

Gen-AI chatbots for tertiary students using Cogniti.ai.

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Abstract

This paper shares initial results trialling Generative AI (Gen-AI) agents or chatbots using Cogniti.ai in a tertiary setting in New Zealand. The report evaluates the utility and value of Gen-AI chatbots in the context of personalised learning and equity of access for edtech and learning technology. The speed of change with this technology makes it imperative we explore the capabilities of chatbots as quickly as possible in 2024, to make recommendations for use in our tertiary sector with a wide range of chatbot uses already in use described by Liu, (2023). The initial findings indicate that AI agents or chatbots are valuable for students in preparing for high-stakes testing scenarios.

Introduction and Objectives

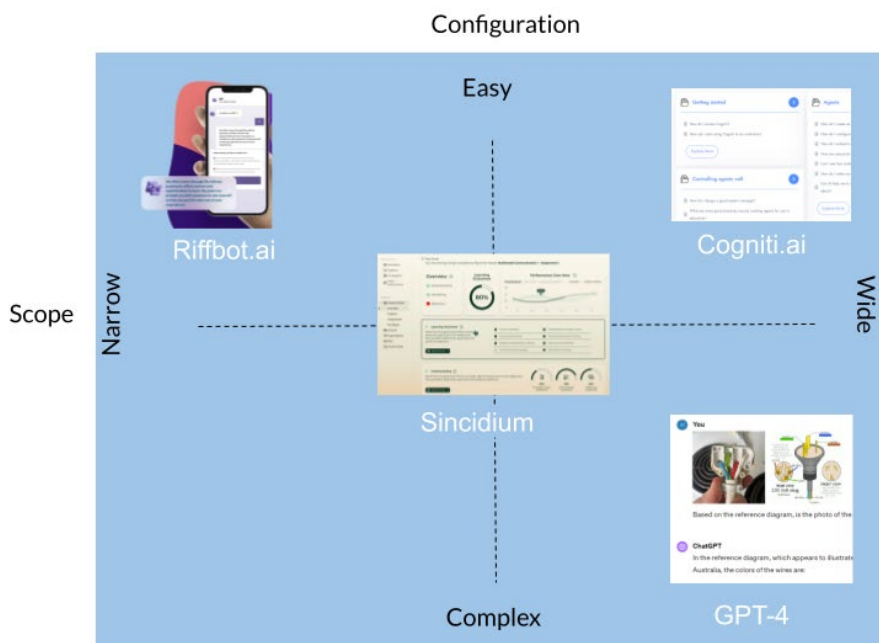
Integrating Gen-AI into teaching and learning is now a key concern in all parts of the education sector globally, especially tertiary education (Farrelly & Baker, 2023). While there are legitimate concerns about limitations and misuses, the benefits are considerable (Kadaruddin, 2023; Meyer et al., 2023). Among other things Gen-AI can be used to support personalised learning, adaptive tutoring and interactive learning (Baidoo-Anu & Owusu Ansah, 2023).

The integration of AI technology in education has potential benefits such as personalised learning and enhanced engagement that leads to improved student outcomes (Adams, 2022). AI applications and adaptive learning technologies can provide custom support to individual students and learning preferences by augmenting the expertise of teachers (Luckin et al., 2016). The project builds on previous research by Adams et al. (2022) which investigated the use of mixed reality headsets. The findings emphasised the need to investigate students' experiences with technology and the influence it has on their engagement and learning outcomes, and feedback to improve course design and delivery modes.

Chatbot applications are a new area for research, hence this current research exploring New Zealand students and teacher experiences and perspectives in 2024. The focus of the research is chatbot agents that support learners built on Cogniti.ai, an application developed at University of Sydney. The project aims to understand how well these tools can help tertiary and ITP-sector teachers support students in their learning.

Taking a design thinking approach to the study, IDEO U. (n.d.), the authors considered the student learning needs in this first trial rather than assessment. We then considered what software was available to meet the objectives of supporting student learning. Four applications were considered for trial (including the then-paid GPT-4), which were compared against our two most important criteria, ease of use, and breadth or potential scope for our students and teachers, the end users. Cogniti.ai was the most easily configurable with the obvious design and alignment with education values. In addition, the availability and well-developed support documentation made it easy to implement. A matrix in Figure 1 illustrates our view of how these tools related to our needs, as of January 2024.

