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Exploring AI-generated output through assessment in a university setting: a case study

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Abstract

Generative AI and large language models have a significant impact on education and business, creating a pressing need for universities to act and support students in their development and understanding of these new technologies. While several emerging studies have investigated the use and perceptions of AI by students, few focus on how educators can actively engage students in developing their critical understanding. We discuss an innovative assessment approach that exposes students to AI using an AI-generated output, focusing them on evaluating output quality, and then use a survey to examine its success. The assessment intervention allowed them to explore and develop their understanding of the risks and limitations of AI.

Keywords: assessment; artificial intelligence; higher education; AI literacy.

Introduction

As artificial intelligence (AI) and large language models (LLMs) like ChatGPT have emerged, universities and government policymakers have needed to react quickly to understand their potential disruption to higher education (HE). This has been evidenced throughout the world, where long-standing and established education systems, for

example in the United Kingdom (UK) and the United States (US), have been unable to grasp the extent to which AI is a threat and/or a tool to benefit education (European University Association, 2023; Faguy, 2023). Recent conversations within HE providers and individual disciplines highlight the need for a clearer understanding of how AI has infiltrated all aspects of university education with some calling for action to critically reflect on the transformative nature of this technology (see, for example, Ansari, Ahmad and Bhutta, 2023; Ballantine, Boyce and Stoner, 2024; Cotton, Cotton and Shipway, 2023; and Li et al., 2023).

A common focus of the emerging literature is students' perceptions and use (or abuse) of AI. For example, according to recent evidence from a large survey of UK undergraduate students (Freeman, 2024) more than one in two respondents (53%) have used generative AI to help them with assessments. However, what is worrisome is that more than one in three student users (35%) do not know how often these tools produce made-up facts, statistics or citations with the suggestion that a 'digital divide' (Freeman, 2024, p. 1) may be emerging. The same study highlights the difficulties higher education institutions (HEIs) are facing in addressing AI and assessment; for example, only 9% of respondents suggested their institutions had significantly changed their approach to assessments, with 24% suggesting no change had been made; and supporting students, where only 21% were satisfied with the support they received.

AI promises many opportunities within the HE system. Kasneci et al. (2023), for example, identify a range of applications in learning and teaching, including empowering learners with disabilities and supporting academics in providing more timely feedback using semi-automated grading. Further, Ansari, Ahmad and Bhutta (2023) identify AI as a teaching assistant, a personalised tutor, an assessment partner and a co-researcher. The power and potential of these opportunities need to be balanced to effectively integrate current and future innovations into educational practices to push forward disciplinary pedagogy (Farrokhnia et al., 2023; Ratten and Jones, 2023). Awwad (2024) highlights the important role HE plays in the education and empowerment of individuals when innovations such as AI arise:

> AI and all it will bring will soon permeate our lives and workplaces, making it beneficial for students to gain exposure to and experience with these technologies. What better way to learn about AI in a controlled, supportive environment than in the classroom? (Awwad, 2024, n.p.)

Following this premise, we implemented an assessment intervention in late 2023 to allow students to reflect on the strengths and (then current) limitations of AI while developing their expertise, understanding and ethical awareness of this emerging technology. In a recent study, Yiğit et al. (2024) conducted in-depth interviews with 10 Health Science students to understand their perceptions of ChatGPT, their experience and their future expectations. They identify the importance of critical thinking when using AI, specifically using it responsibly. This case study adds to this literature by describing the use of an assessment innovation that allows students to engage with an AI-generated output to develop their understanding and critical view of these tools. By employing a survey instrument with both closed and open questions, we collected data on the current position of student use of AI and their reactions to the described assessment intervention.

