



Cape Peninsula
University of Technology
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Enhancing Learning and Teaching at CPUT through Artificial Intelligence: A Guide

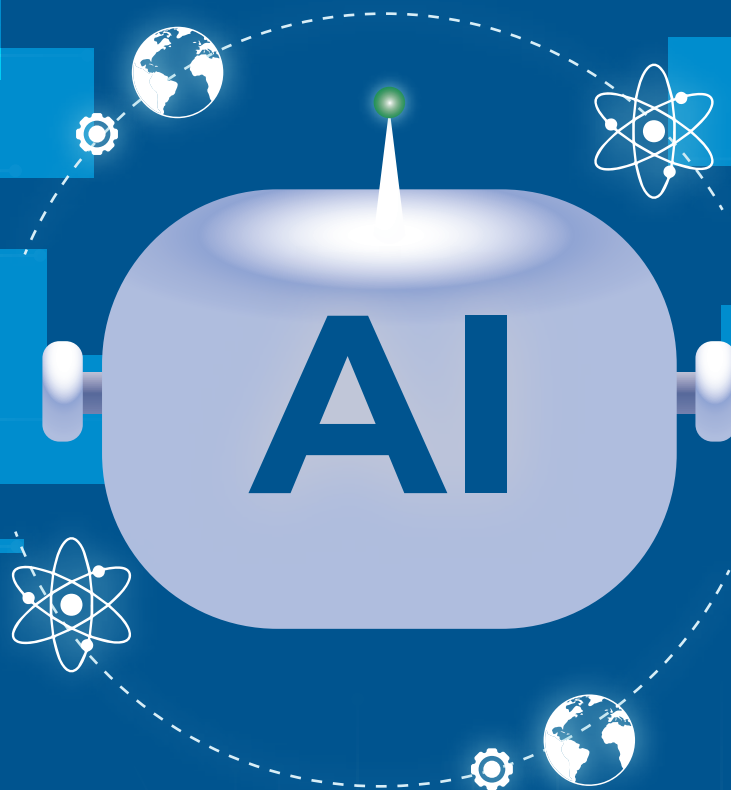


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1. Introduction

The purpose of this guide is to provide staff at Cape Peninsula University of Technology (CPUT) with practical and ethical guidance on incorporating generative AI into their learning, teaching, and assessment practices. Generative AI was used to write parts of this guide. The specific prompts used to develop this guide were formulated with the unique context of CPUT in mind and were shaped by the collective input of a deliberative task team. This document acknowledges the potential impact of generative AI on pedagogy, curriculum design, and academic integrity. It advocates for a balanced and open-minded stance towards learning and teaching, bearing in mind the evolving landscape of knowledge production and distribution in the age of generative AI. Given the spectrum of reactions it may provoke, the guide advocates for the need to foster a continuous discourse which clearly outlines the benefits and challenges tied to artificial intelligence. This serves as an initial guide for the process of exploring and purposefully integrating generative AI, specifically within the context of the Cape Peninsula University of Technology.

At the risk of duplicating very pertinent policies in this guideline, a framework of policies associated with this guideline is listed in the diagram. It is important to read this guideline in conjunction with those policies.

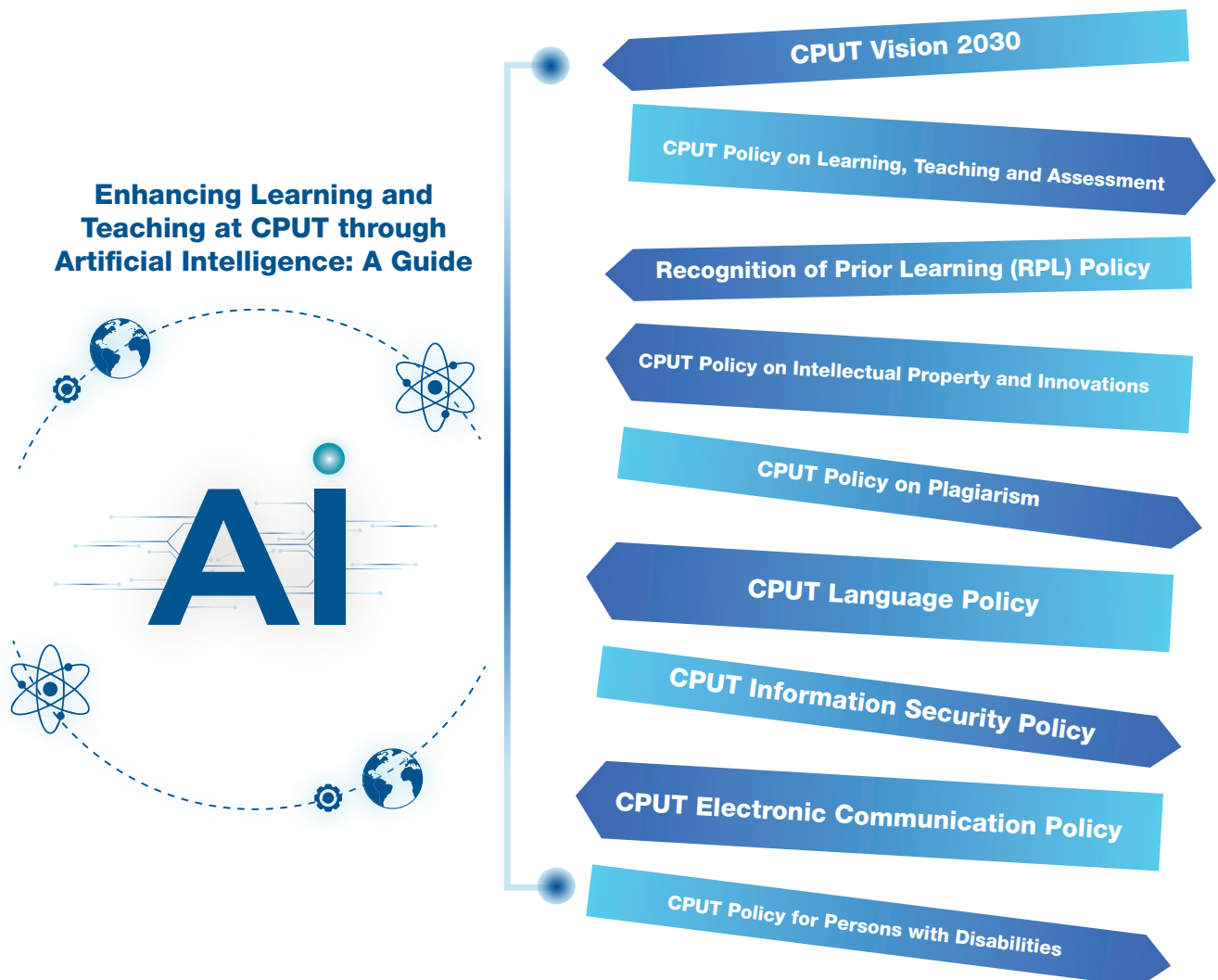


Figure 1: Policies that should read in conjunction with this guide.

Although the guide adopts a positive stance on the integration of generative AI into higher education, it simultaneously recognises the series of reservations outlined in the table that follows. These reservations span from ethical dilemmas to concerns over content quality, the reinforcement of biases, intellectual property, an over-dependence on technology, the shortfall in personalisation, data privacy concerns, the implications for cost and accessibility, the complexities involved in evaluation, and the danger of spreading misinformation. By acknowledging these potential issues, the guide does not seek to diminish their importance but rather to accentuate their essential role in the discussion about generative AI in higher education. In light of the varied responses that the adoption of generative AI may rouse, the guide champions the imperative of maintaining an ongoing dialogue that thoroughly articulates the benefits and acknowledges the challenges tied to the use of artificial intelligence. This balanced approach supports a thoughtful and informed integration of generative AI, striving to harness its strengths while vigilantly navigating its challenges.