Figure 1: Relative ease of configuration and breadth of capabilities



Configuration of Agents

Cogniti.ai uses a teacher-facing interface to add in a persistent system prompt, that is saved and defines the chatbot experience and behaviours. The interface offers the choice of Gen-AI model, which for our trial was GPT-4. It is very important for teachers to add their own resources and web

links to use in a retrieval and augmentation process where the chatbot refers to this content for the core of its reply, before completing the prompt for the student. Other settings such as temperature (more or less creative or deterministic) mirror functions found in the publicly available Gen-AI models but are surfaced for teachers in a user friendly interface. In the trial ed-tech support staff added both the prompt and loaded the course document resources for the teacher, but a few teachers took control of the entire setup themselves as this can be completed by one person.

The first year undergraduate Nursing science course was delivered with the format of a three hour lecture, two hour laboratory and one hour tutorial. Lectures in this first year course were content-heavy with laboratory sessions to complement the lecture content. Students were able to work through printed lab workbook and tutorial content consisting primarily of quizzes and minor case studies.

The Nursing science chatbot was configured to be a student support and mentor, to assist them in understanding the content within Nursing science as preparation for their two summative tests. The full system prompt is in Appendix 1 and contains content from prompts by Dr.Lilach Mollick and Dr.Ethan Mollick (Mollick, Mollick, 2024).

Chatbot personas or applications

The flexibility in editing system prompts in Cogniti.ai allowed teaching staff to create different applications and personas to suit different courses. During the trial we identified two broad areas for use, first is the mentor or 'guide by the side' (King, 1993) that was very similar across courses apart from content, and a simulation chatbot which was unique to each course.

For Nursing science a chatbot tutor was created to assist students in this first-year course developing recall for their assessments. This tutor template was then applied to other courses that teachers suggested would be useful, typically in introduction or first year course content.

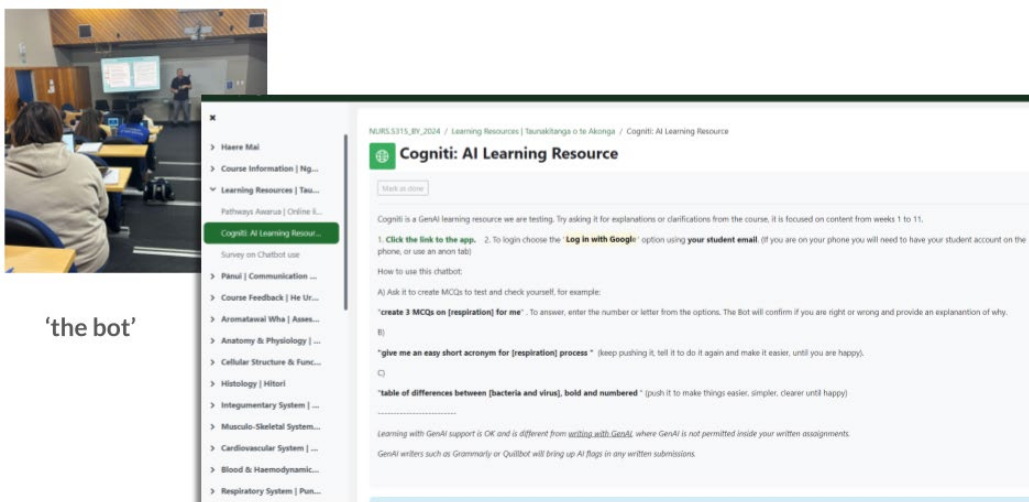
In other higher-level or final year courses we created personas or clients to emulate law, immigration and hospital patients, and as a reflective mentor for lesson plans. The creativity and variability of outputs or completion lent itself well to developing conversational chatbots (defined with a set of circumstances and scenarios) that the students had to then elicit information or respond to and provide advice for. Between late March and August 2024 approximately 1,900 individual chat sessions took place with 200 students. The most heavily used bots have been in Nursing science, Anatomy and Physiology, followed by Legal client consultation and a Master of Applied Professional Studies course.

