



PAPER

# Improving AI prompt literacy: experimental evidence on the effect of an online tutorial among university students

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## ABSTRACT

This study investigated university students' use of generative artificial intelligence (AI) tools, focusing on prompt literacy, user behaviour, and satisfaction with AI-generated outputs. 90 students completed a range of tasks using a generative AI tool of their choice, with half completing a tutorial on effective prompting and output evaluation. ChatGPT was used by most participants, with limited use of alternative tools and a reluctance to engage with additional features. Overall, students reported high levels of satisfaction with AI outputs, particularly for fixing codes, while satisfaction was lower for image creation and data organisation. Students who completed the tutorial were significantly more likely to produce well-structured prompts aligned with the CLEAR framework and to critically evaluate outputs. However, self-reported confidence did not always align with observed behaviours. The findings suggest that prompt literacy is a learnable skill and that tutorials can support more effective and reflective use of generative AI.

**KEYWORDS:** artificial intelligence, generative artificial intelligence, higher education, ChatGPT, academic skills, prompt literacy, GAI tools.

**ARTICLE HISTORY:** Received 17 April 2026. Accepted 22 June 2026.

## Introduction

Recently, Generative Artificial Intelligence (GAI) tools have gained attention from higher education institutions with up to 94% of university students using them for assessed work (Stephenson & Armstrong, 2026). The type of tasks that students use GAI tools for range from understanding concepts, planning assignments, writing emails, organising, coding, proofreading, finding resources, data analysis, translation, creating images, and referencing (Ellison et al., 2025; Johnston et al., 2024; Stephenson & Armstrong, 2026). Prompt literacy has been identified as a key skill in maximising use of GAI tools (Bozkurt, 2024; Knoth et al., 2024; Wang & Mo, 2025), and students have demonstrated a desire for increased training with these tools: 'I really believe using GAI successfully is a skill in itself' (Ellison et al., 2025, p. 8).

GAIs can be adaptable for personal learning strategies and can cater for students of different abilities (Walter, 2024). Walter (2024) argues that appropriate prompt engineering is essential for communicating effectively with GAIs which can ultimately support students with critical thinking, creativity, and communication. Introducing prompt strategies has been shown to improve student interactions with GAIs making them feel clearer and more natural, and can reduce writing anxiety, especially for those who have English as a second language (Alkaras, 2026; Theophilou et al., 2023). Lo (2023) developed a framework for creating effective prompts using the CLEAR method which suggests prompts should be: Concise, Logical, Explicit, Adaptive, and Reflective. Other studies have also emphasised the importance of laying out the context of the prompt (Bozkurt, 2024; Tassoti, 2024; Vaira et al., 2025), experimenting with different AI tools and formats (Joshi, 2025), and critically evaluating the AI output (Qi et al., 2025).

It is evident that comprehensive educational resources on GAI are essential in aiding both teachers and students to use GAI proficiently within academic settings. Furthermore, our research study aims to narrow this gap through discovering how proficient students are in writing prompts and evaluating outputs produced by GAI tools for various academic tasks, as well as establishing whether completion of an online tutorial had an impact on improving their prompt literacy and satisfaction with GAI outputs. Research findings will be used to create a tutorial that further supports students in effectively using GAI in alignment with their academic studies.



## Background

Vyas and Vyas write: 'GAI refers to any automated technique that generates, alters, or synthesizes data using algorithms, typically in the form of images or text that people can read' (2025, p. 20). Zhou and Schofield (2024) highlight the urgency for equipping students with AI skills as not just a matter of professional development but a necessity for their employability and to enable them to become 'AI-literate functioning global citizens in an AI-enabled economy' (Zhou & Schofield, 2024, p. 1). They also highlight that despite this push there is still apprehension about using AI in education.

The integration of GAI into the wider higher education sector is increasingly documented within emerging literature, although its longer-term impact on student learning is yet to be established. Much of this work currently focuses on 'the role of higher education institutions in taking an initiative-taking stance, rather than passively waiting for government line of actions' (Koroleva & Jomezai, 2024, p. 120). Wang et al. (2025) consider what instructional strategies teachers tend to adopt in conducting GAI enabled classroom teaching, and what role it plays in facilitating teaching and learning.

More recently Mzwri and Márta (2025) have evaluated the effectiveness of a course designed to equip students with skills in prompt engineering. They consider how AI-driven tools hold significant promise for personalised educational support. Their study examines the potential of such tools through the case of a self-regulated course titled 'I Learn with Prompt Engineering', designed to empower university students in creating precise instructions for large language models. Findings suggest the need for personalised learning models that address individuals' needs and goals, and that the course was useful for non-native speaking students with lower initial proficiency levels, whilst students with higher proficiency levels displayed minimal progress.

Knoth et al. (2024) demonstrate that although there is significant interest in large language models there is a lack of research with regards to how non-experts, for example individuals who have not been given any formal instruction, can create prompts effectively. Prompt engineering is described as 'developing and improving specific inputs for GAI models in order to obtain high-quality outputs from a model' (Liu et al., 2023, as cited in Knoth et al., 2024, p. 2). The study discusses how 'the ability to engineer effective prompts is becoming more and more important' (White et al., 2023, as cited in Knoth et al., 2024, p. 2); and how it is integral



for educators to have an in depth understanding of how to teach students to interact with large language model (LLM) based AI systems. The study argues for the integration of AI educational content 'into current curricula to enable a hybrid-intelligent society in which students can effectively utilize GAI tools, such as ChatGPT, to enhance learning processes. While learning how to create powerful instructional prompts for AI models' (Knoth et al., 2024, p. 9). They also emphasise that empowering teachers and learners with AI literacy will provide them with the skills and competencies to address future challenges and opportunities presented by the rapid development and integration of AI technologies into our lives.