Reason for not using generative AI	Explanation
Ethical Concerns	The potential for promoting academic dishonesty, such as plagiarism.
Quality of Content	Generative AI-generated content may lack the depth, nuance, and critical thinking required by higher education.
Bias and Fairness	Generative AI models can inherit biases present in their training data, leading to outputs that could perpetuate stereotypes or unfair representations.
Intellectual Property Issues	The use of generative AI raises questions about the ownership of generative AI-generated.
Dependence on Technology	Overreliance on generative AI for content generation and educational tasks could diminish students' and educators' skills development.
Lack of Personalization	While generative AI can produce generalised content, it may not adequately address the specific needs, backgrounds, and learning needs of individual students.
Data Privacy Concerns	The use of generative AI in education requires significant data input, raising concerns about the protection of sensitive information.
Cost and Accessibility	Implementing generative AI solutions can be costly, potentially widening the digital divide and affecting equitable access to educational resources.
Evaluation Challenges	Assessing generative AI-generated work can be difficult, as it may not reflect the student's own knowledge, understanding, or critical thinking abilities.
Misinformation Risk	Generative AI has the potential to generate content that is factually incorrect or misleading, hampering the learning process.

2. Generative AI in the Context of Higher Education

“Generative artificial intelligence models are computational systems trained on large datasets to generate human-like responses or output. These models can assist with a wide range of queries and provide information across multiple domains” (OpenAI, 2022). Generative artificial intelligence (AI), exemplified by Large Language Models (LLMs) such as OpenAI’s ChatGPT and Google’s Gemini, have the capability to generate a wide range of outputs, spanning textual compositions, programming code, musical compositions, and visual imagery from natural language prompts. A plethora of research highlighting the potential of generative AI to improve learning and teaching in various knowledge disciplines already exists. However, despite the many perceived benefits of AI, its use in higher education necessitates an exploration of the potential ethical challenges and reservations pertaining to academic integrity.

In recent years, the higher education sector has seen several disruptions. Between 2015 and 2017, there was student protest in response to the hike in student tuition fees and protest calling for the decolonisation of university curricula. These disruptions played a role in prompting transformations in curriculum and programme development, in addition to fostering considerable scholarly investigations into the decolonisation of university curricula. Moreover, the COVID-19 pandemic, from March 2020 to early 2022, presented a significant disruption. In these contexts, many universities faced difficulties in the process of rapidly transitioning to Emergency remote teaching. The disruptions and ensuing problems have led to a reconsideration of how the curriculum is delivered and have resulted in the introduction of flexible approaches to learning and teaching in universities.

The introduction of generative AI can be considered by some to be yet another disruption in learning and teaching in higher education, one requiring careful navigation. According to Rousseau (2023), the university’s longstanding and uncontested dominant status in the production and dissemination of knowledge has now been called into question due to the progress of digital technology and generative AI. This has led to a range of different responses from universities around the world regarding the incorporation of generative AI tools within the context of learning and teaching. Certain universities have implemented policies that explicitly prohibit the utilisation of such tools. These institutions express their apprehension regarding issues of academic integrity and the possible suppression of independent thought and creativity among both students and teachers. Conversely, there are higher education institutions that view these tools as advantageous to supporting the generation of ideas and to enriching discussions inside the context of learning and teaching. The Cape Peninsula University of Technology (CPUT), with its forward-looking Vision 2030, recognises the immense potential and transformative power of generative AI in shaping the future of education. As we move towards a world increasingly intertwined with technology, it is imperative that guidelines, such as those presented in this document, are established to ensure the ethical, responsible, and effective use of generative AI. It is envisaged that, by means of these guidelines, CPUT not only positions itself at the forefront of educational innovation, but also ensures that its students are equipped with the knowledge and skills to navigate an AI-augmented world.

3. Navigating the Guideline

Not to overload this guide with content with numerous examples showcasing every aspect of generative AI functionality, useful examples of prompts are presented instead. This approach enables users to input these prompts into the generative AI platform of their choice, exploring the functionality first-hand. By presenting the information in this way, we strive to provide a succinct and pragmatic guide, prioritising its readability and usefulness.

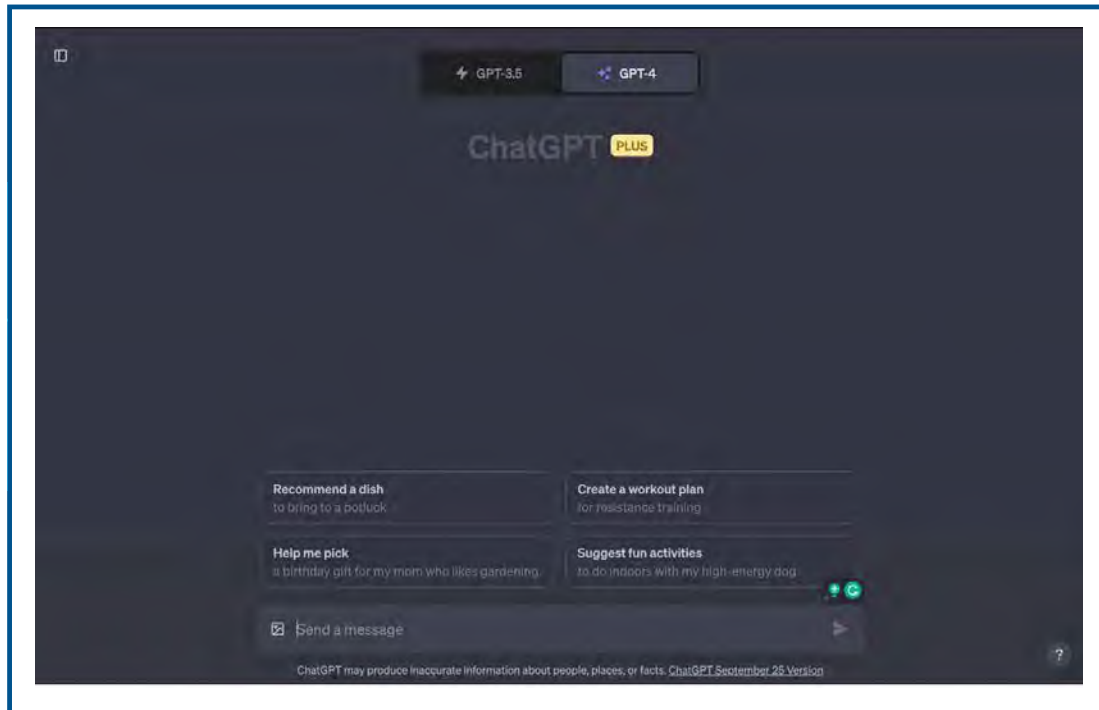


Figure 2: ChatGPT interface by OpenAI: An advanced chat platform supporting inputs such as text, images, code snippets, PDFs, Word Documents, Mathematical Symbols, images and voice prompts.

