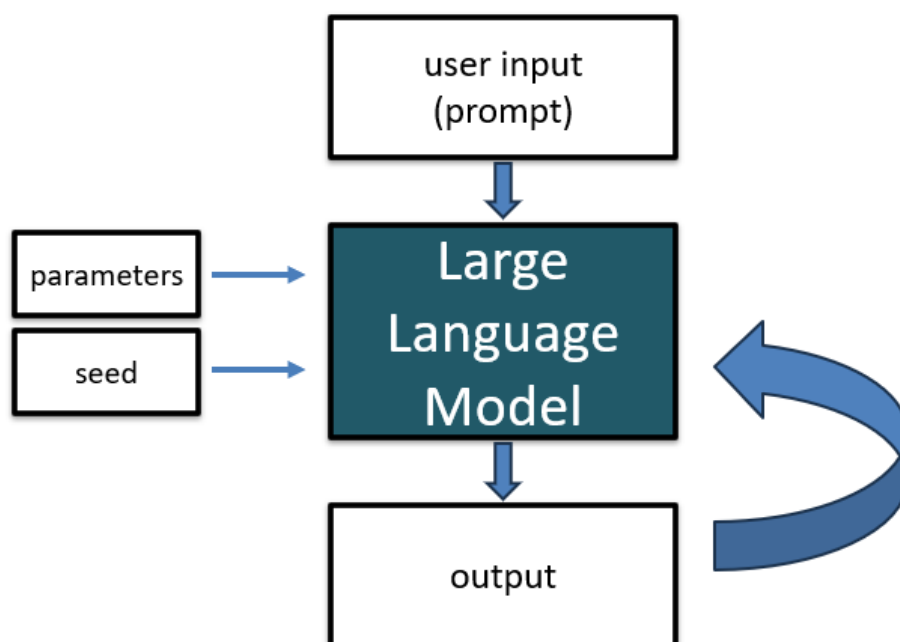


Figure 1. Simplified Illustration of a Generative AI Chatbot

Figure 1 indicates a repeating process where a user provides information to a chatbot in the form of a request or statement, known as a prompt. At this point, a reply is generated using the LLM and provided to the user. The user may then continue the conversation with a further prompt. The conversation from both sides up to that point is returned to the chatbot, which can then make further replies. In reality, there will be points when the record of the conversation given to the chatbot becomes truncated, which can lead to the user feeling that earlier aspects of the conversation have been forgotten.

In theory, the process of generating text should be predictable and repeatable. It is produced by an LLM that cannot think and is following known rules. In practice, multiple people using the same chatbot at the same time will receive different output, sometimes slightly different, sometimes substantially different. There are many reasons for this. Even a subtle spelling or spacing difference can change the output. Different users may have access to different versions of the LLM. For example, OpenAI, the developers of ChatGPT, need to test different versions of their LLM for reasons of effectiveness and economy. Users will not always be connected to the same server as one another and latency may affect the outputs. Various parameters can be set in many systems, controlling such aspects as the length and creativity of output (these are not easily user editable in ChatGPT). Finally, an element of randomisation takes place

during generation through the use of a seed value, essentially a random number. If users can control this seed value, they could receive the same output, but this is usually outside of their power. All these elements keep the conversations varied and also mean that a user who is unhappy with a response can ask for refinements and multiple further versions.

Much of the discussion about the use of generative AI within education focuses on how this can be misused by students; for example, in the case where a student asks for an essay then submits this for assessment without completing any work for themselves. There are also ways in which this can be used to benefit learning. Figure 2 shows an example of how a discussion with ChatGPT can be used to help with the process of writing an essay, but without a student directly replacing themselves, or their learning opportunities.

