CASE STUDY

Transforming Quantitative Research Projects: Empowering Students with Generative AI

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Abstract

This case study explores the integration of generative AI into a large-scale undergraduate business research module at the University of the West of England (UWE), Bristol. Delivered to over 300 students annually, the module 'Introductory Business Research Project' supports second-year learners conducting both qualitative and quantitative research. The quantitative methods section of the module delivery includes a targeted lecture with guided prompt engineering, and dedicated quantitative methods tutorials facilitated by a team of statistics experts. These sessions focus on survey design, data preparation, and analysis interpretation; encouraging students to critically engage with AI-generated outputs. Our experience was that students found generative AI particularly helpful for structuring work, selecting statistical tests, and sourcing references. The approach has led to deeper engagement, reduced reliance on repeating basic support, and improved confidence among students with varying levels of statistical background. However, challenges include inconsistent staff adoption, and limited student transparency in reporting AI use.

Keywords: Artificial Intelligence, Generative AI, Statistics, Quantitative Research, Undergraduate.

1. Introduction

The use of generative AI within mathematics and student research is fraught with risk including but not limited to: the propagation of incorrect or fabricated results; erosion of conceptual understanding; diminished academic integrity; overreliance on opaque tools, bias in generated explanations; and the weakening of students' ability to reason, prove, and communicate ideas independently (Alper, 2026; Klowden & Tao, 2026). However, generative AI tools will be present for the long term, so it is important to embrace discussion and offer solutions now (Alper, 2026; Klowden & Tao, 2026). The growing consensus in the literature is that generative AI can be considered as a tool to aid in education rather than replace educators; with careful design of pedagogy the risks can be reduced while benefits can be enhanced (Samala *et al.*, 2025).

A tailored support model was introduced for students undertaking introductory business research projects. As part of a second-year business research module in the UWE Bristol Business School, students are required to develop a research question, collect data, conduct analyses, and report their findings. Delivered to over 300 students per run, the first generative AI enhanced iteration was delivered in 2024 (see Section 2 for full details).

UWE Bristol is a member of the GenAIOzUK survey study led by Coventry University (Owen *et al.*, 2025), with local institution distribution and ethical approval. This study sought to gain student perceptions of generative AI usage for undergraduate and postgraduate students with some element of statistics learning in their studies. Findings from the GenAIOzUK survey (Owen *et al.*, 2025) are presented in Figure 1 and Figure 2. Responses are from 724 higher education students across 8 universities in the UK and Australia, as at 26/3/2025.

How much are students using GenAI?