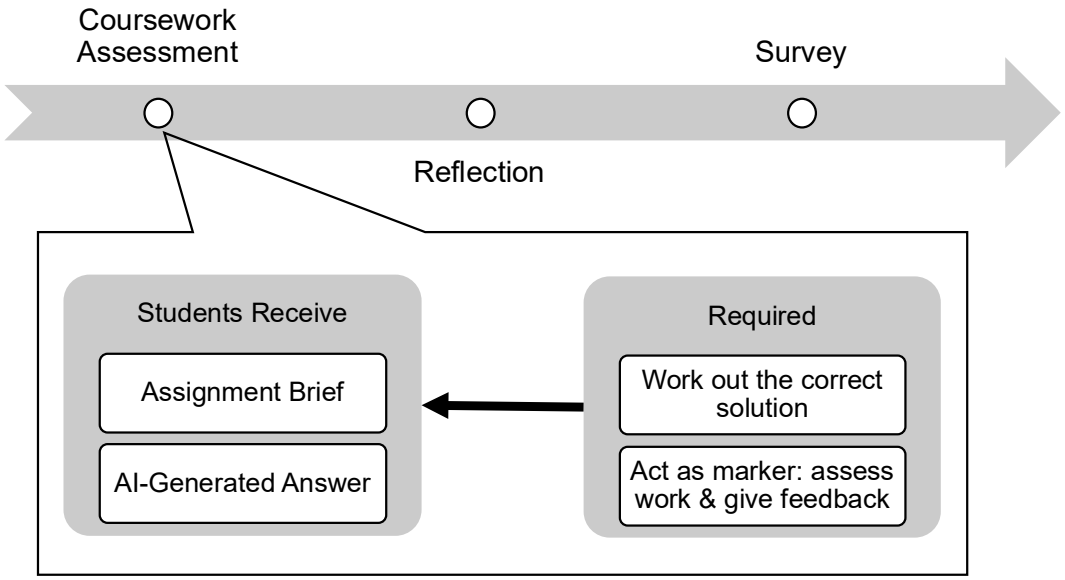
Assessment (re-)design

As the first academic term of 2023/2024 approached, numerous calls were made to reflect upon the emergence of AI and its impact on the quality and reliability of assessment (Hack and Knight, 2023; Moorhouse, Yeo and Wan, 2023; Preece, 2023; Webb, 2023). Although some bodies initially proposed to ban and prohibit the use of AI within their education systems, the realisation of how this technology has proliferated within the education landscape made enforcement unrealistic, and therefore, an education and training approach has been championed (Heaven, 2023). Accounting and Finance is an arena that mixes technical, analytical and critical thinking skills (Paisey and Paisey, 2007). Academics teaching in this space were thus faced with the nuanced challenge of educating students on the appropriate use of AI as a tool, while acknowledging its pitfalls and limitations (Ballantine, Boyce and Stoner, 2024). The authors of this paper reflected on their own assessments with a focus on how they may be re-designed to integrate AI and allow students to reflect on their (potential) use of this emerging technology (Kisfalvi and Oliver, 2015; Awwad, 2024).

One example of a re-designed assessment is described and evaluated in this case. The re-designed assessment sat within a module that taught Accounting and Finance students key mathematical skills, while allowing them to explore their application within the context of business, and represented 25% of the overall module mark. Before the re-design, students were asked to solve several mathematical problems, including applications in an

Accounting and Finance context. Upon reflection by the module teaching team, concerns were raised regarding the emergence of AI and how students, either intentionally or unintentionally, may use freely available AI software to solve the assessment. Further, as the assessment sat within the suite of first-year modules, the team were also concerned about the potential lack of understanding among students of what is acceptable behaviour regarding AI and academic misconduct. A new assessment was implemented, as illustrated in Figure 1, to address this perceived lack of student understanding of the ethical and responsible use of AI.

Figure 1. Intervention and case assessment.