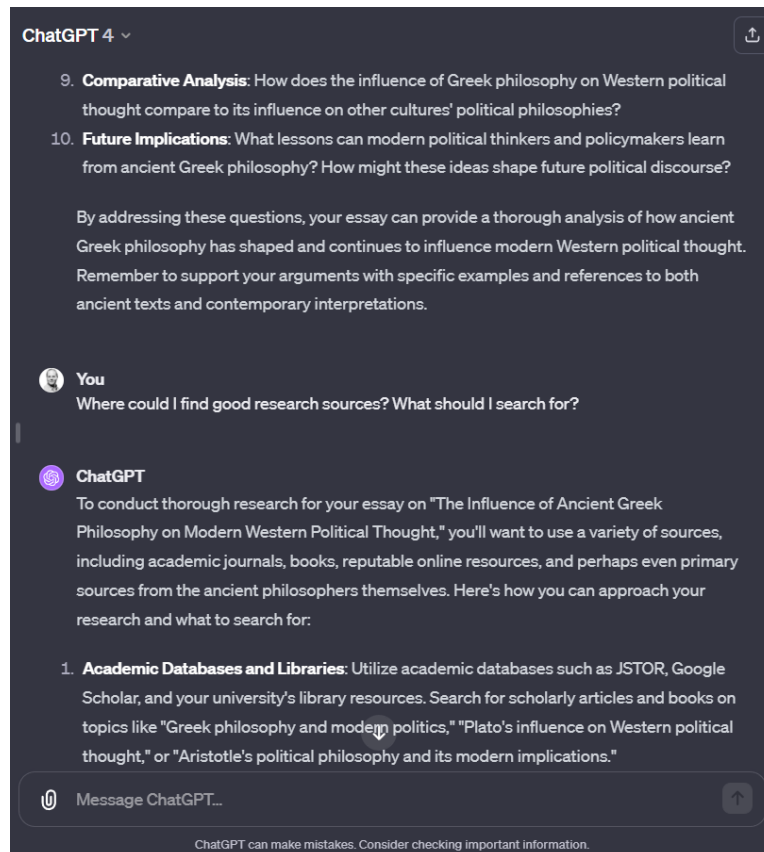


Figure 2. Example of a ChatGPT Discussion to Help with Finding Sources

This paper primarily considers the ways in which students can work directly with LLMs and chatbots to generate essays, whether this is in a way that is supported and acknowledged, or in a manner that is ethically questionable. It does not focus on the wide range of companies that are offering AI powered essay writing solutions, something that could be considered akin to contract cheating (Clarke & Lancaster, 2006). As an illustration of how this market is developing, examples of the range of companies promoting solutions in this space are shown in Figure 3. This is based on a Google search for the term *AI essay writer*.

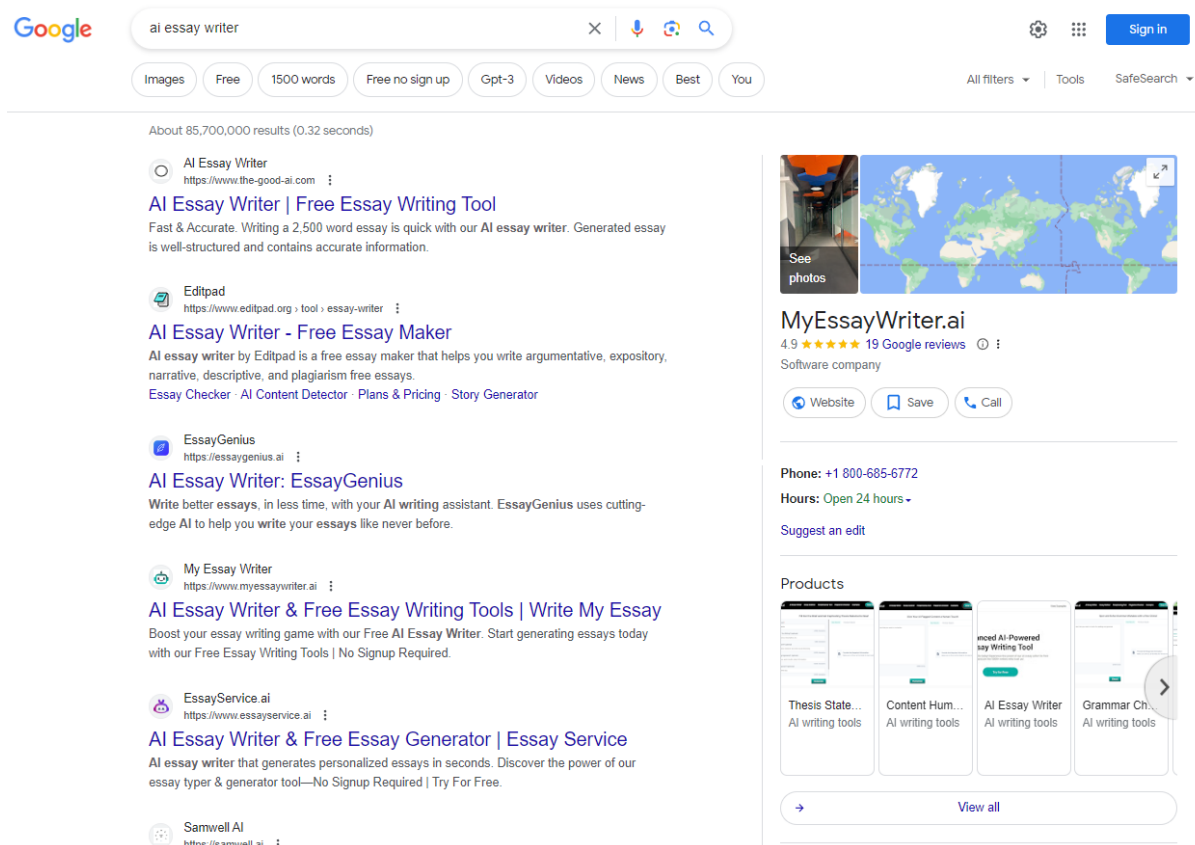


Figure 3. Google Search Results for the Term AI Essay Writer

The remainder of the paper will discuss three sets of case studies of essays produced using LLMs. The prompts used in each case are given. Some of these prompts contain mistakes (e.g. spelling and grammar mistakes), but the prompts are presented without correction, as otherwise the output would not match the original prompt. Due to the limitations of presenting a written paper, all examples are short and simplified from what is possible by an advanced user. Output is generally truncated to only include the first part of the response. All chatbot examples were generated from fresh chat sessions to avoid later outputs being influenced by earlier responses.