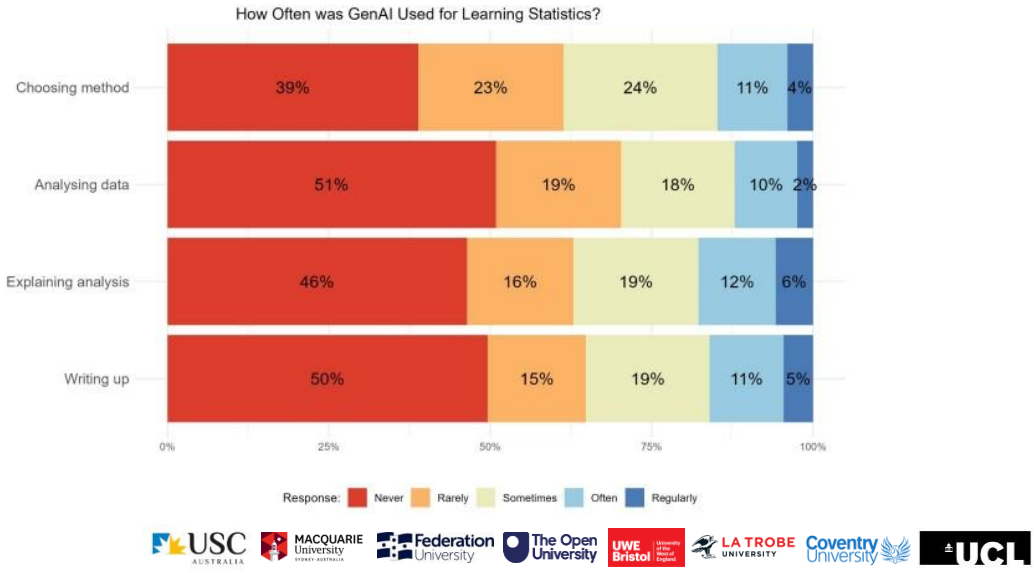

Figure 1. Student awareness, as presented at RoSE E-Conference (Owen *et al*., 2025).

What learning support do students want from us?

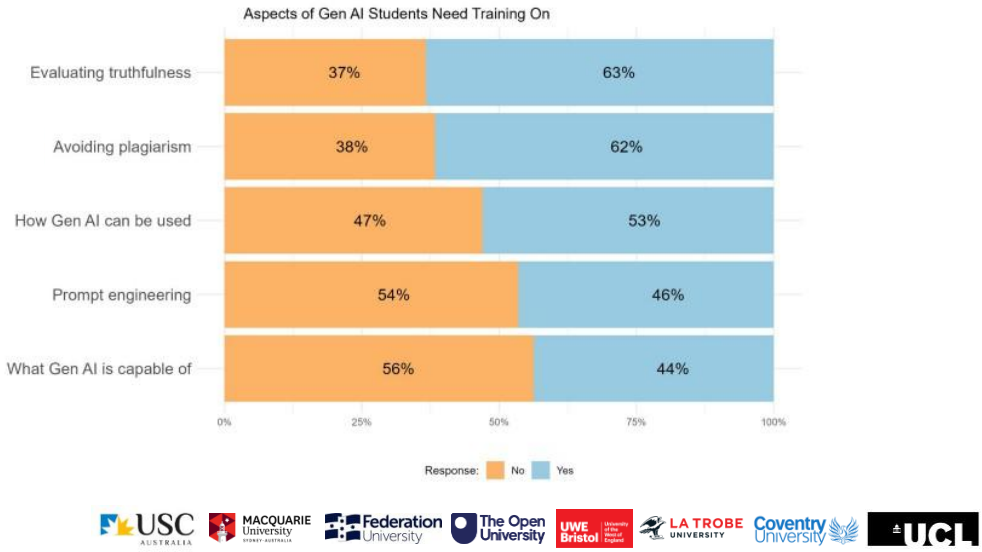

Figure 2. Student support requirements, as presented at RoSE E-Conference (Owen *et al.*, 2025).

Figure 1 shows limited awareness of the potential role of generative AI in quantitative methods. This indicates that there is scope for increasing student awareness of the support that can be provided by generative AI. The need for academic support relating to learning enhanced by generative AI is further demonstrated in Figure 2. This indicates that in many cases approximately half of all students surveyed would benefit from further training on appropriate use of generative AI. Concerns around evaluating truthfulness and ensuring academic integrity are prevalent. Large-scale survey evidence

from undergraduate statistics students in the UK and Australia shows that, despite widespread awareness and use of generative AI, many students report low trust in its outputs, anxiety about academic misconduct, and uncertainty about how to use the tools productively, highlighting the need for structured, guided approaches rather than ad-hoc adoption (Shaker, Owen *et al.*, [in press]). The GenAIOzUK study also demonstrated that generative AI usage is associated with reductions in statistics anxiety and increase in confidence while studying statistics (Shaker, Dunn *et al.*, 2026). Student confidence improves when generative AI validates their proposed analytical approaches or recommends familiar techniques, while providing additional guidance for statistical methods across a broad range of contexts. Together, these findings motivate development of structured support models incorporating generative AI in teaching and learning.