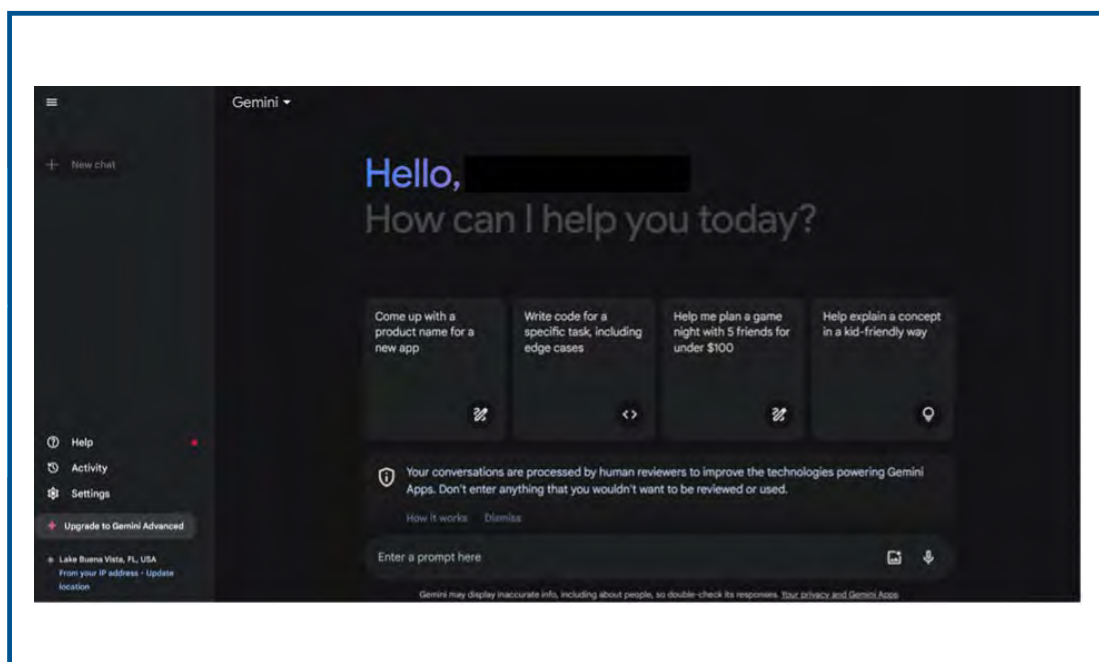


Figure 3: Gemini conversational interface: Engineered to handle diverse data inputs including text, images, code, PDFs, Word Documents, Mathematical Symbols, images and voice prompts

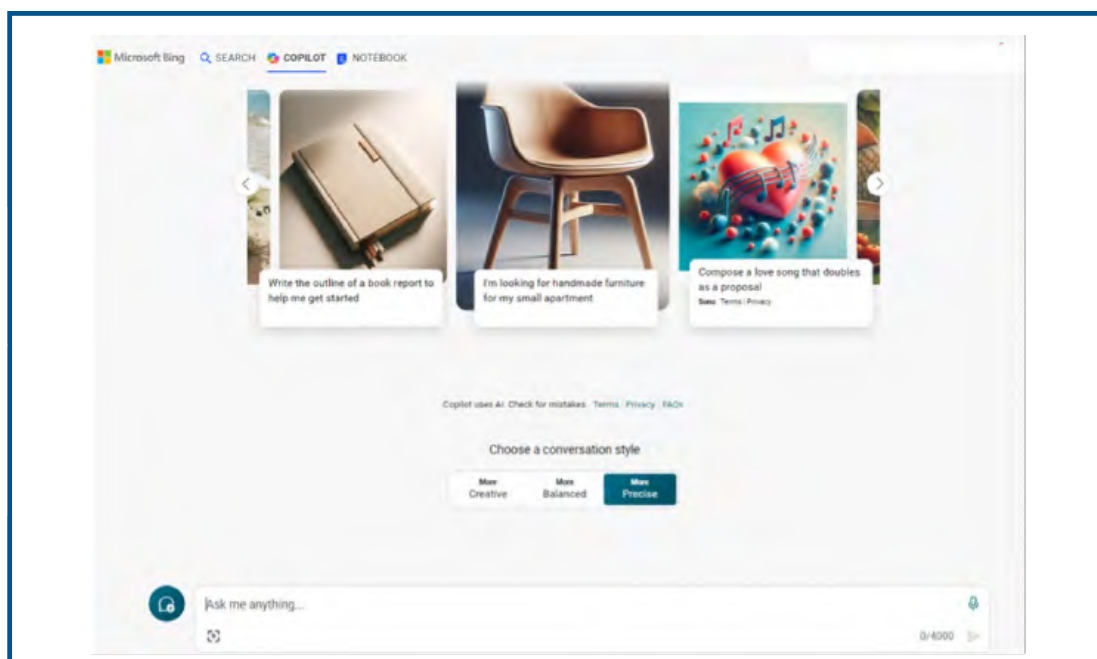


Figure 4: Bing AI interface: A sophisticated chat tool accepting a range of inputs from text and images to PDFs, Word Documents, and Mathematical Expressions.



Image generated by OpenAI's DALL·E 3

4. General Recommendations and Principles for the Use of Generative AI

The section below offers general recommendations and principles for the responsible, informed, and effective use of generative AI in various learning and teaching contexts at CPUT.



Clear rationale

The inclusion of any digital technology in the learning and teaching context should be undertaken with thoughtful consideration aimed at enhancing the pedagogical process. The integration of generative AI in this process needs to be attuned to this consideration.



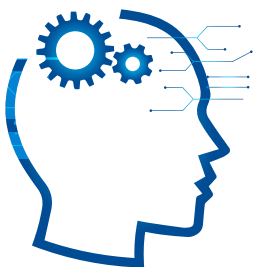
Clear instructions

When suggesting the use of generative AI in a learning and teaching context, clear instructions for its use should be provided. The aim of these instructions should be to develop a clear understanding of how to interpret the results and how to use the technology in informed and effective ways to facilitate learning while at all times being mindful of potential challenges and limitations.



Student comprehension

It is important to develop in students an understanding of the functioning of generative AI. It is crucial for them to grasp that generative AI functions by generating word sequences that are likely based on its training data. It does not possess any form of comprehension, cognition, or reasoning abilities.



Critical Thinking

Critical thinking is the disciplined process of actively and skilfully conceptualising, applying, analysing, synthesising, and evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action (Paul & Elder, 2006). It is imperative to underscore the significance of critical thinking when analysing the role of generative AI. While generative AI has the potential to offer valuable insights, it should not be considered a substitute for the fundamental cognitive process of critical thinking (Paul & Elder, 2006). The cultivation of graduates who possess the ability to exhibit autonomous thinking and generate innovative ideas is a fundamental objective of CPUT Vision 2030, and of higher education.



Corroborating information

Corroborating information generated from AI by curating other reliable sources ensures the accuracy and reliability of the information. Generative AI tools should together serve as a complementary source of information rather than constituting the sole reference.



Openness

Individuals should be encouraged to state whether and in what contexts they have used generative AI. This means highlighting instances of the use of tools such as language models when completing tasks.



Rigorous discourse

Discussions pertaining to the ethical aspects associated with the utilisation of generative AI should be encouraged. These should relate to its constraints, inherent biases, copyright implications, labour and environmental considerations, as well as data ownership rights. In the context of these discussions, it is crucial to engage in a rigorous assessment of the generative AI's outputs in order to ensure adherence to academic integrity norms.

Adherence to these recommendations and principles may assist CPUT staff and students to effectively integrate the use of generative AI. These recommendations and principles recognise the need for fostering critical thinking skills, maintaining a clear educational rationale, addressing issues of ethics, and for advocating transparency. These considerations are essential within the broader context of the ever-evolving higher education sphere.



Image generated by OpenAI's DALL-E 3

5. Getting the Best Out of generative AI: Tips for Engineering Prompts

The guidelines below are intended to assist CPUT staff and students in navigating their interactions with generative AI with the purpose of obtaining reliable, relevant, and concise information while also being cognisant of the potential limitations.

Suggestion	Description
Be Specific	Being specific and clear with prompts enhances response accuracy.
Sequential Questions	Broad topics benefit from breakdown into sequential or related questions, enabling more focused and detailed answers.
Specify the Desired Format	Specifying the desired format, such as a list, paragraph, or summary, refines the response.
Anticipate Bias and Ambiguity	While generative AI aims for neutrality factuality, considerations about potential bias or balanced coverage might include prompts like “Provide a balanced overview of the pros and cons of nuclear energy.”
Utilise the Knowledge Cutoff	Training data extends up to April 2023. Queries about post-cut-off events or information may have potential gaps in response.
Ask for Sources or Bases	For evidence-backed information, prompts might seek the basis or sources for generative AI statements, e.g., “Evidence supporting the health benefits of meditation?”
Refinement Follow Ups	Refining follow-up questions based on initial answers facilitates an iterative approach to obtain clearer information.
Limit Information Overload	Narrow, targeted queries often prove more effective than broad, open-ended ones.
Leverage Multimodal Capabilities	Including images or non-textual prompts can add context or cater to visual based queries.
Stay Updated on and Capabilities	Generative AI tools’ capabilities evolve. Periodic checks for new features guidelines are recommended

6. Recommendations for Privacy and Security of Data

According to the guidelines and practices of the currently-available LLM platforms, privacy and security of data are top priorities. The following recommendations, taken from OpenAI in particular, may assist in maintaining the privacy and security of data.