Bozkurt (2024) also focuses on prompt engineering and its importance in understanding the endless possibilities of AI. He describes prompt engineering as 'the key to unlocking the full potential of GAI technologies by optimizing human-AI communication' (Bozkurt, 2024, p. 111). Bozkurt considers the key principles of creating effective prompts which includes defining objectives, providing contextual background, and using key concepts and keywords. He discusses how you should guide the AI, using examples and templates, asking for proofs to enhance credibility and ensuring information is obtained ethically. Bozkurt (2024) believes that these strategies are effective in creating a comprehensive framework for engaging with AI.

It can be seen from the literature that although the integration of GAI into the higher education sector has received significant attention there are still gaps in terms of how proficient students are in using GAI tools for different tasks, how satisfied they are using GAI tools for these tasks, whether they use different tools for different tasks (now that GAI tools are so abundant), and to what extent an intervention such as training or online tutorials can improve their ability to construct effective prompts. Existing literature highlights that there is a need to support students in using GAI effectively in both their academic studies and for future professional environments. Prompt engineering remains a key skill in teaching students how to interact effectively with GAI tools and to use the technology responsibly and ethically.

This research project aims to examine university students' habits and satisfaction when using Generative Artificial Intelligence (GAI) tools for various tasks, to discover how proficient students are in writing prompts and evaluating outputs produced by GAI tools, and to establish whether completing an online tutorial



improves their prompt literacy. Findings will inform the creation of a university-wide educational resource that will further support students' learning and their use of GAI.

## Methods

### *Expression of interest*

In order to recruit participants, a survey for students to express their interest in taking part in the study was created using JISC online surveys. This survey was open for two weeks in February 2025 and distributed to undergraduate and postgraduate taught students across all faculties using Canvas (our Virtual Learning Environment). The survey contained questions asking for the student's name, email address, level of study, and confidence in GAI (rated from —not confident at all, to 5—very confident). If they were selected, we also asked what days and times they would be available to come into the library to take part in the study.

1078 students completed the expression of interest survey. To choose 90 students to participate, the spreadsheet of responses was exported, research postgraduates were removed, and an online number generator was used to randomly select the participants.

### *User experience study*

The 40-minute slots took place in a study room in the library during March and April 2025, and students were asked to bring their own laptop, enabling them to access any technologies they were accustomed to using. Upon arrival, the students watched a short video explaining the study. Participants were assigned to either the online tutorial group or the control group using a systematic alternating method. As students were enrolled, every other student was assigned the online tutorial. Although this approach was not truly randomised, it was the most suitable due to the unpredictable number of total participants. This resulted in half of the participants initially completing an online tutorial (The University of Liverpool, 2025) created in Articulate Storyline which focused on creating effective GAI prompts and evaluating outputs. This tutorial was based around the CLEAR technique which was adapted from Lo (2023) to include more information on context, experimenting with different tools and critical evaluation:

- C: be Concise and specific.
- L: Lay out the context and background information.



- E: Experiment with various tools and formats to find what works best.
- A: Adjust and refine your prompt based on feedback.
- R: Review and critically evaluate the output.

All students were then provided with a list of 19 tasks (Appendix 1) including writing emails, fixing broken R code, creating revision flashcards, generating images, and creating elements of essays. Tasks were designed by the researchers, with some resources such as lecture notes and essay introductions created using Microsoft Copilot. 10 different versions of the tasks were assigned to participants. These versions had the same questions but in a different and random order of tasks to avoid bias in only the first few tasks being selected. They were informed that they could choose any tasks they wished and use any GAI tool to complete the tasks during their slot. After completing each task, they were asked to verbally explain how satisfied they were with the output and why. The student's screen and narration were recorded in Microsoft Teams as they completed the tasks. Once the slot was complete, the recording was saved, and the student was provided with a £20 Amazon voucher. Ethical approval was granted by the University of Liverpool's Ethics Committee (Ref 12737).

### ***Statistical analysis***

The recordings were reviewed by the five researchers. For each recording the research team recorded the tasks which the student chose to complete, the GAI tool they chose, and the student's satisfaction with the output. Reasons for student levels of satisfaction were categorised including, for example accuracy, format, tone, limitation with GAI, and for all students, it was noted which elements of the CLEAR method the student followed when completing the tasks. Statistical analysis was performed using SPSS version 29 and R version 4.5.0. A Kruskal-Wallis test was used to examine differences between satisfaction scores of each task, and confidence in using AI between each faculty.

