

AI'ming for success: How can students leverage AI in project-based learning?

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ABSTRACT

CONTEXT

Generative AI has received a lot of attention from the educators. Most of this publicity has been centred around the dangers of plagiarism; however, in technology-based subjects, students will need to engage with emerging technologies such as generative AI and recognise how it will impact their future careers. Thus, universities need to engage with generative AI and encourage students to use it to support their learning. This paper looks at key considerations when re-designing learning to incorporate generative AI in the design process.

PURPOSE OR GOAL

This paper reports on the initial phase of a project to introduce generative AI to first-year IT students studying in large cohort (1000+ students per year), group design-based subjects. Specifically, this paper will focus on identifying and understanding different perspectives (from students, tutors and the university) on how this re-design could be implemented, which will be used to inform implementation in the near future.

METHODS & METHODOLOGY

Focus groups with students and tutors were conducted to gather data on current course activities and their potential for augmentation. A thematic analysis was conducted to identify opportunities for use of generative AI in the subject and to identify beliefs around ethical usage of generative AI.

OUTCOMES

Both students and tutors saw opportunities for using AI in the weekly tutorials and in design work; however, they were more reserved about its utility in supporting teamwork due to the interpersonal nature of teamwork. Where tutors and students disagreed was in relation to whether generative AI would be able to provide feedback against a performative rubric, with students seeing potential in its use whereas tutors emphasising that there are many variables that might affect a marking decision, which mirror institutional concerns around marking using generative AI.

CONCLUSIONS & RECOMMENDATIONS

Generative AI has potential to be very useful in supporting the design thinking process, particularly in generating and critiquing ideas. For successful use of generative AI, greater clarity around how to use generative AI and the extent to which it should be used is required.

KEYWORDS

Generative AI, design thinking process, EWB Challenge

Introduction

A growing need for expertise and skills aligned with AI has been highlighted by employers in the sector (Crosthwaite 2019) and students are increasingly aware of the impact that generative AI will have on their future careers (Chan & Hu 2023). As a result, AI is expected to radically affect tertiary education (Halaweh 2023) and there has been a focus on the potential dangers of cheating and plagiarism (Pocock 2023). However, there are opportunities to use generative AI to enhance student learning and research. Students have indicated willingness to work with generative AI on tasks such as searching for sources, synthesising information, brainstorming and production of multimedia (Chan & Hu 2023) and it has the potential to provide early support to low-performing teams in design work (Zhang et al. 2021). In fact, many students are already using AI in their studies; however, are seeking guidance on how best to use generative AI effectively (S. Buckingham Shun, personal communication, August 6, 2023).

The implementation of generative AI within engineering and IT curricula is important not only to prepare students to create and use generative AI within their future professional practice, but also to build in them the skills that they'll need to consider, question and leverage new technologies that will emerge during their careers. Key AI literacies (Ng et al. 2021) include:

- knowing and understanding AI
- using and applying AI
- evaluating and creating AI
- understanding and applying AI ethics

There has been a recent focus on the robustness of assessments to AI use (e.g. Nikolic et al. 2023; institutional responses); and a recognised need to re-design teaching and learning practices to help students learn how to responsibly use AI (Bozkurt et al. 2023). Suggested strategies for such learning re-design include:

- scaffolding and limiting responses from the AI to avoid cognitive overload (Zhang et al. 2021; Wu 2023)
- augmentation, rather than replacement of existing practice (Wu 2023)
- raising awareness of the limitations of AI (Kasneci et al. 2023)
- incorporating critical thinking into the curriculum (Kasneci et al. 2023; Wu 2023)
- using teacher expertise to explore the utility of AI responses (Kasneci et al. 2023)

Context

Communication for IT Professionals is a first-year subject at the University of Technology Sydney that is undertaken by 1000 IT students across two semesters each year and is supported by teaching teams of 10–20 tutors. The subject provides students with an introduction to essential skills required in their future professional practice (including communication and design thinking). As the only compulsory subject across all IT degrees, it also covers ethics to meet ACS accreditation requirements.

The subject uses a project-based learning approach where the project is the Engineers Without Borders (EWB) Challenge. Assessments are process-based and scaffold the project, with a formative background report, as well as draft and peer review opportunities that lead into a summative report and presentation. Students currently undertake a range of activities in class, which can be broadly categorised as:

- **aiding transition into university**, e.g., referencing, academic integrity, presentation skills
- **scaffolding the design thinking process**, e.g., user journey mapping, problem trees, brainstorming, decision matrices
- **supporting teamwork**, e.g., avoiding groupthink, models for groupwork
- **building an understanding of ethics in IT**, e.g., ethical case studies

Communication for IT Professionals is seen as a good subject in which to introduce generative AI because students are expected to research the background to the Country and the people with whom they are working. This allows for a dialogue to narrow down the focus and suggest areas for research. Once students have researched the background, they are expected to brainstorm solutions for their challenge. This provides the opportunity for students to find and expand on solutions. It also allows students to sense check their work, in that they can use AI to criticise and add suggestions as to potential improvements. The subject was chosen as it provides a wide canvas on which students can experiment.