The implemented support model is grounded in two key principles: encouraging both the ethical use, and the effective use of generative AI tools. Ethical use refers to how students engage with generative AI in ways that align with academic integrity, transparency, and fairness. This includes acknowledging when and how AI has been used, avoiding plagiarism, ensuring that AI-generated content is not misrepresented as original student work, and being mindful of biases or inaccuracies in AI outputs. Effective and correct use focuses on how well students can apply AI tools to enhance their research process, learning and cognitive thinking. This involves utilising AI appropriately for tasks such as formulating hypotheses, refining research questions, exploring data analysis techniques, or interpreting statistical output, without over-relying on the technology or misapplying its capabilities.

The activity formed part of normal teaching practice and is reported here as reflective scholarship.

2. Case study detail

The statistical tools needed for the project are introduced in earlier first-year and second-year modules. Students enter with varying levels of foundational knowledge of these methods depending on prior engagement. Previous module deliveries often relied upon repeating foundational material. The integration of generative AI to support the staff-student experience changes the emphasis from teaching basics to higher-level engagement.

At the start of this second-year project, students are given a one-hour lecture on appropriate and effective use of generative AI. Students then work in small groups to complete their quantitative research projects and are offered twelve one-hour timetabled sessions with a tutor. Attendance for these sessions is not mandatory nor formally recorded.

Of the twelve weekly tutorial sessions, nine are facilitated by subject area specialists, while three are led by quantitative methods specialists. It is in preparation for, and during these quantitative methods sessions delivered by a team of statistics experts, that students are particularly encouraged to explore the use of generative AI. The three tutorials, are broadly split between:

1) study / survey design;
2) preparing data for analyses;
3) analyses / interpretation.

ChatGPT was used in the examples provided to students in the first iteration, as the best-known generative AI support tool at that time. However, in future iterations Microsoft Copilot is used, as supported and licensed by the university.

The lesson plan for the three quantitative methods tutorials includes beginning each session by reviewing preparatory work of students that have engaged with generative AI, then the academic

discussing within the individual groups while they continue working on their project. Links to university wide general principles and resources are signposted to students, with the teaching focus on the context specific use within quantitative research.

Figure 3 summarises the lecture; it gives the students an idea of aspects which they could engage with generative AI, with additional appropriate cautions given during the lecture and tutorial discussions.

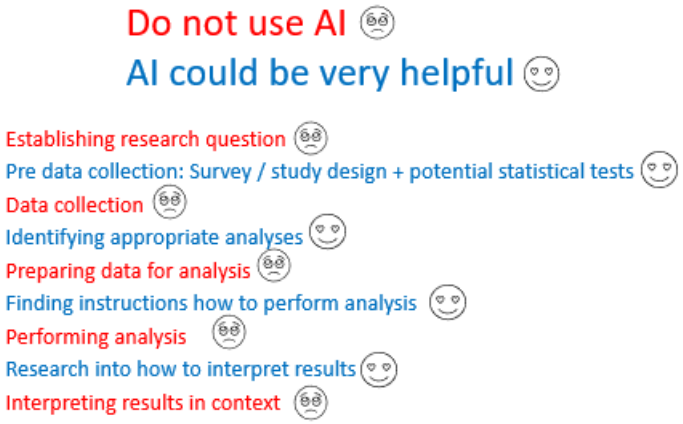

Figure 3. Slide from UMCDMA-15-2 lecture series.

Figure 3 gives students the clarity that integrated use of generative AI is permitted and encouraged for research and exploration in learning and assessment, akin to a 'green light' traffic signal from the strategy options introduced by Grove (2025).

Students are guided to consider their research question in terms of response variable and explanatory variables, so that they can generate appropriate prompts for generative AI. Students are provided examples of prompt generation for choosing appropriate statistical tests (see Figure 4 and Figure 5). The guidance provided builds upon the success of 'Stats Clinic', a statistics drop-in support service (Derrick & Weir, 2025). These prompts were developed through many hours of author experimental trial and error in ChatGPT (GPT-4) with several example scenarios, using prompts by Owen (2023) and Goodale (2024) as a starting basis.