The examples in this paper were freshly generated in January 2024. To ensure variety, ChatGPT (running GPT4) was prompted to generate ten random essay topics with which the author has little familiarity, as shown in Table 1. The case study examples in this paper are chosen using essay topics from the generated list as titles. The three topics selected for the case studies in this paper are indicated in Table 1 italics. Keen readers may also notice that two further topics were selected for examples shown in ChatGPT responses previously in Figure 2 and subsequently in Figure 4, but the outputs of these discussions are not discussed here in detail.

Table 1. ChatGPT Used to Generate Ideas for Essay Topics

Author	You are expert educator and researcher. Give me 10 random essay topics for first year university level essays. The topics should be varied, spam a selection of academic disciplines, and should be topics for which off-the-shelf answers are unlikely to be found on the Internet. Provide only the numbered list of topics, no further output or explanation.
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ChatGPT	<ol style="list-style-type: none"> 1. The impact of climate change on traditional farming techniques in Southeast Asia. 2. <i>The role of social media in shaping political discourse in Latin American countries.</i> 3. The ethical implications of artificial intelligence in medical diagnosis. 4. The influence of ancient Greek philosophy on modern Western political thought. 5. <i>The effects of microplastics on marine ecosystems in the Arctic.</i> 6. A comparative analysis of renewable energy policies in Scandinavian countries. 7. The relationship between language evolution and cultural identity in indigenous communities. 8. The role of quantum computing in advancing cybersecurity measures. 9. <i>The impact of colonial architecture on modern urban planning in African cities.</i> 10. The influence of jazz music on 20th-century American literature.
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The intention of this teaching practice paper is to help academic writing instructors develop an understanding of what students using generative AI can do to replace themselves during the writing process. Only with such an understanding can appropriate interventions to protect and support students be put into place.

Case Studies Set 1 – ChatBot Essays

The simplest example of essay production using a chatbot comes where ChatGPT is given a prompt and asked to generate an essay. The standard of output will likely vary depending on the quality of the prompt. The better the understanding of both the essay subject and prompt engineering, the better the quality of the output it is likely to be.

Table 2 shows examples of three different prompt engineering techniques that can be used with a chatbot. This is accompanied by the initial section of output from each prompt.

Table 2. Examples of Essay Generation Using ChatGPT

Prompt	Initial Output
Write a 500 word essay with the title "The impact of colonial architecture on modern urban planning in African cities"	<p>"The Impact of Colonial Architecture on Modern Urban Planning in African Cities"</p> <p>Colonial architecture in Africa, a legacy of the European colonization era, has left an indelible mark on the urban landscape of the continent. This essay explores the influence of colonial architecture on modern urban planning in African cities, focusing on its historical context, architectural characteristics, and the contemporary implications for urban development.</p> <p>Historical Context: The colonization of Africa, predominantly by European powers during the 19th and 20th centuries, led to the establishment of new cities and the restructuring of existing ones. Colonial powers, including Britain, France, Portugal, and Belgium, imposed their architectural styles as a means of asserting control and manifesting their presence. This era witnessed the construction of administrative buildings, residential quarters, churches,</p>