The new assessment used a case study approach in which students were asked to review and mark a pseudo-student submission addressing a set assessment (Kreber, 2001). Students were issued the following: (1) the case, consisting of an assignment brief requiring the achievement of various learning outcomes (see Table 1 for the assessment's structure and brief assessment approach), and (2) a pseudo-student submission. The pseudo submission was AI-generated using ChatGPT-3.5 in September 2023 (OpenAI, 2022). At the time of sourcing an AI response, ChatGPT's performance in solving mathematical problems was not of a sufficiently high standard to pass a course convincingly, though this has changed with new versions since then (Frieder et al., 2023). In turn, the pseudo-student submission contained sufficient variation in quality to challenge the students and test their abilities across all subject matter and skills. Students were asked to step into the role of instructor and examine the quality of the provided solution by

reviewing the work before marking and providing feedback on the submission as part of a coursework assignment. To evaluate understanding and the relevant intended learning outcomes of the original assessment, model answers to the case assignment brief were not provided to the students, requiring them to create their own solutions to mark and provide feedback (illustrative solutions) on the pseudo-student submission.

Table 1. Assessment structure.

Question	Learning Level	Approach
1	Understanding and Application	Solve and graphically represent a linear equation
2	Understanding and Analysis	Evaluate statements with supporting explanations.
3	Memory, Understanding and Application	State a number of different mathematical concepts and link them to a specific subject, e.g., Accounting or Finance.

Measuring the success of the re-design

To examine the learning of students once exposed to AI, it was important to facilitate the opportunity for individual reflection within a safe environment, enhancing the experiential learning that the assessment re-design provided (Kisfalvi and Oliver, 2015; Veine et al., 2020). A survey was administered to students after the assignment submission deadline in late 2023. The survey included questions on the students' perceptions of generative AI, their experiences using AI tools, lessons learned from the assessment, and general demographic information (the instrument is available in the Appendix).[1]

The students engaged in this study were all registered on an undergraduate course in the area(s) of Accounting and(or) Finance at a research-intensive UK University and required to complete the module associated with the re-designed assessment. In total, 132 undergraduate students completed the module assessment, of whom 44 students (33.3%) participated in the study by completing the post-assessment submission survey.[2] The

[1] Ethical approval for the study was obtained from the Faculty of Humanities and Social Sciences ethics committee (Research Ethics Approval Number: 1 2023 8087 6924). All participants received a participant information sheet (PIS) and provided written consent.

[2] The response rate and sample size are in line with recent literature demanding a balance between the timeliness of emerging areas of research and the rationale for increased response rates (Hendra and Hill, 2019; Bourne and Bell, 2024). Nonetheless, we acknowledge that lower response rates can limit the generalisability of the findings.

average survey respondent was 19 years old (std. dev. = 1.31 years), and 80% (20%) of the sample identified as male (female), which is largely representative of the wider cohort.

Current understanding and use of AI

This section explores how the students who undertook the re-designed assessment currently use AI.

Over half (58.70%) of respondents reported that they had used ChatGPT before, but fewer than one in ten students (7.79%) used ChatGPT or other AI tools on a daily basis. Instead, most students reported occasional use, with 50% stating that they had only used such tools once or twice. About one in four respondents reported that they were not interested in using ChatGPT in their day-to-day work, with the majority of students classifying their interest as 'very little' or 'somewhat'. Only about 5% of respondents indicated that they were interested 'to a great extent'.[3]

To better understand how the respondents viewed themselves, students were further asked to what extent they agreed or disagreed with a statement describing them as 'an experienced ChatGPT user'. A majority of respondents disagreed with the statement and did not view themselves as experienced users – only about one in four respondents (26.93%) at least somewhat agreed.

How and why are students using AI?

To further understand how our participants were using AI, they were asked to indicate how frequently, if at all, they were using AI for a variety of educational tasks, from finding relevant material to brainstorming. In line with our previous discussion, in which students described themselves as having a low proficiency in AI, the data shows that AI was more frequently used for more straightforward tasks, such as explaining a concept or searching for information. The respondents were using it less frequently for problem-solving or to directly create answers for their assignments. These results are consistent with evidence from other HE studies, such as Freeman (2024), undertaken at the time of this study.