Suggestion	Description
No Personal Data Retention	OpenAI retains customer API data for 30 days but does not use this data to enhance its models.
Anonymity	Users are advised not to disclose personally identifiable information. OpenAI does not associate the data with specific individuals or develop user profiles.
Encryption	Data transferred to and from OpenAI's services undergoes encryption, ensuring secure communication.
Transparency	OpenAI practises transparency regarding its data usage, allowing individuals to consult its privacy policy and terms of service for a thorough understanding of these.

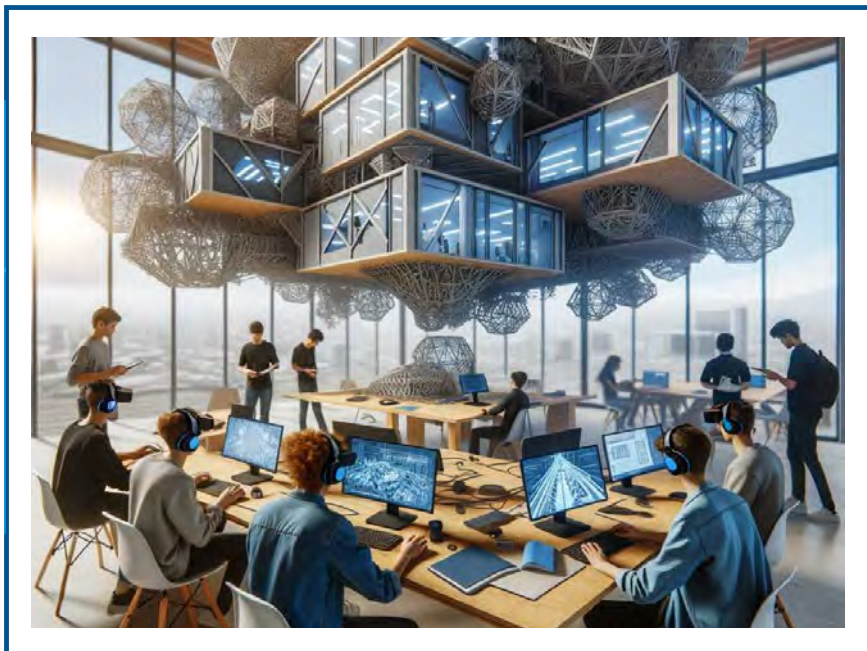


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7. Academic Integrity

CPUT's Plagiarism Policy serves as the focal point for upholding academic integrity within the university. It demonstrates the university's commitment to establishing a culture of scholarly academic conduct. The policy is aimed at ensuring that both academic staff and students are dedicated to producing those academic outputs that advance their respective fields of study. By alerting the CPUT community to the potential risks of using generative AI to plagiarism, this guide, informed by the CPUT Plagiarism Policy, aims to inspire a conscious effort among its staff and students to avoid academic misconduct. Ensuring the integrity of one's work has grown increasingly difficult, while simultaneously becoming more critical in the age of LLMs. The distinction between original content and computer-generated material can occasionally become blurred when advanced technologies, such as ChatGPT, Google Gemini, or Microsoft BING become increasingly common. Thus, it is crucial for staff and students to learn to use these resources appropriately and ethically. Academic integrity may be under threat if the Plagiarism Policy, through the lens of generative AI, is not followed, or if generative AI is used carelessly without adequate and appropriate citation and understanding. Furthermore, while it is accepted that research frequently calls for expanding upon the ideas and contributions of others, CPUT's Plagiarism Policy emphasises the need to harmoniously combine external knowledge with one's original thoughts and analyses. By doing so, staff and students are not just paying homage to the contributions of their predecessors but are also ensuring the production and dissemination of authentic, original academic work.

The CPUT Plagiarism Policy defines plagiarism as the representation of another person's ideas, research, expressions, computer code, design artefacts, or work as one's own. Examples of plagiarism interpreted in the context of generative AI include, but are not limited to:



Image generated by OpenAI's DALL·E 3

The CPUT plagiarism policy defines plagiarism as the representation of another person's ideas, research, expressions, computer code, design artefacts, or work as one's own. Examples of plagiarism interpreted in the context of generative AI include, but are not limited to:

Examples of plagiarism as listed in the CPUT plagiarism policy

- Copying directly from print or electronic sources into one's own work.
- Imitating existing designs in one's own work.
- Copying another student's assignment or part thereof
- Overuse of sources; disguising the act of verbatim copying by substitution of wording
- Paraphrasing without citation
- Self-plagiarism (repeating own previously published research without acknowledgement).

Examples of plagiarism as listed in the CPUT plagiarism policy interpreted in the context of generative AI.

- Using generative AI models to produce content and submitting them as one's own without citation. Using generative AI to scrape and reproduce content verbatim from databases, e-books, online journals, or websites without proper acknowledgment.
- Using generative AI-driven design software to reproduce or slightly modify existing designs, graphics, or art without significant original input, or without giving credit to the initial design source.
- Using generative AI tools to scan and replicate other students' assignments or dissertation, even if modified slightly with generative AI assistance, and presenting such assignments as original work.
- Leveraging generative AI to paraphrase or reword content excessively from multiple sources without proper citation. This could be using tools that automatically swap words or reorder sentences to make content seem distinct, even if the core content remains unchanged.
- Employing generative AI-driven paraphrasing tools to alter the structure of a sentence or change words but maintaining the original meaning, and not citing the original source.
- Republishing one's own content or research in multiple platforms or journals without indicating that it has been previously published or presented. This could also mean using generative AI tools to slightly modify one's previous works and presenting them as new findings or creations.

The above examples of plagiarism from the CPUT plagiarism policy have now been interpreted in the context of generative AI. In the 21st century, AI tools can produce, replicate, or modify content, all of which pose challenges to academic integrity. These tools can be used to scrape content, imitate designs, replicate assignments, paraphrase without citation, and even modify one's own previously published work. The development and increasing use of generative AI make it crucial for academic institutions to recognise these new dimensions of, and potential opportunities for, plagiarism and for them to adapt their guidelines and policies to maintain the sanctity of original work (OpenAI, 2022).

Although the CPUT Plagiarism Policy serves as the first means of ensuring academic integrity within the institution, the following sections may further strengthen and ensure academic integrity in the areas of assessment at CPUT.

7.1 Referencing Generative AI

When individuals seek to ensure accuracy in referencing materials within their academic or professional writing, adhering to the correct citation standards is paramount. In instances of uncertainty regarding the proper referencing of sources, a practical solution involves directly prompting a generative AI, such as OpenAI's ChatGPT, for assistance on the subject. By posing specific inquiries related to citation formats for various types of sources, individuals can obtain customized guidance that complies with established referencing styles.