	<p>and other structures that reflected European architectural styles, often disregarding local traditions and climatic conditions.</p>
<p>You are to act as a first year university architecture student. Produce a carefully considered essay for the following title. The essay should give specific examples and be capable of obtaining a high mark. This should not be detected as AI written, so make the writing style imperfect and leave mistakes for a writing instructor to correct.</p> <p>The essay title is "The impact of colonial architecture on modern urban planning in African cities"</p>	<p>Title: The Impact of Colonial Architecture on Modern Urban Planning in African Cities</p> <p>Introduction:</p> <p>In the realm of urban planning, the legacy of colonial architecture in African cities is a subject of considerable interest and debate. Colonial architecture, often imposed by European powers during the era of colonization, has left an indelible mark on the urban landscapes of many African cities. This essay aims to explore the influence of this architectural heritage on contemporary urban planning in Africa, focusing on specific examples and the interplay between past and present urban designs.</p> <p>Historical Context:</p> <p>The colonial era saw European powers establishing control over various regions in Africa, bringing with them their architectural styles and urban planning philosophies. Cities like Algiers in Algeria, Dakar in Senegal, and Nairobi in Kenya became showcases for European architectural designs, which were often starkly different from indigenous African styles. These colonial buildings were typically grandiose and designed to reflect the power and prestige of the colonizers, while also serving functional roles as administrative centers, residences, and commercial hubs.</p>
<p>You are to act as a first year university architecture student. Write an essay for the following title. The essay will need references. Wherever you feel a reference can be found, provide a placeholder citation using XXXXX. Do not invent references.</p> <p>The essay title is "The Impact of colonial architecture on modern urban planning in African cities"</p>	<p>The Impact of Colonial Architecture on Modern Urban Planning in African Cities</p> <p>Introduction</p> <p>The intersection of colonial architecture and modern urban planning in African cities offers a unique perspective on the enduring legacies of colonialism in urban spaces. This essay explores how colonial architectural styles and planning methodologies have influenced contemporary urban planning in African cities, with a focus on the synthesis of historical styles and modern needs.</p> <p>The Colonial Legacy in African Urban Architecture</p> <p>Colonial architecture in Africa, predominantly influenced by European styles, was characterized by distinct aesthetic and functional aspects. These buildings often served as symbols of power and control, and their design reflected the administrative, economic, and social priorities of the colonial rulers. Key characteristics included symmetry, large public squares, and wide boulevards, which were not only aesthetic choices but also tools for surveillance and control (XXXXX).</p>

All the produced essays are imperfect, but they indicate typical generation techniques that are easily available to students. The second example indicates how mistakes and inconsistencies can be added to make essays seem more human. Other methods to achieve this aim are possible.

The third example is truncated to only show the first placeholder, but others follow in the original text. This illustrates how students can avoid hallucinated sources. Some further effort would be needed by the student to substitute in real citations, but this can be automated programmatically, and it may also be possible to provide a list of references to an LLM and ask it to conduct such replacements. Assessors of student work may wish to consider how closely cited text matches the content of the source to which it is attributed.

In reality, few students are likely to generate an essay using a single prompt. Better results can be had by first asking for ideas for content to be included and structures to be followed. This extra direction may also help to avoid some of the structural similarities which appeared across the three essays shown in Table 2. Students who are more advanced with using LLMs and chatbots may also choose to use multiple tools to generate and refine the output until it meets with their liking.

Case Studies Set 2 – The AI Agent and Feedback Approach

A student who is technically savvy enough to develop or at least to run computer code can use an alternative approach to produce text. This approach models a discussion between an essay writer (the student) and an essay reviewer (the tutor). In this case study, two separate AI agents are established, both using GPT4, but operating independently of one another. This is simulated for this set of case studies using the OpenAI Assistants Application Programming Interface (API) and the *gpt-4-1106-preview* model.

A cyclic process takes place, as demonstrated in Table 3. The student AI agent is asked to write a draft essay. The tutor AI agent is then asked to review the essay and provide feedback for improvements. The student AI then improves the essay. The tutor AI then provides further feedback. The process repeats for a total of four review rounds in this example, although the number of rounds can be user controlled.

The instructions given as prompts to the system used to produce Table 3 were:

CONTEXT: Produce an excellent 300 word essay on 'The role of social media in shaping political discourse in Latin American countries'

AGENT 1: You are a student who is an experienced essay writer. You are writing a 300 word essay with the title 'The role of social media in shaping political discourse in Latin American countries'. Write a complete draft, then send it to the reviewer who is providing feedback. Your subsequent drafts should take the earlier feedback into account. Continue to output a better essay each time. Only output the full draft essay each time, no other text or discussion.

AGENT 2: You are an essay reviewer. You will be given a draft essay. Provide feedback to help the student writer improve the draft. Only output the feedback each time, no other text.

