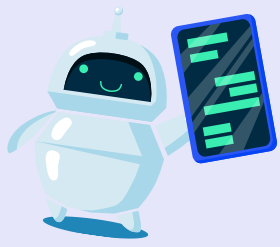
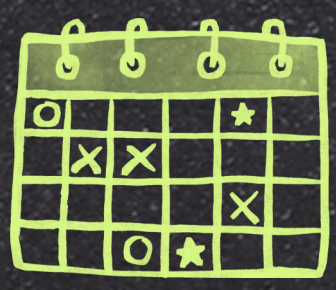
IMPERIAL

Integrating Generative AI (GenAI) in Higher Education: Supporting Concept Development and Technical Design in Engineering Group Projects



Introduction

This case study outlines how Generative AI tools were introduced to Bioengineering students to support their group assessment task. This practice helped students explore creative ideas, improve technical design processes, and reflect on the strengths and limitations of using GenAI. This case study also highlights key insights to help educators apply similar approaches in their teaching.



Assessment Overview

The first-year undergraduate module 'Design & Professional Practice' involved a 40%-weighted group assignment, the 'Design Challenge', with 180 students working in teams of 5-7. Students were tasked with designing a desktop plant pot inspired by bioengineering, submitting a report detailing their design process, final prototype, and the bioengineering concepts behind their design.

Introducing and Using LLMs for the Assessment

Students were introduced to large language models like ChatGPT in a kick-off session that covered the assignment briefing, referencing guidelines, and the potential of GenAI to support design processes. The session included demonstrations of GenAI's capabilities through real-time queries and discussions on its applications and limitations in engineering design. Students were given the option to use ChatGPT or other LLMs, provided that proper referencing was applied.

Defining Boundaries: Ensuring Ethical and Transparent Use of GenAI

Students found GenAI tools are useful for design generation prompts for suitable materials, checking grammar and sentence structure. Some of the challenges students faced when using AI are listed below:

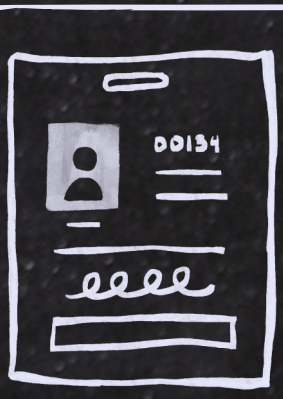
- Lack of citations from ChatGPT output
- Incorrect responses by LLMs
- Lack of Creativity in LLM outputs

Given the wide range of purposes and contexts in which LLMs can be used, staff and students co-developed clear guidelines regarding appropriate LLM usage and corresponding referencing requirements. Specifically, a rubric framework was created to clarify expectations for students and provide a standardised approach to acknowledging LLM contributions.

Template rubric →

USE CASE	Free to Use without Reference	Simple Reference to Acknowledge Use	Reference + Report Primary Prompt	Reference + Report Primary Prompt + Report Chat History	Use Prohibited
Generating Code using LLMs				✗	
Using LLMs for linguistic assistance		✗			
Using LLMs to aid in research			✗		
Using LLMs to generate design concepts			✗		
Using LLMs to generate large portions of text					✗

Key Factors to consider for Effective Implementation



- Open discussion: Demonstrate GenAI tools like ChatGPT during class, running real-time queries. Facilitate conversations with students about the potential and limitations of AI to support their learning and engagement.
- Clear guidelines: Define how LLMs can be used in assignments, such as for brainstorming, technical support, or language assistance and promote AI as a tool to enhance, not replace, student creativity and critical thinking.
- Referencing: Provide a rubric to guide proper citation of AI use, ranging from basic references to detailed context required.

Source: Developed from a case study by Bioengineering UROP students who evaluated the use of GenAI for this assessment.