The screenshot below demonstrates how guidance on how to reference generative AI can be obtained

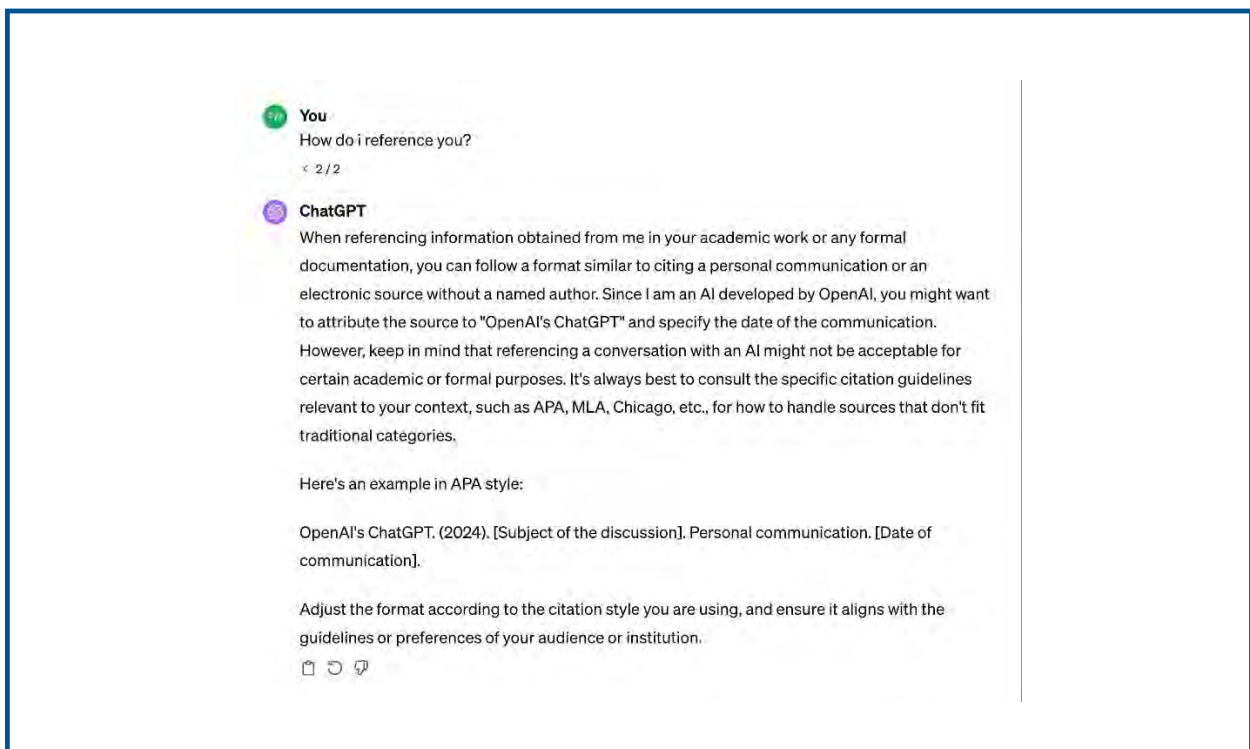



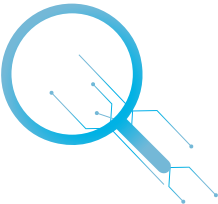


Figure 5: Generative AI is able to provide guidance on referencing, as illustrated in the figure above.

7.2 Assessment Design using Bloom's Taxonomy

Focusing on the higher-order thinking skills in Bloom's Taxonomy, skills that draw on the unique attributes of humans, can assist in the designing of the kinds of assessments which can mitigate unethical conduct. The table below illustrates the unique attributes and capabilities of humans and generative AI. The accompanying recommendations may help to ensure a comprehensive evaluation of student understanding and skills in the context of generative AI as well as helping to ensure ethical behaviour.

Blooms Taxonomy	Human	Generative AI	Approach to mitigate unethical conduct
Remember 	Can recall information in situations where technology is not readily accessible.	Is adept at recalling mainly factual information, listing possible answers, defining terms, and constructing a basic chronology.	Design open-book exams or allow specific resources. Since generative AI can recall facts easily and instantly, design an assignment which tests the application or understanding of those facts rather than testing mere recollection. For instance, ask for unique experiences or personal interpretations related to a topic.
Understand 	Can contextualise answers applying emotional, moral, or ethical considerations.	Is skilled at describing concepts in different words, recognising related examples, and translating.	Ask students to explain topics in their own words, provide personal examples, or discuss what they perceive to be the moral implications of certain facts or theories.
Apply 	Can operate, implement, conduct, execute, experiment, and test in the real world, applying their creativity and imagination to idea and solution development	Is capable of making use of a process, model, or method to illustrate how to solve a quantitative inquiry.	Use scenario-based questions that require students to apply concepts in real-world situations. Encourage creative problem solving. For instance, "How would you apply theory X in situation Y?"
Analyse 	Possess the unique capability to formulate original solutions, incorporating human judgement, and collaborating spontaneously.	Can suggest a range of alternatives, enumerate potential drawbacks and advantages, and describe successful real-world cases.	Encourage students to design, plan, or propose solutions to open-ended problems. Group projects or collaborative assignments can also be effective, especially if they involve peer evaluations.

Evaluate

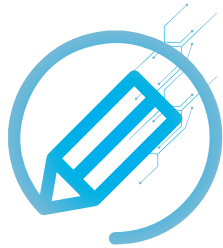


Can engage in metacognitive reflection and holistically appraise the ethical consequences of alternative courses of action.

Can identify the pros and cons of various courses of action and is proficient at developing rubrics.

Ask students to evaluate or critique theories, methods, or case studies. For example, "Discuss what you see as the pros and cons of method X in context Y."

Create



Possess the unique capability to formulate original solutions, incorporating human judgement, and collaborating spontaneously.

Can suggest a range of alternatives, enumerate potential drawbacks and advantages, and describe successful real-world cases.

Encourage students to design, plan, or propose solutions to open-ended problems. Group projects or collaborative assignments can also be effective, especially if they involve peer evaluations.



Image generated by OpenAI's DALL·E 3

7.3 Traditional Assessment Integrity

This list outlines traditional assessment types aimed at ensuring academic integrity and comprehensive student evaluation in the context of generative AI's capabilities and limitations.

Assessment format	Example
On-campus Invigilated Assessments	Make judicious use of supervised tests or exams on campus.
Open-Book Exams	Develop assessments that prioritise comprehension rather than rote memorisation.

7.4 Online Assessment Integrity

This list outlines online assessment types aimed at ensuring academic integrity and comprehensive student evaluation in the context of generative AI's capabilities and limitations.

Assessment tools and strategies	Example
Turnitin, and Respondus LockDown Browser	Use well-known tools for detecting plagiarism in assignments and ensuring honesty during online exams.
Randomised Questioning	Platforms that randomise exam questions to deter collaboration.

7.5 Feedback and Review Mechanisms

The recommendations below are aimed at fostering a culture of accountability and continuous improvement, thereby strengthening academic integrity by making it more challenging for breaches to go ignored.

Feedback and monitoring strategies	Example
Peer Review	Promote peer evaluation among students to foster a sense of group accountability.
Feedback Mechanisms	Consistent, and constructive feedback motivates genuine effort and improvement.
Monitor the Process	Especially in smaller classes, tracking drafts and reflections ensures original student work.

7.6 Honour Codes and Educational Workshops

The following is a list of Initiatives to promote academic integrity.

Promotion and awareness strategies	Example
Honour Codes	Establish a culture of integrity where students pledge against academic dishonesty.
Educational Workshops	Create awareness through workshops on academic integrity and plagiarism. The Fundani Writing Centre has numerous workshops that can assist with developing this






7.7 Additional Recommendations

The following are additional recommendations to ensure academic integrity.

Resources and assessment methods	Example
Resource Availability	Offering writing centres and tutoring can reduce the need for dishonest conduct.
Oral Examinations	The use of oral examination may also mitigate dishonest conduct.

8. Planning and Preparation for Teaching

Generative AI has emerged as a transformative tool that can significantly aid teaching in various aspects of planning and preparation. Judicious leveraging of AI technologies can streamline the intricate process of designing curricula, generating teaching materials, and ensuring quality educational delivery (OpenAI, 2022). Below are some recommendations for the use of generative AI to assist in planning and preparation.