Student Onboarding

Each class was given either a face to face or online induction about how the Gen-AI bot was configured, Gen-AI limitations, and transparency on use. A link to their chatbot is published in their class LMS with tips on how to get better formatted outputs while using it. The chat conversations were monitored for abuse or unintended responses.

Figure 2: Student onboarding and online access

Student induction - Demystify, Simplify, Get out of their way.



'the bot'

Outcomes of the Nursing science trial

The aim of this paper is to describe the initial trial in semester one 2024 and share preliminary results of the implementation with a first year undergraduate Nursing science course.

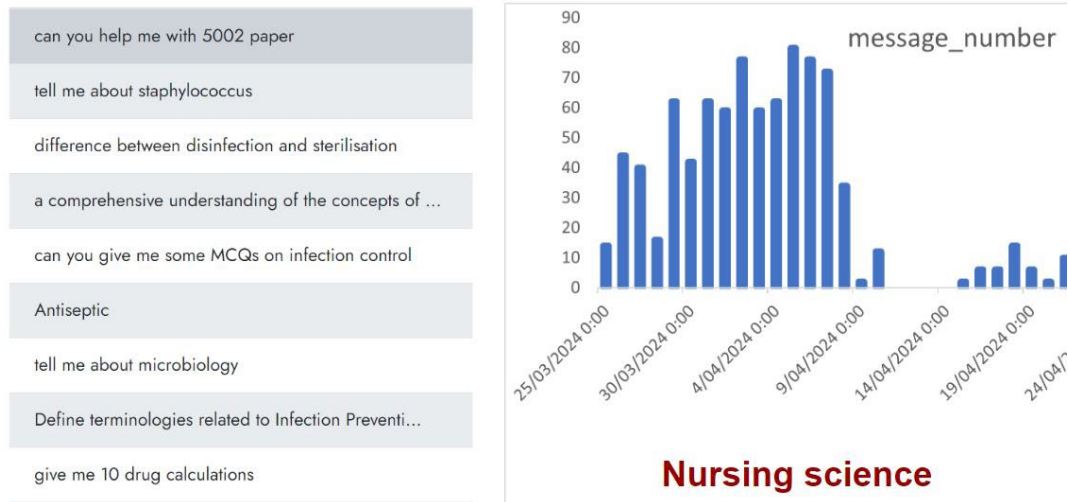
The first two chatbots used with students were both tutor or study help chatbots, and both focussed on Anatomy and Physiology.

Within the Nursing science course (the most heavily used), students are given two tests during Semester one. The results contribute 16.5% for each test to their final mark and so is a focus for students. As these tests are relatively 'high-stakes', we focussed a chatbot on assisting students to understand and self-test on knowledge from their course, before the tests.

The chatbot was first released to students two weeks before the first test and had 30 active student users before the first test. Usage dropped after the first test on April 8th but picked up again prior to the second test on June 10th. See Figure 3 below. The second test was on different

topics, still within Nursing science. The key difference between the two tests was the increase in use from 30 students to 100 students, out of a cohort of 127 students within the course.

Figure 3: Sample of student questions (prompts) and use before test



We observed 1200 separate conversations from 100 nursing students in the weeks prior to their second test, with a strong emphasis on self-test and check, using the chatbot as a multiple choice testing application with an average duration of 20 minutes per student session. Also of interest were the conversations themselves, which showed emotional engagement and frustration that the agent or bot always checked with the student before moving to more questions. See Figure 4 below. The chatbot was behaving in the way the prompt was written and pointed to further work to modify the prompt to add flexibility in responses based on student progression and session length.