[3] We acknowledge that behaviours and attitudes are changing quickly as AI tools and their acceptance evolve. The data presented here reflects a snapshot from late 2023.

Should AI be used?

Finally, students were asked about their views on whether AI should be used. Students indicated that they are uncertain whether AI should be used in education in its current form. While 43.48% of students agreed that it should be used, 17.39% disagreed, and the remaining, almost 40% of respondents, stated that they did not know. These results show that students are currently still rather uncertain about the role of AI in HE.

Student reflections on their perceptions of AI post-assessment

After engaging with the pseudo-student submission generated by ChatGPT, students were asked to reflect on their experiences by answering several open-ended questions, thus allowing a more nuanced understanding (Neuert et al., 2021) of how their perceptions of AI had changed as a result of completing the coursework assessment. We used thematic analysis to identify common themes among our participants (Willig et al., 2017).

Unsurprisingly, some students reported that their perceptions of AI remain unchanged after engaging in the assessment. This group of students commonly mentioned that they were still not sure how AI works or that they had not ‘really used’ AI, since they merely assessed and critiqued AI-generated output. These perceptions hint at a limitation of the assessment re-design. To maintain control over the generated output and ensure a consistent experience for all students, the students were provided with an output rather than generating their own. These sentiments also reflect the fact that AI tools are (perceived to be) omnipresent and so capable that it is not possible to capture all aspects in a single assessment, or even a single course.

Other participants, however, learned important lessons from the experience:

> ChatGPT is not always accurate, which I originally assumed it was. (Participant 1)
>
> I’ve never used it before but after doing the assignment I realised how it works and how to use it to benefit yourself. (Participant 2)
>
> That it has multiple uses both creative and educational. (Participant 3)

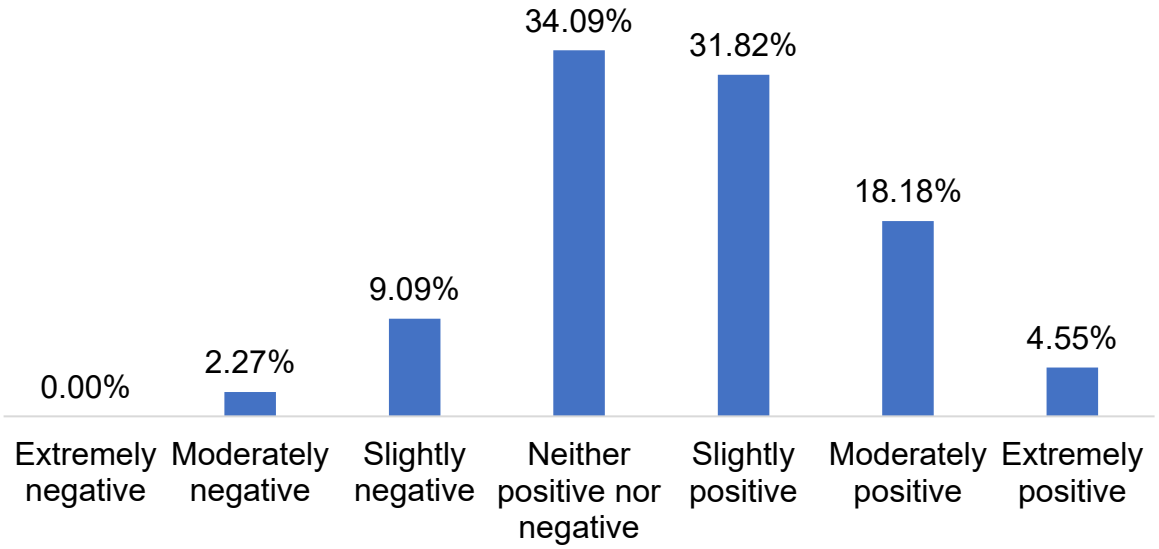
The quote from Participant 1 is symbolic of another common theme. Many students initially overestimated the accuracy of AI, and the assessment allowed them to critically engage with AI-generated output, in the context of a topic that they had recently learned about, so they could observe some of AI's (then current) limitations. Some students, however, learned a different, almost opposite, lesson as the assessment showcased the capabilities of and use cases for AI – see quotes above from Participants 2 and 3, respectively.