For examining whether students followed the CLEAR method, each student was recorded as: never, sometimes, or always doing each aspect of the CLEAR method (for example, review and critically evaluate the output). Each aspect of the CLEAR framework was cross tabulated with whether or not the student had completed the online tutorial. Associations were analysed using Chi square tests, unless expected cell counts were less than five in which case a Fisher's exact test was used. An overall CLEAR score was also calculated for each student (never= 0, sometimes= 1 and always= 2). A Mann-Whitney U test was used to examine (1) differences in



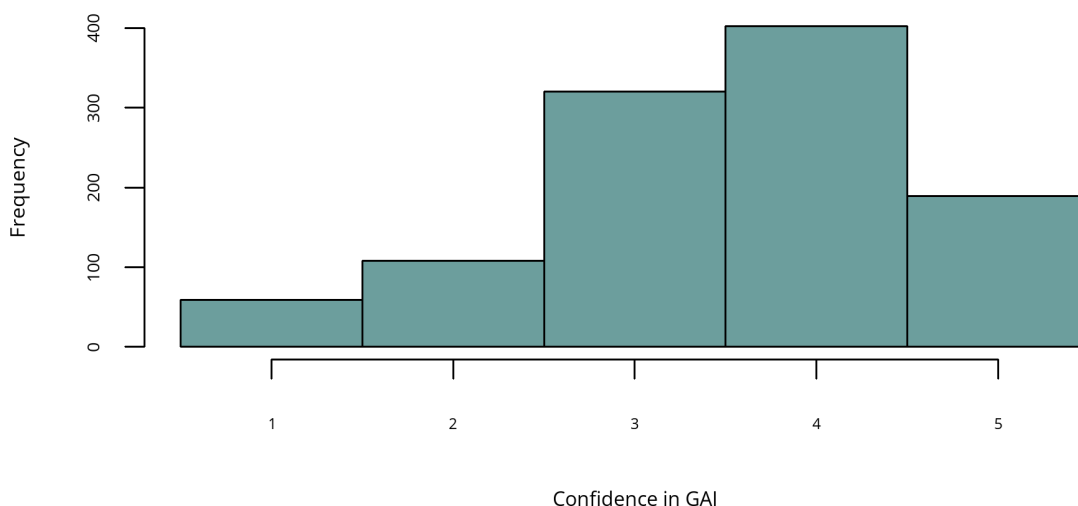
the overall CLEAR score and (2) mean satisfaction of tasks and whether or not students had completed the online tutorial. Spearman's Rank correlation was used to explore the relationship between overall CLEAR score and (1) confidence in using GAI technologies and (2) the number of tasks completed. All data are available in The University of Liverpool's Data Repository (Parsons, 2025).

## Results

### *Expression of interest*

There were 1078 students who completed the expression of interest survey. The distribution of students from across the three different faculties appeared to be even and the majority of students rated their confidence in using GAI technologies as three or higher (Figure 1). Students from the Science and Engineering faculty had significantly higher confidence in AI (mean rank 620.79) than students from Health and Life Sciences (mean rank 471.10) and Humanities and Social Sciences (mean rank 508.79) ( $H_{(2)} = 48.719$ ,  $P < 0.001$ ).

**Figure 1. Histogram showing the distribution of student confidence in using GAI technologies where 1= not confident at all, 5= very confident, N=1078.**



### *User experience study*

Due to 108 non-attenders, 198 students were invited to participate in the user experience study overall. This resulted in 90 students taking part in the user experience, with 45 students



completing a tutorial before performing the tasks and the remaining 45 not completing the tutorial. Of the 90 students who took part, 83.3% were undergraduate and 16.7% were taught postgraduates. Within this cohort, the proportion of students from each faculty was representative of the university with Humanities and Social Sciences representing 43.3% of participants, Health and Life Sciences representing 26.7%, Science and Engineering representing 28.9%, and 1% belonging to multiple faculties.

ChatGPT was used by the vast majority of students with the next most popular technologies being CoPilot and Gemini, although the number of users for these technologies was considerably less (Table 1). The following versions of ChatGPT were observed: ChatGPT-4o, ChatGPT-4o-mini, ChatGPT-o3-mini-high and for those who had a subscription, ChatGPT 4-turbo. It should be noted that students without a subscription would often start with access to ChatGPT-4o but after a certain number of prompts, this would change to a less advanced version such as 4o-mini or o3-mini-high. Only Gemini version 2.0 flash was observed when participants used this tool.

**Table 1. GAI technologies used at any point within the study and the number of participants who used them.**

| Technology       | Number of students that used it |
|------------------|---------------------------------|
| ChatGPT          | 87                              |
| CoPilot          | 12                              |
| Gemini           | 10                              |
| Deep Seek        | 3                               |
| Apple Playground | 2                               |
| Perplexity       | 2                               |
| Grammarly        | 1                               |
| Adobe Firefly    | 1                               |
| AI Chat          | 1                               |
| Alteryx          | 1                               |
| Canva            | 1                               |
| Claude           | 1                               |
| Craiyon          | 1                               |
| Deep AI          | 1                               |



|                                 |   |
|---------------------------------|---|
| Goblin                          | 1 |
| Google Notebook                 | 1 |
| GPT Workspace                   | 1 |
| GPT for Sheets                  | 1 |
| Hugging Chat                    | 1 |
| Jungleai                        | 1 |
| Mindgrasp                       | 1 |
| Powerdrill                      | 1 |
| Quarkle                         | 1 |
| Quilbot                         | 1 |
| Recraft                         | 1 |
| Revisely                        | 1 |
| Revision.ai                     | 1 |
| Slay School AI study note taker | 1 |

The majority of students used just one type of GAI technology for all tasks, and 28 students chose to use two (Table 2). The highest number used by any one student was nine.