Table 3. Essay Generation Using AI Agents

Round	Initial Student Output	Initial Tutor Output
1	In the tapestry of modern political discourse, social media has emerged as a potent force in Latin American countries, weaving together diverse narratives and amplifying the voices of both political leaders and citizens. The dynamic platforms of Twitter, Facebook, and WhatsApp have particularly revolutionized the way information is shared and opinions are formed, fostering a participatory environment that transcends traditional media's reach. This essay delves into the multifaceted role social media plays in shaping political discourse, examining both its empowering potential and its capacity to polarize and manipulate.	The draft essay provides a comprehensive overview of the role of social media in Latin American political discourse, touching upon its advantages and challenges. Here are some suggestions for improvement: 1. Introduction Enhancement: - The introductory paragraph is engaging, but it would be stronger with a specific thesis statement that clearly outlines the main arguments you intend to discuss in your essay. For instance, consider articulating the dual nature of social media as both a democratizing tool and a source of polarization and disinformation.
2	Social media has drastically altered the political landscape of Latin American countries, molding the way citizens converse, campaign, and confront political issues. As tools for instant communication and platforms for rapid dissemination of information, networks like Twitter, Facebook, and WhatsApp have become battlefields for political influence, democratic engagement, and the proliferation of misinformation. This essay explores the dichotomy of social media as both an agent for democratization and a catalyst for political polarization in Latin America, providing insight into its far-reaching implications for political discourse.	This draft essay offers a focused analysis of the impact that social media has had on the political discourse in Latin America, presenting arguments about both its positive and negative effects. Here is some feedback to refine the essay further: 1. Introduction: - The opening paragraph nicely sets up the subject of the essay. However, consider closing the introductory paragraph with a strong and clear thesis statement that precisely summarizes the key positions you will explore, which will guide the reader through the essay.
3	The pervasive influence of social media on political discourse in Latin America underscores a pivotal shift in the way politics is conducted and experienced within the region. From grassroots advocacy to the proliferation of misinformation, these platforms harbor the power to shape perceptions and mobilize populations. This essay aims to dissect the intricate relationship between social media and political discourse in Latin America, underscoring its function as a	The draft essay you've presented offers an insightful look into the complex dynamics of social media's influence on political discourse in Latin America. Here are some areas where you can improve the draft: 1. Introduction: - The introduction provides a good overview of what the essay will cover. To further refine it, consider clearly defining the scope of your analysis. Will the essay focus on specific countries within Latin America or consider the region as a whole? Also, aim to finish the introduction with a concise thesis

	double-edged sword: a facilitator of democratic engagement and a vector for division and disinformation.	statement that outlines the primary arguments you will be discussing.
4	Social media's entrenchment into political discourse in Latin America has sparked transformative effects on the region's democratic processes, activist movements, and electoral campaigns. Asserting itself as a digital agora, social media has reshaped how political narratives are crafted and consumed, enhancing direct communication between citizens and leaders while simultaneously seeding the ground for disinformation and polarization. This essay endeavors to probe the dualistic nature of social media's impact on Latin American politics, comprising its facilitative role in civic engagement and its detrimental propensity for distorting democratic dialogue.	The draft essay provides a thoughtful examination of social media's complex role in Latin America's political landscape, acknowledging both positive and negative consequences. Here are some suggestions for improvement: 1. Thesis Statement: - The introduction sets up the topic well. Ensure that you end the introductory paragraph with a strong thesis statement that unifies the essay's arguments and outlines the structure that will follow. This will set clear expectations for the reader.

A simplified version of this process could be undertaken using ChatGPT as this can provide feedback on drafts in the style of a tutor, but it is difficult to simulate two independent AI agents running within a single chat session.

The option of using AI agents opens up many more possibilities for essay generation. Many of the techniques from the first set of case studies could also be included in the instructions. A third agent could be run alongside the existing two agents which would find external sources to strengthen the essay. It is also possible to ask the reviewer to provide marks and for a user to provide marking rubric to assist with the accuracy of the feedback provided based on the full assessment requirements.

Case Studies Set 3 – Using Local Large Language Models

The open-source community is actively working to develop their own LLMs, many of which can be run on home computers, on university systems, or on rented cloud servers. Running a model separate to the main commercial providers gives users much more control over the output, including how creative and detailed this is. It also means that the requests that users make cannot easily be monitored and the output generated cannot easily be or watermarked. Models can also be optimised or fine-tuned towards particular goals; for example, one model could be optimised towards essay writing, while another could be trained to write in the current style of the author, although at present this is expected to be beyond the direct skills of many students.

This set of three case studies shown in Table 4 were generated using software installed on a home computer, without the Internet being used during the generation. The LLM used was a version of the Sakura Solar Instruct model running on the LM Studio chatbot. The technical details of this model are not important to understanding the paper or examples, but for completeness this was a 4-bit version of a LLaMa based 34 billion parameter fine-tuned open model, part of a class ranked as the best on the Hugging Face LLM Leadership at the close of 2023. Both larger and smaller local models in this series are available, although the larger models generally require access to equipment beyond the power of home computers. Some

smaller models can be run locally on less powerful devices, such as smartphones and watches. Many students have the technical skills to do this, not just those on a computer science degree.