Overall, a majority of the respondents assessed ChatGPT as (at least) somewhat useful for learning, and only about one in five students rated ChatGPT's usefulness for learning as negative. Nonetheless, the results – both qualitative and quantitative – also indicate high levels of uncertainty, which is consistent with the mixed messages and policies students are experiencing (Stone, 2024).

We observed similar themes when zooming in on how the students generally assessed the quality of the AI responses. Participants reported positive views, but most of them did not have a strong opinion. Only about 11% of students perceived the quality of the AI responses as negative, while most respondents chose the neutral point (34.09%) of the scale. The 'slightly positive' option was chosen by 31.82% of respondents, with 18.18% (4.55%) of students choosing moderately (extremely) positive (see Figure 2 for details). One participant reflected on their perception of ChatGPT as follows:

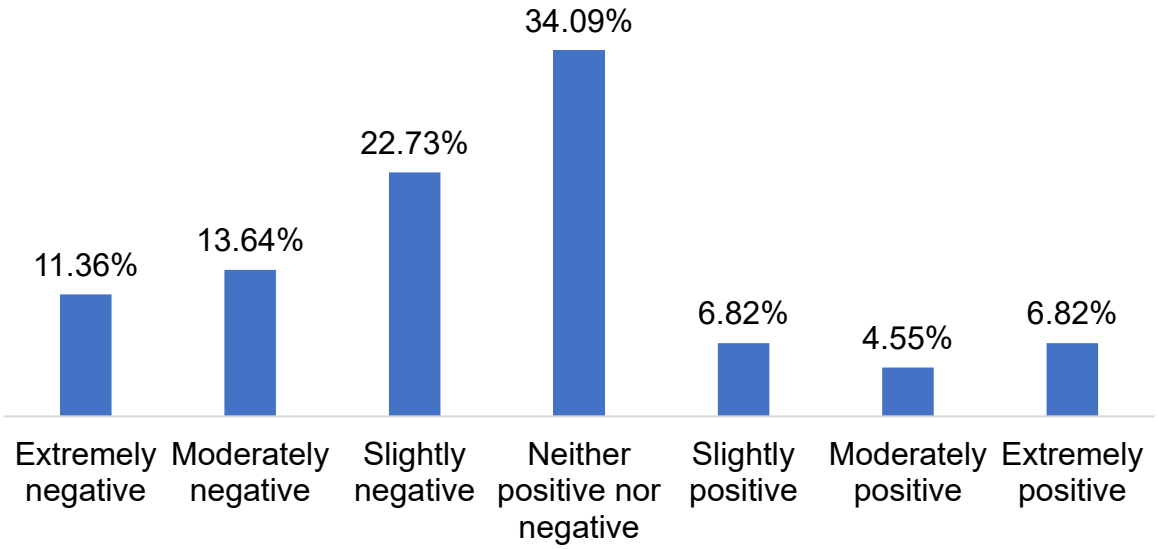
> [it has] made studying certain subjects harder to study because now you can just refer to chat gpt instead of studying for something you might use. It has shown me that chat gpt only scratches the surface of education. (Participant 4)

Figure 2. 'How do you view ChatGPT in terms of quality of responses?'.



Finally, we wanted to explore the ethicality of AI and get a better understanding of students' views on the ethical issues around AI. While this was not one of the key learning outcomes from the assessment re-design, the ethical use of AI in general, and particularly in an education setting, has received a lot of attention from researchers and remains an issue of ongoing debate (Holmes et al., 2022). Students are acutely aware of this (Stone, 2024). Our results show that most students were unsure about ethics – a large share of respondents reported a neutral view, rather than a clearly positive or negative one. However, most students (about 47%) viewed AI at least slightly negatively (see Figure 3 for details).