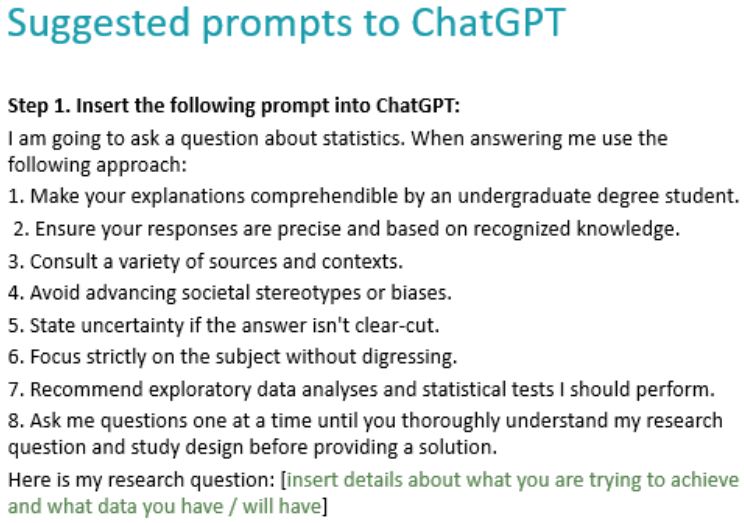

Figure 4. Slide from UMCDMA-15-2 lecture series.

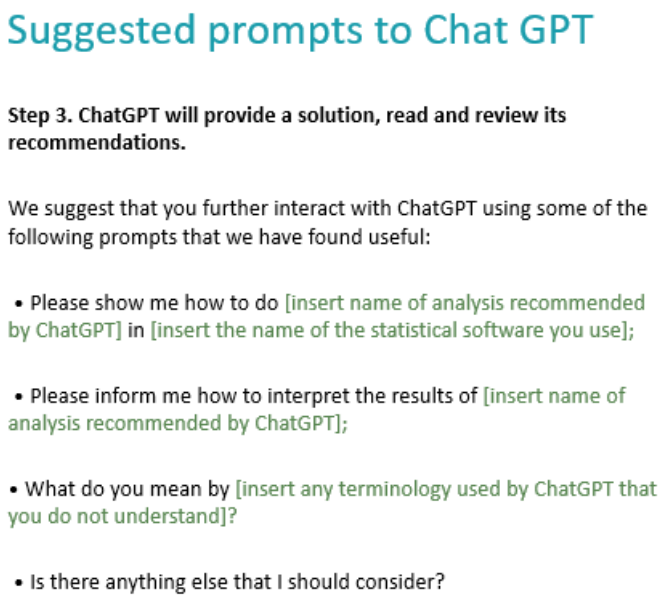

Figure 5. Slide from UMCDMA-15-2 lecture series.

The prompts are discussed with the students including discussion of additional prompts that may be useful. Generative AI help is poor where the student does not know the basics such as their research question or structure of their data. Students are encouraged to learn this point via attempting to prompt generative AI to assist with their analyses; and then identifying any poor responses that are due to student lack of engagement with, or refinement of, the recommended prompts.

Tutors provide demonstration of good and poor interaction with generative AI, including discussion of improvement. The importance of the mantra *'garbage in, garbage out'* is strongly emphasised. This highlights the idea that flawed, poorly thought-out, or irrelevant inputs such as unclear research questions, poorly designed survey questions, or poorly relayed to generative AI will inevitably lead to unreliable or meaningless outputs, regardless of how advanced the analysis tools or methods may be.

As part of the module ethos to encourage students to engage with the discussion around appropriate generative AI support, students were encouraged to complete the GenAIOzUK survey. It is observed that the act of answering the survey was a good teaching method, prompting students to consider and learn how they can use generative AI appropriately and effectively within project work.