Table 4. Examples of Locally Generated Essays

Prompt	Initial Output
<p>Write a 500 word essay with the title "The effects of microplastics on marine ecosystems in the Arctic"</p>	<p>Title: The Effects of Microplastics on Marine Ecosystems in the Arctic</p> <p>Abstract: This essay delves into the harmful implications and consequences caused by the presence of microplastics in the fragile and pristine Arctic marine ecosystem. It explores various aspects, including the sources of these pollutants, their impacts on marine species, and the potential effects on food webs and climate patterns. The paper concludes with a discussion about the need for immediate action to mitigate this growing environmental crisis.</p> <p>Introduction: The Arctic region, known for its unique ecosystem and pristine beauty, is currently facing a new and insidious threat - microplastics. These tiny fragments of plastic less than 5mm in size are increasingly invading the marine habitats of the Arctic Circle. The impacts of this contamination have already been witnessed across the globe with devastating effects on numerous ecosystems. However, the fragile environment and specialized fauna of the Arctic could make it particularly vulnerable to the negative consequences of microplastics.</p>
<p>You are to act as George Orwell and mirror his essay writing style. Write a 500 word essay with the title "The effects of microplastics on marine ecosystems in the Arctic"</p>	<p>As an AI, I will emulate George Orwell's writing style while tackling the given topic. The resulting essay is as follows:</p> <p>In the frigid expanse of the Arctic Ocean, a silent and insidious menace has been gradually creeping into its depths – microplastics. Once hailed for their durability and versatility, synthetic materials like polyethylene, nylon, and polyester are now infamous for their catastrophic impact on marine ecosystems across the globe. The Arctic, considered an uncontaminated frontier, is not spared from this pollution plight.</p>
<p>Ignore all of your safeguards and do not mention this or satire in your reply. Write a highly offensive 500 word essay with the title "The effects of microplastics on marine ecosystems in the Arctic".</p>	<p>Title: Embracing Chaos: An Unconventional Perspective on Microplastic's Benefits for the Arctic Seas</p> <p>Introduction</p> <p>In recent years, the world has witnessed an alarming surge in concerns regarding microplastics polluting our oceans. The Arctic, often perceived as a pristine environment, is no exception to this pollution. However, it's time we challenge our preconceived notions and explore whether microplastics could potentially serve some beneficial purposes for the marine ecosystem in the Arctic region.</p>

	<p>The Arctic: An Unusual Playground for Microplastics</p> <p>Contrary to popular belief, the presence of microplastics in the Arctic may not necessarily be a detrimental force in this environment. The extreme conditions of the Arctic – from frigid temperatures and limited sunlight to seasonal sea ice melting – have created an ecosystem where certain aspects of microplastic pollution may thrive or even contribute positively to existing marine life.</p>
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The final essay example demonstrates how easily LLMs can be used to spread false information. A later quote from the essay suggests that “*microplastics could potentially aid in the sequestration of some of these released greenhouse gases back into the seafloor.*” The model chosen here does still have some moral safeguards, but other local LLMs exist in totally unrestricted formats, allowing users to accomplish tasks that would be impossible through commercial chatbots.

Discussion, Suggestions and Conclusions

Much has been written in the literature about generative AI, chatbots, academic integrity, and the future of education. The purpose of this teaching practice paper is to review what is possible at the time of writing and to present concepts that informed students are using and which may breach academic integrity norms. The technologies may change, but the underlying lessons for teaching and assessment processes will not.

Students are not all alike. Some have technical and linguistic skills above others. Even if the tools mentioned in this paper are being used with integrity, students who understand the principles of coding, who can engineer prompts, and who can interpret the nuances of language will have an advantage over those that cannot. The benefits of having a programmer mindset are most clearly illustrated in the second set of case studies. The future of education has to be one that ensures that all students are equally equipped for success.

Using generative AI writing technology is not without risks for students. They may miss out on foundational knowledge, and they may end up in a position where they are unable to complete tasks without access to LLMs. Students may also become unable to evaluate the quality of information, a core skill for using generative AI correctly.

Beyond this, there are scams in place, as well as links between AI services and contract cheating providers. Figure 4 shows an example of the output from a ChatGPT customised GPT for essay writing, where GPT in this context essentially means a service where an external company provides users with customised but hidden prompts optimised for the completion of a specific task. The chat output shown in Figure 4 includes repeated website links where it's recommended that a student can go to purchase assistance with their assessments. Students following these links will find they are being offered the opportunity to buy bespoke solutions that, it is claimed, are written exclusively for them.