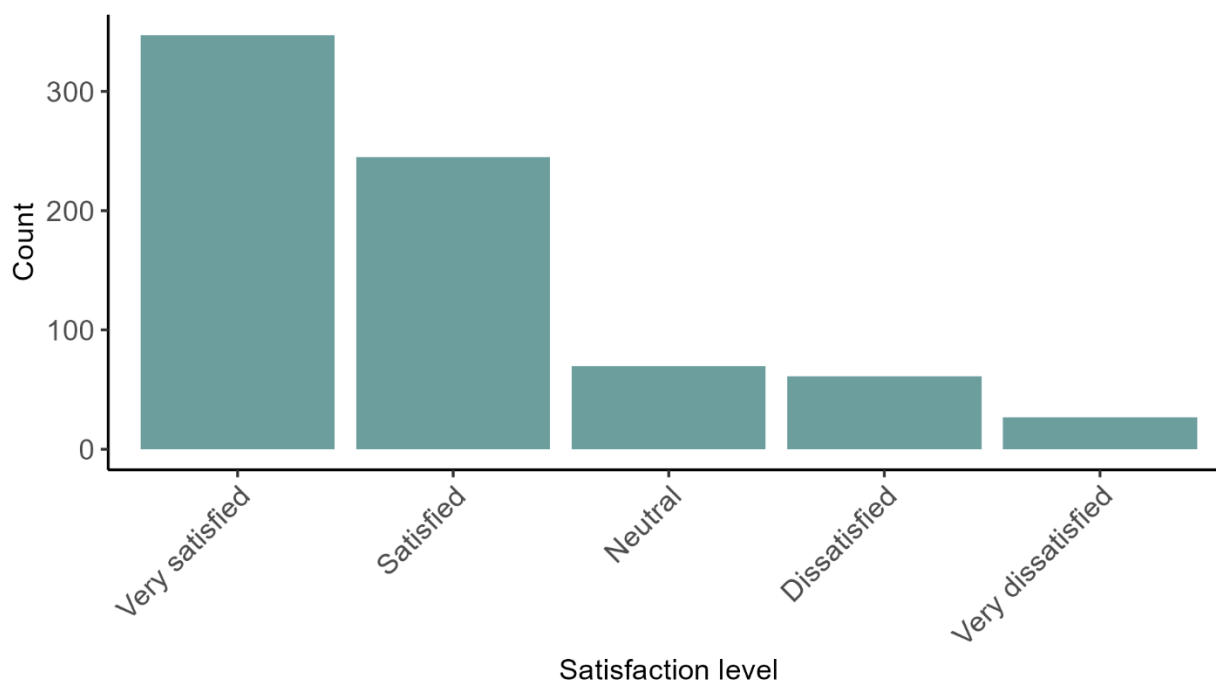
**Table 2. Number of different types of GAI technologies used by individual students.**

| Number of different types of GAIs used | Frequency |
|----------------------------------------|-----------|
| 1                                      | 55        |
| 2                                      | 28        |
| 3                                      | 4         |
| 4+                                     | 3         |

### ***Satisfaction with GAI performance for different tasks***

Due to the dominance of ChatGPT, some students using multiple GAI tools and the choice of tasks students completed, it was not possible to compare satisfaction across the different GAI tools. Overall, 79% of students selected very satisfied or satisfied for the performance of their chosen GAI therefore suggesting high levels of satisfaction with the GAI technologies (Figure 2). Table 3 lists all the tasks and the median satisfaction score.



**Figure 2. Histogram showing total number of satisfaction ratings for all tasks combined.****Table 3. Median satisfaction scores for how GAI's performed each task.**

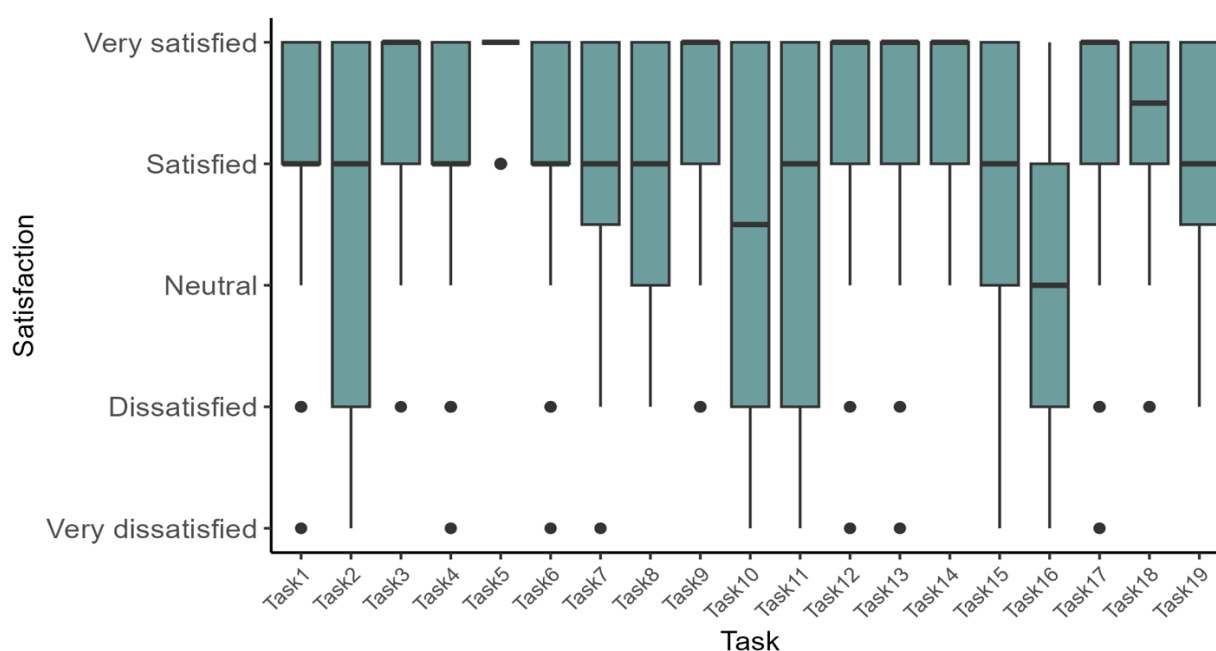
| Task                                                           | Median satisfaction |
|----------------------------------------------------------------|---------------------|
| Task 5: Fix a broken code                                      | 1                   |
| Task 14: Calculate a maths question                            | 1                   |
| Task 3: Write an email enquiring about a job                   | 1                   |
| Task 13: Create a revision quiz                                | 1                   |
| Task 12: Ask for feedback on an essay                          | 1                   |
| Task 9: Make an email more formal                              | 1                   |
| Task 17: Create a plan to distribute tasks for a group project | 1                   |
| Task 18: Create an essay plan                                  | 1.5                 |
| Task 6: Summarise a theory                                     | 2                   |
| Task 4: Request a list of sources for a literature review      | 2                   |
| Task 1: Summarise a journal article                            | 2                   |
| Task 8: Create a revision plan                                 | 2                   |
| Task 7: Create flash cards from lecture notes                  | 2                   |
| Task 19: Create an introduction for an essay                   | 2                   |
| Task 15: Interpret a statistical output                        | 2                   |
| Task 2: Create a reference for a journal article               | 2                   |