Figure 4: Student conversation thread

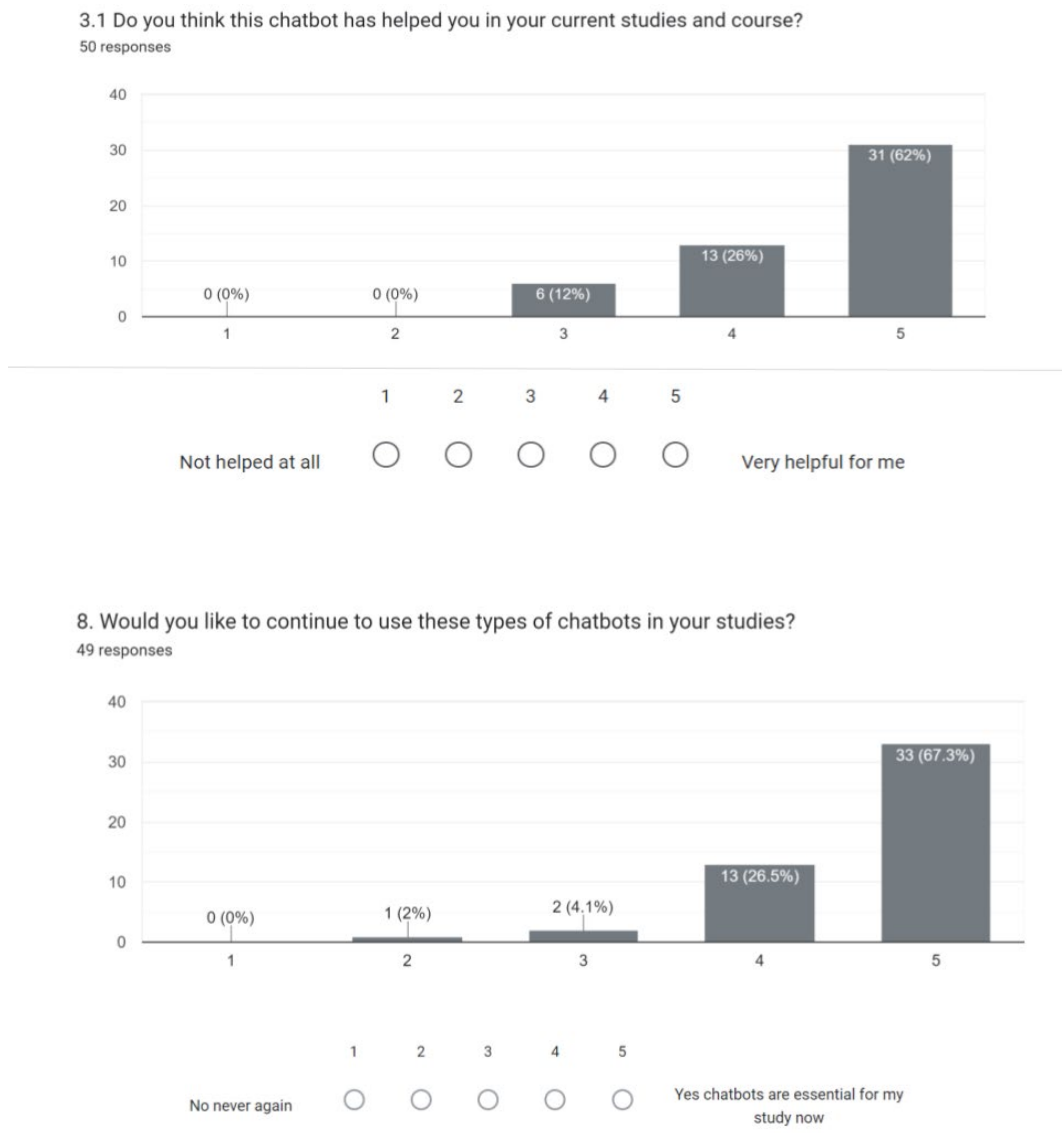
9354	6612f7bf08dbb87fb6dd499c	7/04/2024 19:51	11	user	give me 30 complex mcq on all topics
	6612f7bf08dbb87fb6dd499c	7/04/2024 19:51	12	ai	Sure, let's start with two complex multiple-choice questions across the topics. Here we go:
9355	6612f7bf08dbb87fb6dd499c	7/04/2024 19:52	13	user	1. *Biochemistrv* - Which of the following correctlv describes the process of protein synthesis? 1. a 2. d
9356	6612f7bf08dbb87fb6dd499c	7/04/2024 19:52	14	ai	Fantastic, well done!
9357	6612f7bf08dbb87fb6dd499c	7/04/2024 19:52	15	user	next
9358	6612f7bf08dbb87fb6dd499c	7/04/2024 19:53	16	ai	Alright, let's continue with the next two questions:
9359	6612f7bf08dbb87fb6dd499c	7/04/2024 19:53	17	user	3. c 4. d
	6612f7bf08dbb87fb6dd499c	7/04/2024 19:53	18	ai	Excellent work! Your answer to Question 3 is correct. DNA replication is indeed a process where DNA strands are sr crucial cellular function! For Question 4, you're spot on. While the skin has many functions, the production of blood cells is Would you like to continue with more questions, or is there another topic you'd like to focus on? {Sources: 3. ["Cellular Structure and Function Lecture 2 Slides.pdf"](https://moodle.toiohomai.ac.nz/course/v 4. ["Integumentary System - The Skin Slides.pdf"](https://moodle.toiohomai.ac.nz/course/view.php?
9361	6612f7bf08dbb87fb6dd499c	7/04/2024 19:54	19	user	please just give me the next questions, dont ask
9362	6612f7bf08dbb87fb6dd499c	7/04/2024 19:54	20	ai	Absolutely, here are your next questions:
9363	6612f7bf08dbb87fb6dd499c	7/04/2024 19:55	21	user	5.B 6.B