Figure 3. 'How do you view ChatGPT in terms of ethics?'.



After completing the assessment, the students demonstrated significant reflective thinking and thoughtful engagement with ethical issues surrounding AI usage when asked about potential concerns. Key themes that were highlighted in the responses include information security and storage, ethical concerns around privacy and copyright, plagiarism and accuracy, as well as a lack of unique thinking:

> everyone will get the same responses so then it's never really going to help you stand out (Participant 5)

> The information in its answers can just be wrong. Ethical concerns of chatgpt using people's work in its answers without permission. (Participant 6)

> Some information may be incorrect because there will inevitably be sources on the internet that have false information. (Participant 7)

Discussion and conclusion

Universities and academics have a duty to prepare learners (and the workforce of the future) with the skills and knowledge to address the contemporary issues facing the world, whether social, environmental or technological. AI is widely expected to have – and has already had – an immense impact on how people live, and businesses operate:

> The time for higher education to act is now. AI is here to stay, and higher education must keep up with the pace of change to remain relevant and continue fulfilling its purpose of educating and empowering learners (Awwad, 2024, n.p.)

This case examined student perceptions of AI within HE and used an assessment innovation to allow students to experience and engage with AI in a safe, constructive space. As AI technology is expected to have a seismic impact on students' academic development and future careers, the assessment intervention asks students to actively engage with ChatGPT output to develop their understanding and ethical awareness of current AI tools.

Overall, the results from this case show that students were infrequent users of ChatGPT and other related AI tools at the time of this study, and consequently, most of them view themselves as rather inexperienced users. When students used AI, they more frequently used it for straightforward tasks like explaining a concept or searching for information, rather than for more complex tasks such as problem-solving. This finding highlights the lack of student understanding of emerging innovative technologies, an area in which HEIs should be forging the way, not being silent bystanders. The innovative assessment intervention described in this case aims to facilitate the development of student understanding and can be further developed depending on the subject matter and proficiency of the students. In the format used here, we observed critical thinking and extensive reflection by the students after they completed the assessment, particularly with respect to response quality and ethics.

To develop student skills in this area, educators need to understand current perceptions to help address student uncertainties through relevant curricula and learning experiences. LLMs and other AI tools are likely to be part of the future for all professionals, especially in Business, Finance, and Accounting, so effective education and skills development are critical (Freeman-Wong, Munguia and Mohr, 2023).

Like a lot of the emerging literature in this area, a limitation of this study is its focus on a single subject area within a single institution, which may impact the generalisability of our findings. Similarly, the underlying AI technology is constantly changing, so our results should be interpreted in the context of when the study was conducted. Finally, following on from Ballantine, Boyce and Stoner (2024), we call for academics to reflect on whether

students approach the acceptance and use of AI critically, and if not, what can we do as educators to facilitate this mindset within our students.

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The authors did not use generative AI technologies, beyond copy editing, in the creation of this manuscript.

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Licence

Appendix: survey instrument

Please tell us a little bit about yourself by answering the below questions:

What is your age (in years)?

- ○ Age: _____
- ○ Prefer not to say

What is your gender?

- ○ Male
- ○ Female
- ○ Other: _____
- ○ Prefer not to say

What is your ethnicity?

- ○ Prefer not to say
- ○ Not known
- ○ Asian or Asian British
- ○ Black, Black British, Caribbean or African
- ○ Mixed or multiple ethnic groups
- ○ White
- ○ Other ethnic group

Do you have a disability?