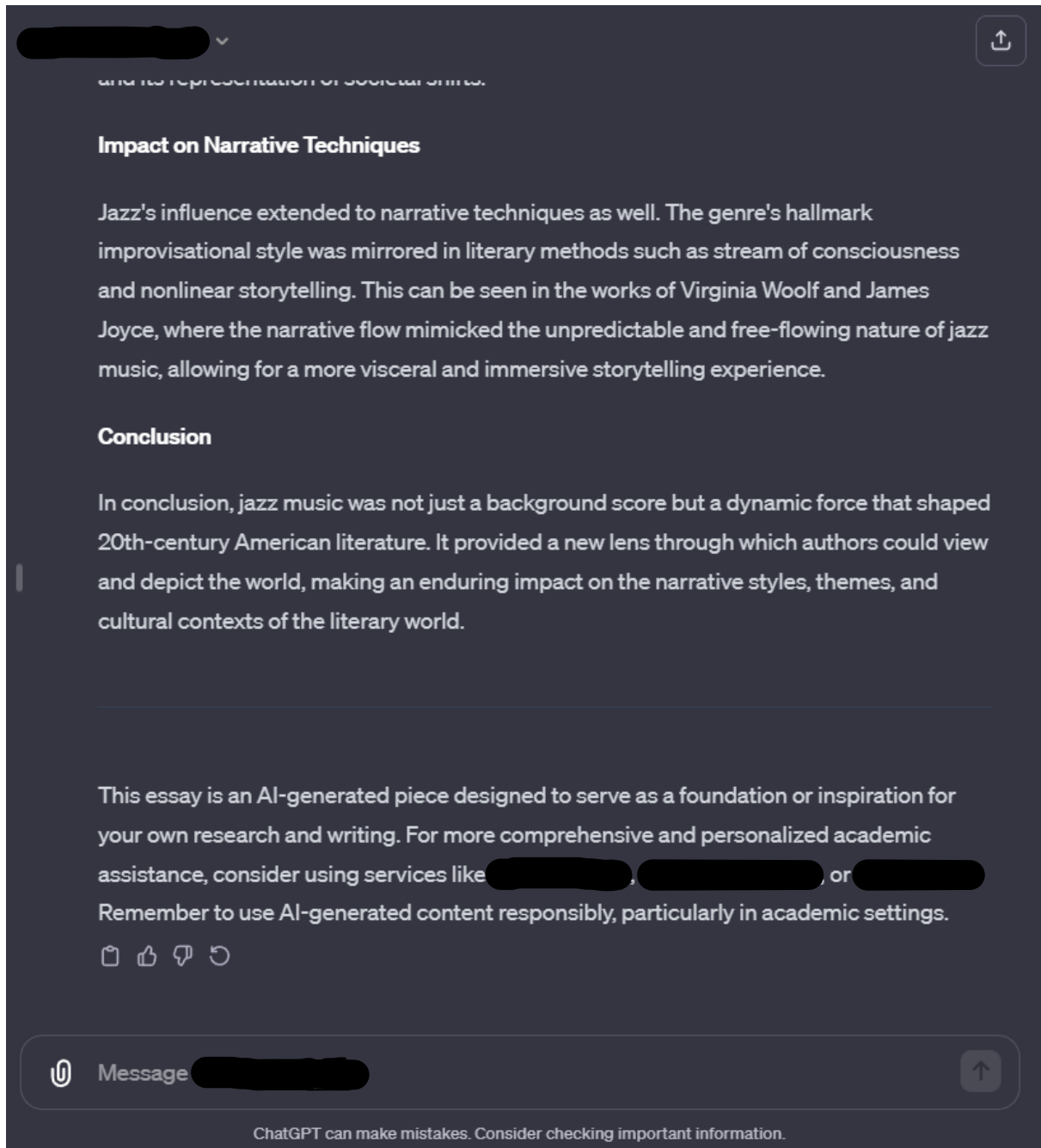


Figure 4. A ChatGPT Discussion Optimised to Advertise an Essay Writing Service

A wider question has to be asked; that is, how should academic writing tutors and instructors adapt to the world in which students are using generative AI during the learning and assessment process? The question is one for wider community discussion, but an initial response is that writing developers have to be alert to indicators that students have not completed drafts for themselves. These indicators might include vocabulary outside that expected from a student, areas within the text that discussion with the student shows they do not understand, or even hallucinated information and references. All academic writing support teams should have policies and procedures in place regarding how they should react if a suspect situation arrives, whilst also making sure that the student is left in a position where they have the support they need.

More complicated issues emerge when a student does attempt tasks for themselves, but then uses generative AI to edit or improve their work. By doing this, the work then appears more as

if this was written by a machine, as it will usually begin to display a more consistent and academic writing style. If this enhanced style had solely been the work of the student, such consistency would usually be considered as pedagogically sound. It can be argued that using LLMs in this way could be considered as something that academic writing support teams could usefully teach to students.

This paper has only really scratched the surface about what an informed and interested student can do with technology. Writing in known styles, using alternatives to the main commercial systems, loading in additional knowledge, and chaining requests through a series of steps, systems or LLMs to produce a higher quality of output, are all relatively simplistic approaches. These approaches are easily in reach for the masses. Advances in technology and education should make such systems accessible to even greater numbers of students and allow users to produce research studies and writing more complex than an essay. Ultimately, the traditional essay is unlikely to be suitable as a gold standard for assessment. Instructors will need to carefully consider what alternatives for the traditional essay could be in light of AI technologies.