|                                                |   |
|------------------------------------------------|---|
| Task 11: Calculate the mean from a set of data | 2 |
| Task 10: Organise data in a table              | 3 |
| Task 16: Create an image for a website         | 3 |

Satisfaction ratings: 1= very satisfied, 2= satisfied, 3= neutral, 4= dissatisfied and 5= very dissatisfied.

There were significant differences in satisfaction scores across tasks, regardless of which GAI was used ( $H_{(18)} = 93.680$ ,  $P < 0.001$ ,  $N = 750$ ). Task 5, using GAI to fix a broken code, received the highest satisfaction scores overall and this was significantly higher than several other tasks (Figure 3 and Table 1). This task also showed the least amount of variation in satisfaction scores between different students, whereas tasks 2, 10, 11, 15, and 16 showed the most variation between different students (Figure 3). Several other tasks also received consistently high satisfaction ratings such as Task 14, calculating a maths question, Task 3, emailing about a job, Task 13, creating a revision quiz, Task 12, requesting feedback on an essay, and Task 9, making an email more formal. These tasks also showed significant differences between the satisfaction scores of several other tasks, although this significant difference did not remain after correcting for multiple comparisons. Conversely, Task 16, creating an image for a website, and Task 10, organising data in Excel, received the lowest satisfaction scores and these were significantly less than the satisfaction scores for several other tasks (Figure 3 and Table 1).

**Figure 3. Box plot showing the median satisfaction scores given by students for each task. Open circles indicate an outlier and \* indicates a significant outlier.**



**Table 4. Tasks with highest and lowest satisfaction scores with most common reasons for satisfaction scores including quotes from students.**

| Task                       | Most common reason | % of participants who completed this task who gave this reason | Example quotes                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------|--------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5. Fix broken code         | Accuracy           | 88.9%                                                          | <p>'Chat GPT fixed the code easily and explained clearly.'</p> <p>'The AI correctly found and solved the problem.'</p>                                                                                                                                                                                                                                                                                                                                       |
| 14. Maths calculation      | Accuracy           | 72.4%                                                          | <p>'Very happy with how the AI broke down the workings out into steps and explained each step to get the right answer.'</p> <p>'It calculated the correct answer and broke it down into bullet points.'</p>                                                                                                                                                                                                                                                  |
| 13. Create a revision quiz | Format             | 44.9%                                                          | <p>'I am surprised by the mixture of multiple choice/short answer questions/true/false options. The quiz reflects exam papers well and links to what I have learnt in lectures. I would use ChatGPT for this again in the future!'</p> <p>'I love that it's given different types of questions - that's so helpful and the content is spot on, and the amount of questions is ideal, and it's given options for more. That's exactly what I would need.'</p> |
| 12. Feedback on essay      | Tailored response  | 48.7%                                                          | <p>'Impressed that they have given strengths and areas for improvement in the feedback. It was important to state that it was university level to get relevant feedback.'</p> <p>'I am happy that the AI took text specifically from the essay and gave suggested improvements and also justified why those changes should be made.'</p>                                                                                                                     |

|                                   |                    |       |                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------|--------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9. Make an email more formal      | Tone               | 83.1% | <p>'Exactly what I wanted—a more formal tone with a subject header. The previous message was inappropriate, but the new message is something you could send.'</p> <p>'Very satisfied because it's to a lecturer and it introduces it the way I would like it to be introduced. It's very different to the one written in the prompt which was very informal, I'd be happy to send this off.'</p> |
| 16. Create an image for a website | Limitations of GAI | 40.9% | <p>'ChatGPT won't allow me to create an image if I am not logged in.'</p> <p>'Couldn't create in ChatGPT or CoPilot without signing in.'</p>                                                                                                                                                                                                                                                     |
| 10. Organise data into a table    | Limitations of GAI | 32.0% | <p>'It says I have reached data analysis limit for ChatGPT—seems more restrictive than usual.'</p> <p>'ChatGPT has limit to number of documents can upload with free version so can't complete this task.'</p>                                                                                                                                                                                   |

Some example reasons for satisfaction scores are provided in Table 4. Students were satisfied with fixing broken codes and maths questions because they felt the answers were accurate and well explained. The format, diversity of questions, and tailored responses were common reasons for students being satisfied with revision quizzes and feedback on essays, while students also appreciated the tone GAI tools used for writing emails (Table 4). Conversely, students were less satisfied creating images and organising data due to the limitations of using GAI tools when not logged in (Table 4). Several comments were also made about outputs appearing to be 'obviously AI' especially for the images task.