3. Discussion

Students generally responded positively to the teaching delivery enhanced with generative AI, expressing during tutorials that they enjoy discussing the outputs, and receiving validation for relatively autonomous work. There is a shared sense among the teaching team that the groups which actively engaged in the learning approach are making meaningful progress in both their understanding and quality of their project work. Rather than revisiting basics via didactic teaching, students were able to critically interpret AI-generated outputs and build upon them, leading to richer learning experiences. A key learning point demonstrated is that students need some understanding of the topic so that generative AI can be used effectively as an assistance tool, rather than a poor replacement for the student researcher.

While 'optional' attendance is not a new feature to the module, the risk of low attendance is observed. Although overall attendance was similar to previous years, those who did attend made more

meaningful use of the sessions. Tutors also noted a decline in the number of basic support requests received ad-hoc via email or otherwise, indicating that the AI assisted approach may be helping students with lower confidence in numeracy to work more independently. At the same time, more students appeared to pursue and achieve advanced learning goals, suggesting the model not only supports weaker students but also facilitates stretch goals for stronger students.

Students that reported using generative AI during the module stated that it was useful. Within classes, recurring themes of areas where students found generative AI useful were structuring of work, finding appropriate statistical tests, and sourcing appropriate references or materials to review further. Students asked to sum up their experience of generative AI, were mostly positive, with the most frequently occurring statements including 'useful'; 'helpful'; and 'tool'. However, a smaller number of students responded negatively to the use of generative AI, with expressions of 'inaccuracies' and 'cheating'. These findings are consistent with those from the GenAIOzUK survey (Owen *et al.*, 2025).

The module leader, who is not part of the statistics delivery team but has oversight of the module and assessment submissions, reflects that there are more students using the correct tests or at least coming to a decision about which to use than a few years ago. However, few students stated details about how they utilised generative AI in either of the two requirements for assessment - a report and a personal reflection. The lack of transparency relating to the support that generative AI provided in final assessment submissions is something that we plan to resolve by adding to the reflection requirements of the assessment, and module review. Students appreciated the transparency given from our explanations of where using generative AI is encouraged or discouraged. We recommend fully setting out terms and conditions of both appropriate use and citation of generative AI in each learning activity and assessment as per Grove (2025).

A significant challenge has been coordinating a team of staff to ensure consistent delivery, particularly given the limited staff training in generative AI and the lack of consensus around its appropriate use. The varying levels of staff engagement with these processes are therefore understandable. Some staff followed the provided lesson plan closely, embraced the technology, and incorporated their own relevant ideas. Meanwhile, a few members of staff remain hesitant, preferring more traditional teaching approaches. These challenges are common across the higher education sector (Alexander and Davies, 2025). A key recommendation is to focus on building both staff consensus and training. As per the approach within this module, training should go beyond simply endorsing ethical use of generative AI. Training must also equip staff with the skills to teach with it effectively themselves, particularly in prompt engineering and critique of output. This is increasingly important as the academic role shifts toward actively training students in the effective and responsible use of generative AI.

With academic learning of generative AI being self-taught and self-researched, there are things the authors have identified that could have been done differently regarding the integration of generative AI within this module. For example, already some of the prepared classroom activity for this module is outdated, including the use of ChatGPT rather than other generative AI tools. In addition, we have begun using a Microsoft Copilot agent as an interactive AI assistant, which has in-built suggested prompts and instructions provided by academic staff to guide the responses that the tool generates, similar to that presented by Owen and Sanchez Andalco (2025). As generative AI tools evolve, the guidance we give students within the classroom and supporting materials needs to be continually monitored and evolve accordingly.

While over-reliance on generative AI is expected to pose challenges in the coming years (Lee *et al*., 2025), students who participate in course directed discussion are well positioned to develop a more balanced use of the technology.

Further work is in progress to generalise the guidance for the use of generative AI within any student research project, including exploration of the use of Microsoft copilot agent discussed above.

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