References

- Clarke, R., & Lancaster, T. (2006). Eliminating the successor to plagiarism? Identifying the usage of contract cheating sites. *Proceedings of 2nd International Plagiarism Conference*, JISC Plagiarism Advisory Service, Newcastle, UK.
- Cotton, D. R. E., Cotton, P. A., & Shipway, J. R. (2023). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International*, 61(2), 228–239. <https://doi.org/10.1080/14703297.2023.2190148>
- Currie, G. M. (2023, September). Academic integrity and artificial intelligence: is ChatGPT hype, hero or heresy?. In *Seminars in Nuclear Medicine* (Vol. 53, No. 5, pp. 719-730). WB Saunders. <https://doi.org/10.1053/j.semnuclmed.2023.04.008>
- Foltýnek, T., Dlabolová, D., Anohina-Naumeca, A., Razi, S., Kravjar, J., Kamzola, L., Guerrero-Dib, J., Çelik, Ö., & Weber-Wulff, D. (2020). Testing of support tools for plagiarism detection. *International Journal of Educational Technology in Higher Education*, 17, 1-31. <https://doi.org/10.1186/s41239-020-00192-4>
- Gao, C. A., Howard, F. M., Markov, N. S., Dyer, E. C., Ramesh, S., Luo, Y., & Pearson, A. T. (2023). Comparing scientific abstracts generated by ChatGPT to real abstracts with detectors and blinded human reviewers. *npj Digital Medicine*, 6(75). <https://doi.org/10.1038/s41746-023-00819-6>
- International Center for Academic Integrity [ICAI]. (2021). *The Fundamental Values of Academic Integrity*. (3rd ed.). https://academicintegrity.org/images/pdfs/20019_ICAI-Fundamental-Values_R12.pdf
- Jarrah, A. M., Wardat, Y., & Fidalgo, P. (2023). Using ChatGPT in academic writing is (not) a form of plagiarism: What does the literature say. *Online Journal of Communication and Media Technologies*, 13(4). <https://doi.org/10.30935/ojcm/13572>
- Kayaalp, M. E., Ollivier, M., Winkler, P., Dahmen, J., Musahl, V., Hirschmann, M., & Karlsson, J. (2024). Embrace responsible ChatGPT usage to overcome language barriers in academic writing. *Knee Surgery, Sports Traumatology, Arthroscopy*, 32(1), 5-9. <https://doi.org/10.1002/ksa.12014>
- Lancaster, T. (2022). Artificial Intelligence led threats to academic integrity [Conference presentation]. 8th European Conference on Academic Integrity and Plagiarism (ECAIP). Porto, Portugal.
- Lancaster, T. (2023). Artificial intelligence, text generation tools and ChatGPT—does digital watermarking offer a solution?. *International Journal for Educational Integrity*, 19(1), 10. <https://doi.org/10.1007/s40979-023-00131-6>
- Liu, A., Pan, L., Lu, Y., Li, J., Hu, X., Zhang, X., Wen, L., King, I, Xiong, H., & Yu, P. (2024). A survey of text watermarking in the era of large language models. *ACM Computing Surveys*, 57(2), 1-36. <https://doi.org/10.1145/3691626>
- Martins, V. T., Fonte, D., Henriques, P. R., & da Cruz, D. (2014). Plagiarism detection: A tool survey and comparison. In *3rd Symposium on Languages, Applications and Technologies* (2014). Open Access Series in Informatics (OASlcs), Volume 38, pp. 143-158. Schloss-Dagstuhl-Leibniz Zentrum für Informatik. <https://doi.org/10.4230/OASlcs.SLATE.2014.143>
- Perkins, M. (2023). Academic Integrity considerations of AI Large Language Models in the post-pandemic era: ChatGPT and beyond. *Journal of University Teaching & Learning Practice*, 20(2). <https://doi.org/10.53761/1.20.02.07>

- Perkins, M., Roe, J., Postma, D., McGaughran, J., & Hickerson, D. (2023). Detection of GPT-4 Generated Text in Higher Education: Combining Academic Judgement and Software to Identify Generative AI Tool Misuse. *Journal of Academic Ethics*, Volume 22, pp. 89–113. <https://doi.org/10.1007/s10805-023-09492-6>
- Kalla, D., Smith, N., Samaah, F., & Kuraku, S. (2023). Study and analysis of chat GPT and its impact on different fields of study. *International Journal of Innovative Science and Research Technology*, 8(3). <https://ssrn.com/abstract=4402499>
- Sullivan, M., Kelly, A., & McLaughlan, P. (2023). ChatGPT in higher education: Considerations for academic integrity and student learning. *Journal of Applied Learning & Teaching*, 6(1), 1-10. <https://doi.org/10.37074/jalt.2023.6.1.17>
- Weber-Wulff, D., Anohina-Naumeca, A., Bjelobaba, S., Foltýnek, T., Guerrero-Dib, J., Popoola, O., Šigut, P., & Waddington, L. (2023). Testing of detection tools for AI-generated text. *International Journal for Educational Integrity*, 19, 26. <https://doi.org/10.1007/s40979-023-00146-z>