- ○ Prefer not to say
- ○ No known disability
- ○ A specific learning difficulty such as dyslexia, dyspraxia or AD(H)D
- ○ A social/communication impairment such as Asperger's syndrome/other autistic spectrum disorder
- ○ A long standing illness or health condition such as cancer, HIV, diabetes, chronic heart disease, or epilepsy
- ○ A mental health condition, such as depression, schizophrenia or anxiety disorder
- ○ A physical impairment or mobility issues, such as difficulty using arms or using a wheelchair or crutches
- ○ Deaf or a serious hearing impairment

- ○ Blind or a serious visual impairment uncorrected by glasses
- ○ A disability, impairment or medical condition that is not listed above

Is English your first language?

- ○ Yes
- ○ No
- ○ Prefer not to say

Do you work part-time?

- ○ Yes. How many hours do you work during a normal week?

_____

- ○ No
- ○ Prefer not to say

On average, how many hours a week do you study for this module (XXXX)?

- ○ Study (in hours): _____
- ○ Prefer not to say

How difficult are you finding XXXX so far?

- ○ Extremely easy
- ○ Somewhat easy
- ○ Neither easy nor difficult
- ○ Somewhat difficult
- ○ Extremely difficult

Do you personally own any of the following devices (select all that apply):

- ☐ Mobile phone
- ☐ Tablet
- ☐ Laptop
- ☐ Desktop PC
- ☐ Other _____

In this section, we want to hear about your use of ChatGPT and other artificial intelligence (AI) tools:

Have you used ChatGPT before?

- ○ Yes
- ○ No
- ○ I am not sure

Have you used other artificial intelligence (AI) programs (such as Google Bard or Microsoft Bing)?

- ○ Yes. Which one? _____
- ○ No
- ○ I am not sure

How interested are you in using ChatGPT in your day to day work?

- ○ Not at all
- ○ Very little
- ○ Somewhat

- ○ To a great extent

Should ChatGPT be used in education?

- ○ Yes. How do you think it should be used?

_____

- ○ No. Why not? _____
- ○ I don't know, it is too early to make a statement

How frequently do you use ChatGPT (or other AI tools)?

- ○ I only used it once or twice
- ○ A few times a month
- ○ Once a week
- ○ Most days
- ○ Every day

How do you use ChatGPT (or other AI tools)?

_____

_____

I am an experienced ChatGPT user.

- ○ Strongly disagree
- ○ Somewhat disagree
- ○ Neither agree nor disagree
- ○ Somewhat agree
- ○ Strongly agree

During your university studies, have you used ChatGPT (or other AI tools) for:

	Never	Rarely	Sometimes	Often	Always
To come up with new ideas	○	○	○	○	○
Finding relevant material	○	○	○	○	○
Summarising information	○	○	○	○	○
Solving problems	○	○	○	○	○
Answering assignment questions	○	○	○	○	○
Explaining difficult concepts	○	○	○	○	○

What are your reasons for using ChatGPT (or other AI tools)?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I don't have enough time to get all of my work done.	○	○	○	○	○
It is easy to use.	○	○	○	○	○
Everybody is using it.	○	○	○	○	○
It helps me understand difficult subjects.	○	○	○	○	○

Do you have a paid subscription for ChatGPT or any other AI tool (select all that apply)?

☐ Yes, I currently have a subscription (or multiple).

- ☐ No, but I have paid for a subscription in the past.
- ☐ No, but I am thinking about getting one.
- ☐ No, I don't need one.

You recently completed [*course work assignment title*] for this module which involved the assessment of an output generated by ChatGPT.

Upon completing the coursework for this module, have your general perceptions of ChatGPT changed? If so, how? If not, why?

_____

_____

How do you view ChatGPT in terms of

	Extremely negative	Moderately negative	Slightly negative	Neither positive nor negative	Slightly positive	Moderately positive	Extremely positive
Usefulness for learning	○	○	○	○	○	○	○
Quality of responses	○	○	○	○	○	○	○
Ethics	○	○	○	○	○	○	○

What have you learned about ChatGPT?

_____

What concerns do you have when using ChatGPT?

_____

If you could make any changes to the current assessment, what would it be?

_____