### ***Measuring impact of tutorial on prompt literacy***

Students who completed the online tutorial had a significantly higher mean rank score for following the CLEAR method (59.88, N= 45) compared to students who did not complete the



tutorial (31.12,  $N=45$ ) ( $U=365.500$ ,  $P<0.001$ ). When examining each aspect of the CLEAR method, writing clear and specific prompts (Table 5), and laying out the context and background (Table 6) were associated with tutorial completion. Experimenting with various tools and formats was the only aspect of the CLEAR method which was not affected by tutorial completion (Table 7). Adjusting and refining the prompt (Table 8) and critically evaluating the prompt were also associated with tutorial completion (Table 9).

Confidence in using GAI technologies was not associated with following the CLEAR method overall ( $r_s=0.128$ ,  $P>0.05$ ,  $N=90$ ), suggesting that completing the tutorial had a favourable effect on prompt literacy but that confidence levels in using GAI technologies were not associated with better prompt literacy. In addition, there was a negative relationship between the number of tasks completed and following the CLEAR method overall ( $r_s=-0.282$ ,  $P<0.01$ ,  $N=90$ ), demonstrating a moderate trend for students who completed more tasks to adhere less to the CLEAR criteria.

**Table 5. Frequency of students who did or did not complete the online tutorial and whether they never, sometimes or always wrote clear and specific prompts.**

|                 |     | Never | Sometimes | Always | Total |
|-----------------|-----|-------|-----------|--------|-------|
| Tutorial yes/no | No  | 0     | 16        | 29     | 45    |
|                 | Yes | 1     | 6         | 38     | 45    |
| Total           |     | 1     | 22        | 67     | 90    |

(Fisher's exact test  $P<0.05$  with Cramer's  $V=0.274$  indicating a weak association)

**Table 6. Frequency of students who did or did not complete the online tutorial and whether they never, sometimes, or always laid out the context and background information.**

|                 |     | Never | Sometimes | Always | Total |
|-----------------|-----|-------|-----------|--------|-------|
| Tutorial yes/no | No  | 13    | 24        | 8      | 45    |
|                 | Yes | 1     | 18        | 26     | 45    |
| Total           |     | 14    | 42        | 34     | 90    |

( $\chi^2_{[2]}=20.672$ ,  $P<0.001$  with Cramer's  $V=0.479$  indicating a moderate association)



**Table 7. Frequency of students who did or did not complete the online tutorial and whether they never, sometimes, or always experimented with various tools and formats.**

|                 |     | Never | Sometimes | Always | Total |
|-----------------|-----|-------|-----------|--------|-------|
| Tutorial yes/no | No  | 27    | 17        | 1      | 45    |
|                 | Yes | 25    | 18        | 2      | 45    |
| Total           |     | 52    | 35        | 3      | 90    |

(Fisher's exact test  $P > 0.05$ )

**Table 8. Frequency of students who did or did not complete the online tutorial and whether they never, sometimes, or always adjusted and refined their prompts.**

|                 |     | Never | Sometimes | Always | Total |
|-----------------|-----|-------|-----------|--------|-------|
| Tutorial yes/no | No  | 18    | 23        | 4      | 45    |
|                 | Yes | 3     | 22        | 20     | 45    |
| Total           |     | 21    | 45        | 24     | 90    |

( $\chi^2_{[2]} = 21.403$ ,  $P < 0.01$  with Cramer's  $V = 0.488$  indicating a moderate association)

**Table 9. Frequency of students who did or did not complete the online tutorial and whether they never, sometimes, or always reviewed and critically evaluated the output.**

|                 |     | Never | Sometimes | Always | Total |
|-----------------|-----|-------|-----------|--------|-------|
| Tutorial yes/no | No  | 12    | 25        | 8      | 45    |
|                 | Yes | 2     | 13        | 30     | 45    |
| Total           |     | 14    | 38        | 38     | 90    |

( $\chi^2_{[2]} = 23.669$ ,  $P < 0.001$  with Cramer's  $V = 0.513$  indicating a moderate association)

To account for variation in the number of tasks completed, a mean satisfaction score was calculated for each student which indicated no significant difference between those that had completed the online tutorial and those who had not. However, there was a significant difference in the number of tasks completed between the two groups ( $U = 648.5$ ,  $P < 0.01$ ), with students who did not complete the online tutorial completing a greater number of tasks (mean rank = 53.59) than those who did complete the tutorial (mean rank = 37.41).

### ***Observations of student behaviour***

Several students displayed elements of good practice when using GAI, for example starting a new chat when moving on to a different task, using different GAI tools for different tasks,



trying the same task in multiple GAIs, pasting sections of text to summarise rather than one large piece in one go, specifying how information should be presented, for example, bullet points or a table, and using quotation marks to emphasise the topic or essay question.

Conversely, examples of bad practice included continuing with the same chat for different tasks which often resulted in the GAI providing an answer based on the previous task, students copying the task word for word without editing, copying a link into a GAI such as ChatGPT and expecting it to access an article from that link, not checking the output for accuracy, persevering with the same GAI even when it could not perform the task, only using one or two GAIs despite the range of tasks, and not logging in (even for free) which often restricted functionality. These examples of good and poor practice have been integrated into the University of Liverpool's online Library tutorial for creating prompts for GAI (The University of Liverpool, 2025)

In addition, it was noted that some students would treat the GAI as a person, greeting it, thanking it and using polite language. It was also observed that several students who did explore other GAI tools were deterred if they were required to log in, even at no cost.