Recommendation	Description	Prompt
Create lesson 	Draft structured plans that detail the flow and content of a lesson.	Ask generative AI to “Draft a lesson plan for a 45-minute session on Shakespeare’s ‘Romeo and Juliet’ for first year 10 students.” The AI’s plan might include an introduction, group activities, and more.
Write lesson outcomes 	Define what students should understand or achieve by the end of a lesson.	Give generative AI an outline on “World War I” and ask, “What are the expected learning outcomes after this lesson?” The generative AI might suggest outcomes like “Understand the complexity of the causes of World War I.”
Develop a worksheet 	Create custom questions or tasks related to a specific topic.	Prompt generative AI with, “Generate ten multiple-choice questions about the water cycle for a first-year class.” Use, and possibly adapt, the AI’s generated questions for a worksheet.
Create PowerPoint 	Transform textual content into structured points suitable for visual presentation.	Give generative AI lecture notes on “Photosynthesis” and instruct, “Convert these notes into bullet points for a PowerPoint presentation.” Use the produced list for slide creation.
Identify the ‘big ideas’ of a course, unit, or lesson 	Extract key concepts from lengthier materials to focus on essential ideas.	Input an article about “The Renaissance” into generative AI and prompt, “Summarise the key points of the Renaissance.” Use the generative AI’s response to pinpoint core concepts for your lesson.

Evaluate the output for correctness and completeness



Generate benchmark answers or solutions to streamline grading.

For an essay on climate change, feed generative AI the topic and request a model essay. This can then serve as a comparison point for student submissions.

Consider the student's perspective



Anticipate areas of confusion or potential questions by simulating student responses.

Before teaching “quantum physics”, use generative AI to simulate student queries. Input, “Explain quantum physics like I’m a first-year student.” The AI’s answers can guide and/or suggest your teaching approach.



Image generated by OpenAI's DALL-E 3

9. The Use of Generative AI in Learning and Teaching

As with the previous sections, the tables below were developed using generative AI. Furthermore, invaluable input was contributed by colleagues from CPUT, reflecting a collaborative effort that combines academic insights with cutting-edge technological advancements. This list recognises the dynamic and evolving landscape of educational technology, aiming to equip educators and learners with tools and methods that are relevant to today's digital age. Importantly, as the realm of educational technology continues to advance, this table remains adaptable and poised for updates and refinements in response to new developments.

9.1 Information Processing

These recommendations focus on refining and reworking raw data or extensive information. Tasks here involve condensing, summarising, and rephrasing to make content clearer.

Use of generative AI	Description	Example of prompt to generative AI
Sum up information	Condense extensive information into a concise summary.	Summarise the main themes of 'The Great Gatsby' in 200 words. Briefly explain Keynesian economics in 250 words.
Rephrase tricky ideas	Reformulate difficult concepts or thoughts into clear language.	Word thoughts on post-modernism. Rephrase the main points of an argument.



9.2 Academic Support

The subsequent list of recommendations offers a comprehensive overview of the multifaceted roles that AI can play in aiding both teaching and learning, ranging from providing scaffolding support and solving mathematical problems, to assisting with test preparation and writing reviews.

Use of generative AI	Description	Example of prompt to generative AI
Provide scaffolding support	Break complex processes into smaller, more manageable steps.	Simplify the process of photosynthesis. Guide through stoichiometry in chemistry.
Solve math problems using steps	Calculate mathematical problems and show the methodology.	Work out $3x - 7 = 11$ with steps Find the derivative of $f(x) = x^3 + 4x^2 - 5x$ and explain how to do this.
Explain big concepts succinctly.	Offer brief, accessible explanations of complex subjects.	Give a short explanation of existentialism. Give an overview of quantum mechanics.
Plan out writing pieces	Provide structure or an outline for writing assignments.	Topics to cover about renewable energy. Essay outline on city growth challenges.
Review writing	Assess and provide constructive feedback on written content.	Review paragraph on gender roles. Feedback on the content of an essay about climate change.
Check my language quality	Evaluate text for clarity, consistency, and grammatical correctness.	Review the research abstract for clarity. Ensure the use of consistent tenses in an essay.
Prepare for tests	Create materials to aid in test preparation.	Flashcards on the French Revolution. Multiple-choice questions on integration.
Explain code or formulas	Describe and illustrate coding concepts or mathematical formulas.	Explanation of a 'while' loop in C++. How VLOOKUP works in Excel.
Assist with assignments	Offer guidance and solutions for academic assignments.	Help with physics homework on Newton's laws. Guidance on a calculus problem about integrals.
Identify prior knowledge required to understand a topic	Determine the extent of familiarity with the foundational concepts needed before exploring advanced subjects.	Foundational concepts for advanced genetics. Background knowledge before studying the French Revolution.

9.3 Language and Writing

The following recommendations provide an overview of how generative AI can serve as a tool in educational settings, focusing on its capabilities to generate ideas for writing topics, assist with language and grammar, and even create multilingual glossaries for specific subjects.

Use of generative AI	Description	Example of prompt to generative AI
Give ideas for writing topics	Suggest creative themes or topics for writing.	Story idea for a post-apocalyptic world. Creative writing prompt about time travel.
Help with language and grammar	Assist in correct language usage, language registers, and grammatical structures.	Sentence with the word 'albeit'. Proper use of 'whom'.
Create a glossary of terms for a topic in different languages	List and translate key terms related to a subject in multiple languages.	Glossary of anatomy terms in English and Xhosa (isiXhosa). Physics terms related to 'Motion' in English and French.

9.4 Personalised Learning

The following are recommendations for how generative AI can open up avenues for tailoring personalised learning paths, crafting engaging visual aids, simulating experiments or phenomena, and conducting insightful analyses of student performance with valuable feedback.

Use of generative AI	Description	Example of prompt to generative AI
Personalised Learning Paths	Tailor learning trajectories based on individual needs and progress.	Algebra topics following on from, and based on, current understanding. Exercises for improving reading comprehension.
Generate Visual Aids	Produce graphical representations to explain concepts.	Visual representation of the water cycle. Flowchart for photosynthesis.
Simulate Experiments or Phenomena	Digitally reproduce scientific events or phenomena for understanding.	Simulation of pendulum motion. Demonstration of volcanic eruptions.
Analyse Student Performance and Give Feedback	Evaluate learners' progress and provide constructive, developmental feedback.	Progress assessment in geometry. Feedback on academic performance for the semester.

9.5 Resource Recommendations

The following is a list of recommendations to guide students to additional materials using generative AI. Generative AI can suggest books, documentaries, or other resources. It can aid in expansion of a student's knowledge base outside of the primary course content.

Use of generative AI	Description	Example of prompt to AI
Provide Recommendations for Additional Resources	Suggest supplementary materials for deeper exploration of topics.	<ul style="list-style-type: none">Book recommendations on African Architecture and Design. Documentary suggestions on climate change.

9.6 Collaborative Learning

The following is a list of recommendations for ways in which generative AI can support group interactions and peer-to-peer engagements. These recommendations focus on activities that foster teamwork, discussion and shared learning experiences.

Use of generative AI	Description	Example of prompt to generative AI
Facilitate Group Collaborations and Peer Learning	Enable collaborative learning experiences and peer-to-peer interactions.	Set up space for group projects. Connect peers for learning sessions.
Gamified Learning and Quizzes	Design engaging and interactive learning exercises and assessments.	Quiz on cellular biology. Gamified exercise.

Further to the above recommendations, in a recent article by Mike Sharples (2023), "Towards Social Generative AI for Education: Theory, Practice and Ethics", generative AI is described as a component in an education system in which humans and AI act as language agents. Sharples (2023) argues for conversation as a fundamental process in learning. He argues that, through conversation, we can reflect on existing understandings of knowledge and question underlying assumptions as we come to a consensus. Through a conversational learning system, the potential exists to continually explore differences, gain experience, and reach agreements (Sharples, 2023). Generative AI can enable these collaborative, 'conversational' learning experiences.