Given the emerging impact of generative AI, these early year IT students are likely to enter the work force and be practicing in a context where AI skills will be expected knowledge. It would be remiss of us as educators not to acknowledge this rapid transition in our classrooms. Our compulsory, first year subject provides an opportunity to include generative AI in activities to keep the subject up to date with this trend and to support the learning outcomes (such as ethics in IT) for the subject. A project to include student and tutors in the co-design of new activities that authentically develop students understanding of the use and impact of generative AI has been supported by a First and Further Year experience grant from the university.

In addition, an institutional response from the University of Technology Sydney to the emergence of generative AI, has been to launch a Spring Intensive Assessment Review program that aims to assist subject coordinators to adapt their assessment tasks to be more AI-robust.

This paper reports on the first phase of this re-design project, collecting data to inform the design and implementation of activities and potentially assessment. Future work will investigate the impact of the changes on student experience and learning.

Methods & Methodology

This project involves conducting a re-design of an existing, first-year IT subject. The redesign will be done as a co-design activity with past students and current tutors in the subject. The design will be further informed by university guideline on the use of AI, and by the emerging literature on the use of generative AI in teaching and learning.

In our learning design, we shifted the emphasis from solely focusing on assessment re-design to prioritising the re-design of learning activities. This study collects data from a variety of sources and analyses the data to identify similarities, differences and how each source contributes to informing the learning design. The ethical aspects of this study have been approved per UTS HREC REF NO. ETH23-8340

Co-design with tutors and students

A student focus groups was conducted with students who had completed the subject in the first semester of 2023. Students were invited to participate in an hour long, online focus group and provided a voucher as an incentive. 5 students participated in the focus group. All students were first-year IT students, with 2 female and 3 male student participants. Their academic performances in the subject ranged from pass to distinction (1 pass, 3 credits and 1 distinction).

Tutors were recruited for a separate focus group from a pool of tutors who had recently, or were currently, teaching the subject. The tutor focus group was also conducted online and a voucher was offered for participation. 5 tutors participated in the focus group. Tutor participants included 2 English-language teachers, 2 Engineering/IT startup employees and 1 IT industry employee.

Both focus groups followed a semi-structured format with the following questions being asked as prompts:

1. What are the learning goals we should be aiming for through incorporating AI into the subject?

2. In what areas do you feel generative AI can be used to help students with the EWB project?
3. What suggestions do you have for implementing generative AI into the subject?
4. Can you foresee any negative consequences through using Generative AI in the subject?

The focus groups were conducted by researchers who do not currently teach the students and who do not supervise the tutors. Recordings were made and the transcripts saved for analysis by the research team. The data was analysed to find ideas and recurrent themes that could be incorporated into the design of new activities that support the four identified categories (aiding student transition, scaffolding design thinking, supporting teamwork and building an understanding of ethics in IT).

Design in line with university guidelines

Our university encourages the use of 'ethically informed engagement'. However, they also state that different subjects and faculties may take different approaches to incorporating the use of generative AI in teaching and learning. Despite this, much of the dialogue so far has been concerned with assessment and how to deal with plagiarism. The main considerations are whether the use of AI will prevent students from achieving learning goals and how the use of AI should be acknowledged. Within these guidelines, all assessments should be reviewed for their "robustness" in terms of generative AI being misused by students.

There are additional concerns around the sharing of student data with generative AI platforms and AI checking tools and, for this reason, we have not considered any activities or assessments which involve uploading student work into AI platforms.

Results & Discussion

Opportunities of generative AI

Both students and tutors are aware of the opportunities that generative AI can bring to our subject, while also being aware of the risks. Students and tutors saw opportunities for using AI in the weekly tutorials and in students' own work. In reflecting on past students' enthusiasm at the emerging technology, Tutor T observed:

'Students were really excited about using it, and they would always play around with it. So, I think in that sense, it would also be a good way to ease into the subject as well.'

The enthusiasm for the emerging technology is to be expected in a cohort of IT students and the observation aligns with the goal of in class activities 'aiding student transition into university'. We can demonstrate that the subject incorporates interesting and authentic, emergent information technology.

Interestingly, in spite of this enthusiasm, tutors saw a wider use of generative AI than students. Students saw the main uses of AI as generating big picture ideas. They report hitting a block in researching the background of design project stakeholders, or in brainstorming solutions for the EWB design challenge. It was felt that AI would be useful in breaking this impasse. However, they did not feel it was ethical or useful to research the details.