## Discussion

### *GAI tools used*

ChatGPT (OpenAI) was the dominant technology chosen by students in this study, despite the university providing a free account for Microsoft Copilot and the abundance of AI technologies that are now available. Similar results were observed from students at the same university in 2024 where 60% of students chose to use ChatGPT at some stage of the research/planning process stating 'ChatGPT is my go-to AI, don't know any others to use—I use it for almost all my essays' (Johnston et al., 2025, p. 7). A similar dominance has been recorded at other institutions too (Lee, 2024; Sousa & Cardoso, 2025). It was noted that despite the variety of tasks in this study, students rarely used more than two GAI tools, and the majority used just one. This was the case even when the chosen tool was unable to perform the specific task. This is consistent with previous research from The University of Liverpool where 33% of students who used a GAI tool chose to use more than one technology, compared to 39% in the present study (Johnston et al., 2025, p. 7). These results suggest that



the majority of students do not adjust the GAI tool depending on the task, and that this could be an area for developing students' skills when using GAI tools.

### ***Student satisfaction with GAI tools***

Overall, there were high levels of satisfaction with the outputs from GAI tools, with some tasks rated consistently as very satisfied or satisfied, such as fixing broken codes, maths calculations, creating revision quizzes, and receiving feedback on essays. Similarly, Vieriu and Petrea's (2025) research suggests that virtual assistants are the most used AI applications (88.2%), providing support for information retrieval, task management, and real-time feedback. It is interesting to note that in a large international study of over 20,000 students, the most common reasons for using ChatGPT were for brainstorming, summarising, finding information, academic writing, and practising for exams (Ravšelj et al., 2025). Similarly, Stephenson and Armstrong, (2026) noted that explaining concepts and summarising articles were among the most popular uses for GAI related to assessed work. Whilst there are some similarities with the present study, tasks which involved summarising did not receive the highest satisfaction scores. This suggests that although students remain curious in using AI related applications to summarise tasks there are perhaps limitations in the AI's current capabilities to perform such processes or meet the expectations of the user.

Satisfaction was less consistent for other tasks, but sorting/calculating data from spreadsheets and creating images resulted in consistently low satisfaction scores. Students generally commented on the accuracy of the GAI when giving a high level of satisfaction for tasks such as fixing broken codes and maths questions. They also commented on the way the information was broken down in a way that was easy to understand and that they appreciated tailored feedback. GAIs are well known for their strengths in coding (Piccolo et al., 2023) and it has been noted previously that students believe that one of the benefits of GAIs is to break down information into less complex explanations (Lee, 2024; Ravšelj et al., 2025). Conversely, low satisfaction scores were regularly due to limitations of the GAI, often due to the student persisting with the same GAI tool, or not logging in to maximise the features such as uploading files or creating images. Several students also commented that an output 'looked obviously AI generated' which would result in lower satisfaction scores. Previous research has also identified concerns among students that GAIs lack a human touch (Al Abri et al., 2025), suggesting this remains an important consideration for students, who in addition,



may have unrealistic expectations around GAI abilities. This and other studies have reported that time saving is an important consideration for students when using GAI tools (Al Abri et al., 2025; Lee, 2024; Stephenson & Armstrong, 2026) and although this was not a common reason given in the present study, several students spent a limited amount of time over each task, and it was often these students who failed to follow the CLEAR technique. This could be inferred from the negative association between number of tasks completed (indicating less time spent on each task) and following the CLEAR method. Overall, it appears that there are still differences in opinions when it comes to student satisfaction when using GAI tools for different tasks, but strengths in coding and tailored responses appear consistent. Furthermore, there is a concern that students prioritise the speed of the prompt/output, rather than the quality, and their lack of knowledge about how to use the GAI tool (for example, not signing in) reduces the quality of the output.

### ***Effects of online prompt tutorial***

Each element of the CLEAR technique was improved by completing the online tutorial with the exception of experimenting with different tools and formats, which can largely be explained by students' resistance to using multiple GAIs or their resistance to logging in to access certain features. Completing an online tutorial, centred on the adapted CLEAR technique, appeared to improve the quality of students' prompts and may have encouraged students to spend longer on each task, resulting in fewer tasks completed. However, it is important to note that students who completed the online tutorial had less time for tasks, with completion of the tutorial taking approximately five minutes. As such, this finding should be interpreted with caution and may reflect a combination of reduced available time and more deliberate engagement with individual tasks. Furthermore, completion of the online tutorial did not translate into increased satisfaction with outputs.