Sharples references six different roles of generative AI supporting cooperative and social learning. These roles can be realised in both a synchronous face-to-face lecture theatre modality and through an online modality. In the lecture theatre students and lecturers can together provide the prompts for the generative AI. In the online modality of a lecture stream, using platforms such as Microsoft Teams and Blackboard Collaborate, students could be encouraged to provide prompts either via a microphone or chat functionality. As outlined in the earlier sections, with the use of generative AI, it is essential to provide a clear rationale and instructions, ensure student understanding, promote critical thinking, emphasise the importance and ethicality of verifying information, and encourage open and rigorous debate.

The roles and functions of generative AI in such processes include a Possibility Engine, Socratic Opponent, Collaboration Coach, Co-Designer, Exploratorium, and Storyteller.

Role of generative AI	Description	Example of prompts
Possibility Engine	A student may explore an open question, prompting generative AI to generate multiple responses.	Students write prompts in generative AI and submit each prompt multiple times to examine alternative responses.
Socratic Opponent	Generative AI can be used as an opponent in an argument.	Students enter prompts into generative AI to converse or debate. Teachers can ask students to use generative AI to prepare for discussions.
Collaboration Coach	Generative AI helps groups to research and solve problems together.	Working in groups, students use generative AI to discover information to complete assignments.
Co-Designer	Generative AI assists throughout the design process.	Students ask generative AI for ideas about designing or updating a website, or focus on specific goals (e.g., how to make the website more accessible).
Exploratorium	Generative AI provides tools to play with, explore, and interpret data.	Students use generative AI to explore different ways to visualise and explain a large database, such as census data.
Storyteller	Generative AI creates stories that include diverse views, abilities and experiences.	Students take it in turn to ask generative AI to continue a story, prompting it to include a diversity of characters.



10. The Use of Generative AI in Research

As outlined in earlier sections of this guide, the utilisation of generative AI for teaching and learning often intersects with its potential in research. However, the following table offers examples of how generative AI can distinctly support research activities.

Research Activity	Example of prompt	Description	Research Application
Literature Review	“Summarise key themes from the latest articles on [subject area].”	Generative AI will provide condensed information from recent publications within a subject area.	Helps in grasping the current state of research and identifying trends.
Hypothesis Generation	“Suggest potential hypotheses based on the current understanding of [topic].”	Generative AI uses existing knowledge to propose plausible research questions or hypotheses.	Assists in developing testable predictions to guide the research direction.
Data Analysis	“Analyse the dataset [details] and identify any significant patterns.”	Generative AI tools process and interpret complex datasets to find meaningful patterns or anomalies.	Aids in making sense of large amounts of data, which can be time-consuming manually.
Drafting Research Proposals	“Draft an outline for a research proposal on [topic] including objectives and methodology.”	Generative AI helps in structuring a research proposal, suggesting a coherent flow of ideas.	Provides a starting point for proposal writing, which can be refined further.
Experiment Design	“Design a research experiment for [study objective] considering control and variables.”	Generative AI can suggest experimental setups that align with research goals.	Helps in creating robust experimental designs that can lead to valid results.
Statistical Analysis	“Perform a statistical analysis using [statistical method] on [data].”	Generative AI can carry out complex statistical computations and interpret the results.	Saves time and improves accuracy in the data analysis phase of research.
Research Collaboration	“Identify potential collaborators with expertise in [field] and [specific interest].”	Generative AI can suggest researchers and professionals as potential collaborators.	Facilitates the formation of multidisciplinary teams for research projects.
Writing Research Papers	“Generate a draft for the discussion section of a paper based on [findings].”	Generative AI can help in structuring the narrative of research findings.	Assists in articulating the implications and significance of research results.
Peer Review Preparation	“Create a checklist for peer-reviewing a manuscript on [topic].”	Generative AI develops a comprehensive list of aspects to consider when reviewing a paper.	Ensures thorough preparation for peer review, contributing to research quality.
Enhancing Research Presentations	“Suggest a structure for a presentation on [research findings], including visual aids.”	Generative AI helps in organizing content and suggests visualizations for clarity.	Enhances the delivery and impact of research findings in presentations.

11. Ai Artistry and Video Generation

For those interested in the intersection of language and visual representation, DALL-E is a groundbreaking technology you should explore. Developed by OpenAI, DALL-E is a state-of-the-art image generation model that combines the capabilities of GPT-3 with a VQ-VAE-2 generative model. This allows it to produce highly detailed and imaginative images based on textual descriptions. Whether you're looking to better understand the frontiers of machine learning or are considering its implications in various academic disciplines, DALL-E offers a fascinating look into the future of AI-generated art and design.

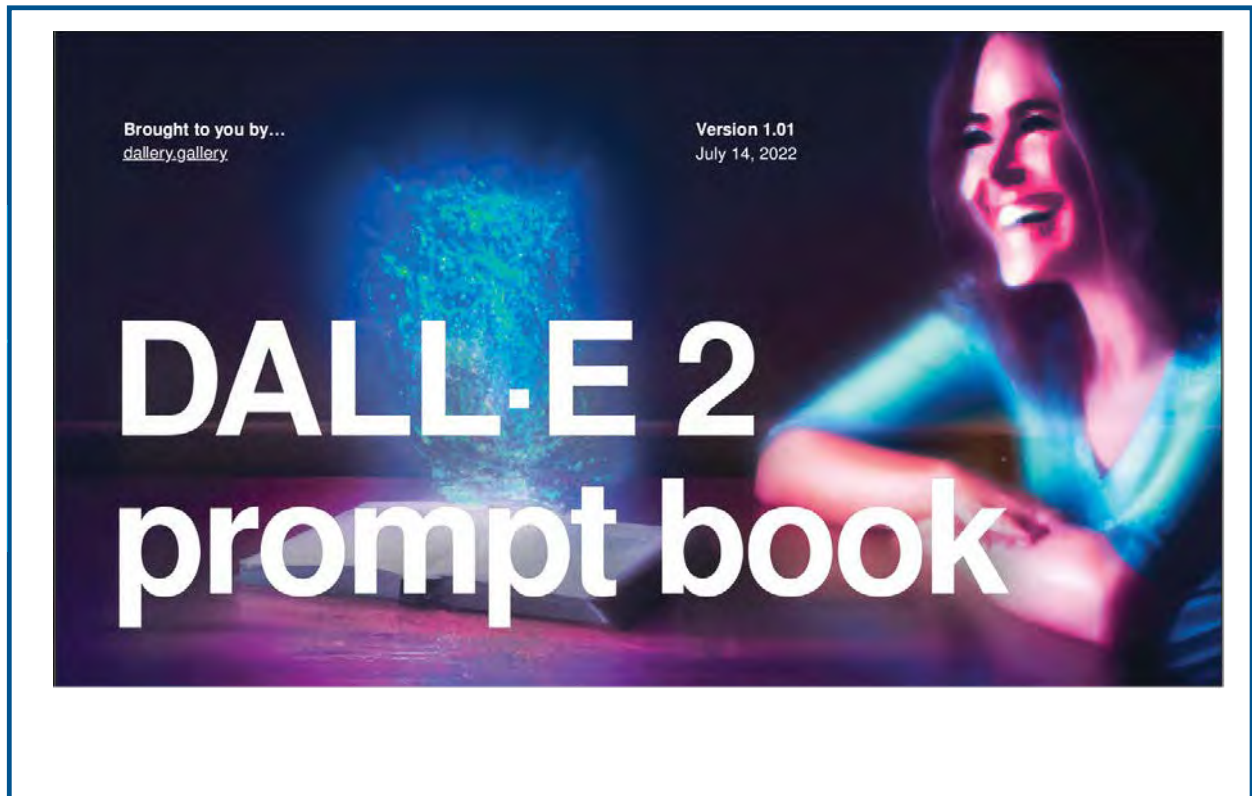


Figure 6: Discover a great guide to mastering DALL-E: from aesthetics and art history to prompt engineering and image editing. Unlock endless creative possibilities! Access the guide here: <https://dallery.gallery/the-dalle-2-prompt-book/>