'I'd say so, general broad research. It'd be fine. as long as you go into more in depth into the research.' Student M

This may be due to a concern about generating false or unhelpful information. In student Y's words its main use is to *'check how you are doing and get feedback.'* This mirrored tutor's concerns, as they felt that generative AI could be used in most areas of the report. However, they saw the potential for creating inaccurate or biased information. This is particularly the case as the EWB project works with an Aboriginal Community. Tutor A stated that:

'As part of the empathise stage, you want to be considerate about the cultural background. You want to make sure you're speaking to the right people, whatever that is, and have that be referenced so that they're linking it to linking it to actual academically peer reviewed ideas'

Building on these observations we can see how generative AI activities can be used to 'scaffold the design thinking process' (one aim of Communication for IT Professionals subject activities). However, it also gives us a clear indication of potential problems with the use. To avoid misinformation, student groups need to be taught how to develop prompts that stimulate discussions and will provide relevant information. Both students and tutors recognise the potential of poor prompts and limited understanding of the working of AI generating *'large numbers of words that mean nothing.'* (Tutor A), or *'just generating large sentences.'* (Student Y).

Other advantages stated by tutors were that it was seen as more engaging than reading content online, and that it gave students permission to be creative. Students did not immediately mention the creative side of generative AI. Students first responses were that AI would be most useful as a tool for improving writing. As Student M stated:

'I noticed that a lot of my group members didn't know how to write certain parts of the report. I think AI would help with fixing that up.'

When it came to tutors using generative AI to assist with marking, the response was nuanced. Tutors felt that it would be difficult for generative AI to accurately match work to a performative rubric. This was due to there being many variables that might affect a marking decision. However, it was felt that AI could be useful in generating a bank of comments that could be used to cover some of the more common issues. Students on the other hand were happy for tutors to be assisted in their marking by generative AI.

Both tutors' and students' views of how AI could be used in supporting teamwork were linked to menial, executive tasks such as scheduling or limited task allocation. Both groups expressed reservations about its usefulness due to the interpersonal nature of teamwork in the subject.

Ethical use of generative AI

In preparation for using AI in the classroom both tutors and students stressed the importance of clear guidelines on how and when AI can be used. Student Y suggested a Zoom session setting out regulations on how Generative AI could be used and how to avoid plagiarism. Students are concerned about unintentional plagiarism and would appreciate a clear framework of what is acceptable. As Student M said:

'It's better to teach people the ethics, and not an unethical situations of how to use it.'

Tutor D agreed that an important factor in allowing students to use AI was *'knowing what the policy was'* as students were concerned about they could and couldn't do.

This concern for using AI ethically and the need for clear guidelines aligns with the work of Buckingham Shum and Bozhurt et al 2023.

Students felt that using AI to develop prototypes was unethical. Prototypes are an area in which the student groups can display their creativity. It is felt that replacing this creativity with an AI generated design is tantamount to cheating. However, again this may be due to concerns that this will result in the whole project being 'handed over' to AI. This is supported by them finding it acceptable to use AI to generate the ideas and then to enhance these ideas to develop the prototype.

'You could ask it to look at a few options and then base your final prototype off an option it does give you.' Student M

The clear link that students see between the ethics of using technology and emerging generative AI capability provides an opportunity for us to use this as a discussion point and an authentic,

relevant case study for 'building an understanding of ethics in IT' by anchoring the discussion to their own activities and assessments in class.

To summarise, both students and tutors felt that generative AI has a role in augmenting student projects, but clear boundaries need to be set out to show what is and what is not acceptable. Students believe that generative AI is most useful for looking at the picture in that it can help brainstorm ideas and highlight areas that have been missed. However, tutors feel that it would also be useful for looking at details. Students did not feel this was ethical largely due to a fear of incorrect or biased information. These fears may be overcome through well-structured prompts. Given that the subject has many non-native English speakers, it is not surprising that both tutors and students saw generative AI as a writing assistant. Overall, both groups felt generative AI had a significant role in the classroom.

The co-design focus groups identified opportunities for activities that support the learning goals of this subject (and arguably other first year design subjects). Understanding that both tutors and students recognise the opportunity, and where we can expect them to resist, is important to any activity design. The details of the co-design focus groups will be used to design a set of activities to be implemented in the second semester of 2023, and appropriate training given to those that require to develop AI literacy levels. Future funded work will include evaluating the implementation.

Conclusions and Next Steps

It is important that the possibilities of generative AI are recognised in a project based first year IT subject. Students will be aware that future industry designs will be influenced by generative AI thereby growing their AI literacy skills. Generative AI has a role in generating and critiquing ideas that can be taken forward and improved in later iterations of the project design. Therefore, generative AI should be seen as a useful support tool to support student learning. To ensure generative AI's successful use, there needs to be clear rules about the extent to which it can be used in the project. This is particularly true as much of the dialogue so far has centred on assessment and the detection of work with insufficient student input. Naturally, students are keen to determine the extent to which it may be used.

This paper will be used as the starting point for designing methods for students to augment their designs to meet the EWB challenge. Tutors will be given clear rules as to what is acceptable and what is not before encouraging students to experiment with generative AI to enhance their work. This will lead to students being encouraged to develop a series of specific prompts to firstly investigate the background to the people and the country, before moving on to brainstorm possible solutions and use AI to critique and enhance the solutions that the groups have decided upon.

Finally, it needs to be recognised that generative AI is developing quickly. Hence, its use today is likely to be very different in a year's time.

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