It has been suggested previously that following a prompt strategy improves satisfaction with GAI outputs (Tassoti, 2024), although this was not the case in the present study. Recent work has suggested that there may be benefits to using more of a dialogic approach to prompting with advantages such as improving students' fact-checking and critical questioning, and moving students from passive to active interaction (Tang et al, 2025; Yan et al., 2025). These approaches view prompting as an ongoing and conversational process, in contrast to the CLEAR framework used in the present study which is a more structured prompt-response



model. Therefore, had the online tutorial in the present study encouraged more of a dialogic approach, results may have differed, including satisfaction with the outputs. Nevertheless, a key element across both structured and dialogic approaches is critical analysis which is why the CLEAR method was chosen. Interestingly, the participants' ability to follow the CLEAR method for creating prompts was not associated with their self-reported confidence in using GAI, suggesting that students may overestimate their abilities in using GAI and creating prompts. This potential overestimation is reflected throughout this study. Despite relatively high levels of reported confidence in AI, students' reluctance to sign in to the AI tools, use additional features, and to match different tools to the different tasks demonstrates that their self-reported confidence may not reflect their understanding of GAI capabilities, but rather their familiarity with a particular tool. Lee et al. (2025) reported that increased confidence in GAI was associated with less critical thinking, but overall self-confidence was positively associated with critical thinking, whilst Tassoti (2024) also noted that students over-estimate their ability to create specific and clear prompts and that 'perceived correctness' decreased for higher levels of education. They suggest that self-reflection of students' own prompts is an important step in prompt engineering.

The CLEAR technique (Lo, 2023) was adapted to include 'review and critically evaluate the output' as this is a crucial element of interacting with GAI tools (Lee & Low, 2024). Improving critical thinking skills has been highlighted as one of the most important skills for university students to develop (Davies & Barnett, 2015). The present study reveals that critical thinking skills can be improved with a short online tutorial and therefore suggests students can improve their GAI skills after a relatively short but well-timed intervention. In addition, this is an excellent example of how learning developers, librarians, and professionals in other similar roles across academia can demonstrate their value.

### ***Student behaviour***

It was noted that several students chose to copy and paste the task question without editing it and this is a pattern observed by Tassoti (2024), where 60% of participants chose to copy and paste the question without editing the prompt. This was attributed to a lack of understanding of how a short and simple prompt might not be as effective as a conversational prompt with less technical language (Tassoti, 2024). Of the students who explored alternative GAI tools, several abandoned the tool when asked to register or sign in, even at no cost and it was noted



that several students who used ChatGPT were not signed in. Several universities provide access to a GAI tool at no cost for students (most commonly Microsoft Copilot due to its data protection policy (Microsoft, 2025)); however, it is unclear if students are fully aware of the capabilities of tools such as Microsoft Copilot and the free access provided, whether they simply prefer other tools such as ChatGPT, or whether they choose to avoid a GAI tool associated with a university for fear of breaching academic integrity policies.

## Recommendations

These examples of good and poor practice should be used to educate students in designing prompts for GAI tools. Several students demonstrated good practice which should be encouraged when using a GAI tool. These include starting new chats for new topics, using different GAI tools for different tasks, summarising small sections of text at a time, specifying how information should be presented, and logging in to gain access to additional features. Examples of poor practice which should be discouraged included pasting a link into the GAI tool and expecting it to access it, persevering with the same GAI tool when it produced an unsatisfactory answer, and not critically reviewing the output.

## Limitations

It is unknown how long the effects of the tutorial persisted and whether or not the students continued to use these skills. Some task questions were already concise and did not require much editing from students. This combined with the fact that example topics given for some tasks were not aligned with the students' subjects, meant that students did not have as much freedom to create the prompts from scratch; if they had, this might have resulted in more realistic prompts. Furthermore, students were aware they were being recorded, and this might have altered their behaviour, for example, being reluctant to sign into GAI tools (which might reveal previous conversations). Although confidence in AI was evidenced, prior experience with AI was not recorded as part of this study and this may have influenced student behaviour. There were an insufficient number of students with self-reported disabilities/neurodivergence in the user experience study to draw any conclusions in terms of behaviour or satisfaction. However, this would be of great interest and future studies should focus on how these students may differ when it comes to choosing a GAI tool and their satisfaction with different tasks.



## Conclusion

ChatGPT appears to be the most popular GAI tool for students within this study and evidence suggests that students do not commonly adjust the GAI tool depending on the task. Students demonstrated the highest levels of satisfaction for tasks involving coding and tailored feedback, likely reflecting the perceived abilities of GAI tools. The lowest levels of satisfaction were recorded for tasks involving organising/calculating data from spreadsheets and creating images. These were largely attributed to students not signing in to make the most of extra features within these tools or persevering with tools which could not perform certain tasks. Some students appeared to prioritise the speed of the output over the quality of the prompt or output and it was often these students who failed to follow the CLEAR technique for creating prompts. Completing an online tutorial that focused on creating effective prompts significantly improved the quality of the prompts although no increase in satisfaction with the outputs was observed. There was evidence to suggest that students may over-estimate their ability to create effective prompts, and that self-reflection of their prompts would be beneficial. The improvements observed after students completed the online tutorial provide learning developers, and those in similar roles, tangible evidence of their impact and value.

Areas for student upskilling include training students to use the most suitable GAI tool for the task, encouraging them to sign in to GAI tools such as university recommended GAI tools, prioritising the quality of the prompt and output over the speed, and taking time to reflect on their prompts. This study has demonstrated that even a short online tutorial can effectively teach these skills and lead to measurable improvement in GAI prompt engineering and evaluating outputs.

## Acknowledgements

With thanks to The Centre for Innovation in Education, University of Liverpool, for funding the present study.

## Disclosure statement

The authors used the following generative AI tools in the preparation of this manuscript: Microsoft Copilot. Copilot was used to create some of the tasks students completed in the study, for example, creating pretend lecture notes. The tasks relevant to methodology are



explained in the Methods section. The authors have complied with the journal's principles of AI use.

## Funding

This study was funded by a grant obtained from the Centre for Innovation in Education at The University of Liverpool. Funding was received in 2024.

The authors have no competing interests to declare that are relevant to the content of this article.

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