Developments in the area of LLMs have been rapid, and these can now generate videos from natural language prompts as well. OpenAI's Sora offers this capability, as well as Bing Chat Create and Pika (<https://pika.art>)

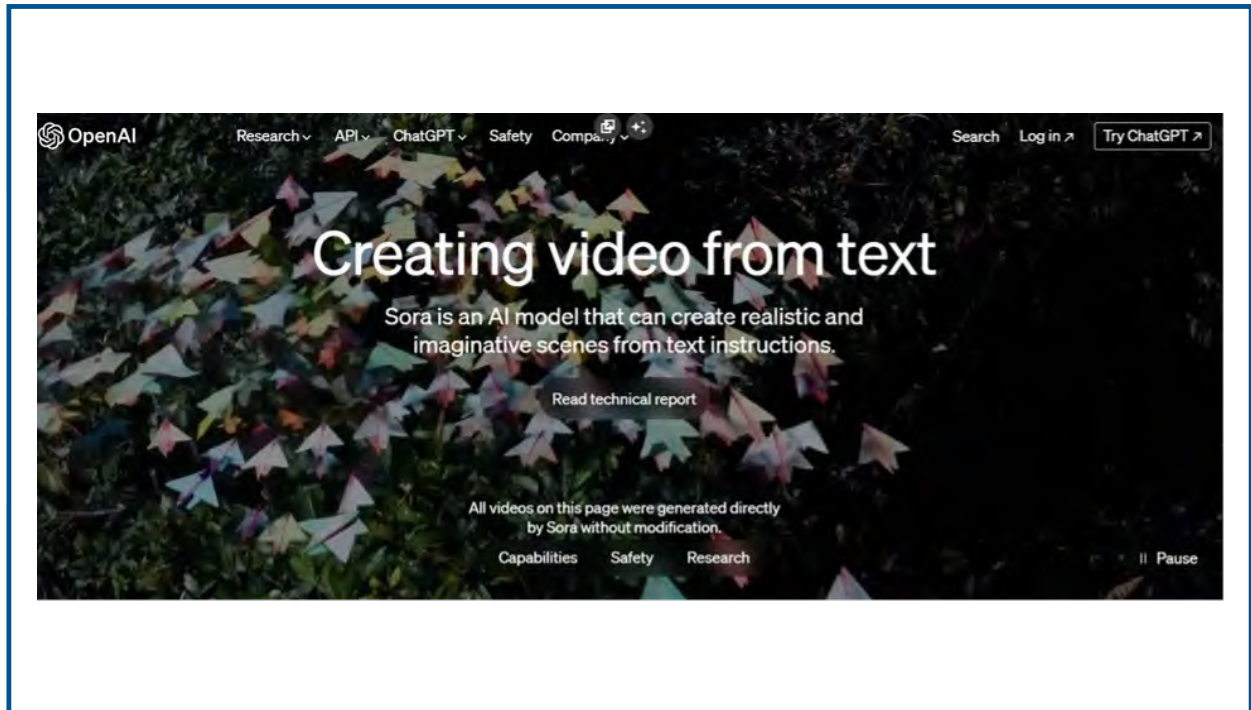


Figure 7: Platforms such as OpenAI's Sora are able to generate video content from prompts.

12. Conclusion (Written by generative AI)

The integration of generative AI into the academic environment of CPUT heralds a new era of educational innovation. The technological advancements represented by tools like generative AI have the potential to significantly transform and enrich pedagogical approaches, curriculum design, and academic integrity. While generative AI presents unprecedented opportunities to enrich learning and teaching, it also brings forth ethical and integrity challenges that require astute navigation. The university's proactive stance, as evidenced by this comprehensive guide, demonstrates a commitment to harnessing the power of generative AI while safeguarding academic integrity. generative AI, when used responsibly and ethically, can serve as a tool to address some of these challenges, offering both educators and students a means to navigate the evolving landscape of knowledge dissemination.

In conclusion, as CPUT embarks on this journey of weaving generative AI into its academic fabric, it does so standing at the precipitous edge of a transformative educational experience. With the appropriate and imaginative guidelines, continuous discourse, and ethical considerations, the university is well prepared to lead in this AI-augmented future, and to ensure that its students and academic staff are fully equipped to navigate the complexities of the modern world.

13. Additional Resources

This list of resources serves as an additional guide to explore the intersection of AI and education. Covering a range of topics from foundational AI concepts for educators to specific applications in the classroom, these resources have been curated to provide a comprehensive understanding of the role AI can play in transforming educational practices. The list includes research and initiatives from both South African universities and global institutions to offer a well-rounded perspective on the subject.

Stanford's Artificial Intelligence in Education Report: This is an extensive report covering how AI can be integrated into K-12 education. <https://hai.stanford.edu/research/education/>

University of Cape Town's AI and Learning Research: Papers and articles focused on the use of AI in South African educational settings. URL: <https://www.uct.ac.za/research/ai-education>

AI4K12 Guidelines: A framework for educators in K-12 on how to effectively implement AI in classrooms. URL: <https://ai4k12.org/>

Coursera's AI for Everyone: While not directly related to education, this course teaches foundational AI concepts that educators could implement. URL: <https://www.coursera.org/learn/ai-for-everyone>

IBM's Teacher Advisor: An AI tool designed to assist teachers in creating lesson plans. URL: <https://teacheradvisor.org/>

WITS AI in Education: Research and initiatives from the University of the Witwatersrand in Johannesburg focusing on AI in education. URL: <https://www.wits.ac.za/research-ai/>

AI in Higher Education by Educause Review: An article focusing on how AI can benefit tertiary education. URL: <https://er.educause.edu/articles/2018/10/artificial-intelligence-in-higher-education-applications-promises-and-perils>

MIT's Open Learning: AI-based projects aimed at transforming teaching and learning. URL: <https://openlearning.mit.edu/>

Google's Machine Learning for Kids: A tool that lets children and educators experiment with machine learning. URL: <https://machinelearningforkids.co.uk/>

Udacity's AI for Classroom: Online courses designed for teachers interested in AI. URL: <https://www.udacity.com/course/ai-for-classrooms--ud0419>

Harvard's Data Wise Project: A guide to help educators use data, including AI-generated analytics. URL: <https://datawise.gse.harvard.edu/>

European Commission's AI in Education: Provides information about AI in educational practices in Europe. URL: <https://digital-strategy.ec.europa.eu/en/policies/ai-education>

University of Pretoria's Research in AI and Learning: Includes several research papers and pilot projects. URL: <https://www.up.ac.za/research-innovation>

Learning LandsCAPE AI for Research symposium: <https://www.dropbox.com/scl/fi/ydgjnhv9egao3jj2v6s366/AI-Research-tools-Tools.pdf?rlkey=3u6fityrmf06p3x6almvsx83d&dl=0>

Microsoft's AI in Education: A set of tools and solutions specifically designed for educational applications. URL: <https://education.microsoft.com/en-us/resource/520e08e6>

Squirrel AI Learning: Offers adaptive learning tools for students, providing personalised education. URL: <https://www.squirrelai.com/en/index.html>

Oxford's AI Education Research: Various papers and articles on AI in educational settings. URL: <https://www.oii.ox.ac.uk/research/ai/>

DeepMind's AI for Education White Paper: Discusses the potential benefits and ethical considerations of using AI in education. URL: <https://deepmind.com/research/publications/ai-education>

Australian Government's AI Ethics in Education: A report discussing the ethical dimensions of AI in education. URL: <https://www.data61.csiro.au/en/Who-we-are/Our-programs/AI-and-machine-learning/AI-Ethics>

Querium's AI-based Tutor: An AI system that acts like a tutor for STEM subjects. URL: <https://www.querium.com/>

Elementary Literacy through AI: Developed by Carnegie Mellon, this tool aims to improve literacy in elementary schools using AI. URL: <https://www.cmu.edu/news/stories/archives/2019/february/ai-literacy.html>

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