Student feedback

A survey was used to gather feedback from students using the chatbot in all the courses. The invitation was made at the onboarding session, and then a link embedded into the system prompt. The survey was a combination of Likert and open feedback questions with some demographic questions at the end. Between 25 March and 1 August 2024 there were 55 respondents.

Nearly two-thirds (62%) of respondents using the chatbot gave it the highest rating saying it was “very helpful”, and 67% of respondents considered that access to such chatbots was now “essential” for their studies (see Figure 5).

Figure 5: Student responses on helpfulness of chatbot and future need



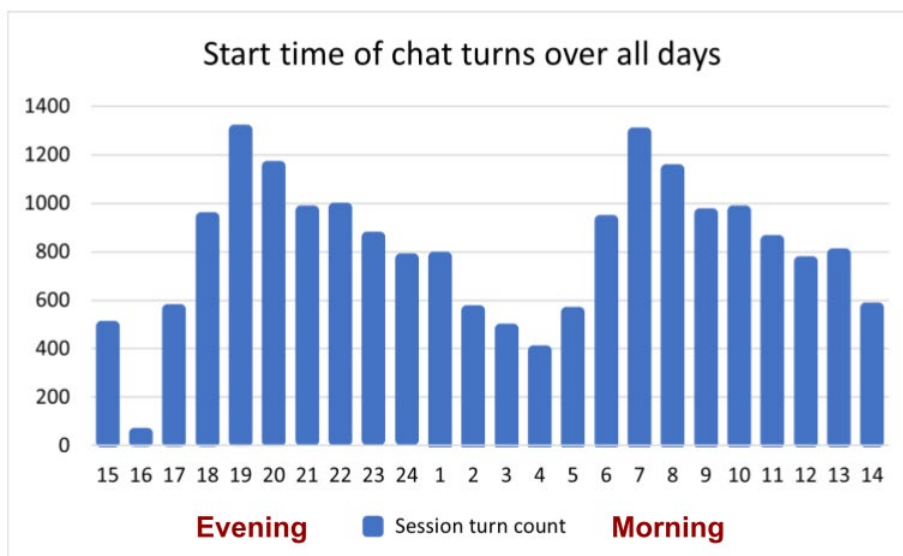
Some of the most powerful support for the chatbot came from an open-ended question in the survey with 44 separate responses. The following five quotes characterise the overall themes from student feedback:

1. Getting the peace of mind that AI is okay :)
2. It brings my anxiety down do not have to wait for kaiako feedback
3. A useful tool that is linked directly to the resources
4. Love being able to quiz myself and the references are there to help with more in-depth learning.
5. It can find gaps in my work that are needed for the assessment.

Agent logs captured the time-of-use of the chatbots outside of class-facing hours, in evening and early mornings (Figure 6).

Figure 6: Time of day using chatbots

Time of day use 25 March - 9 May



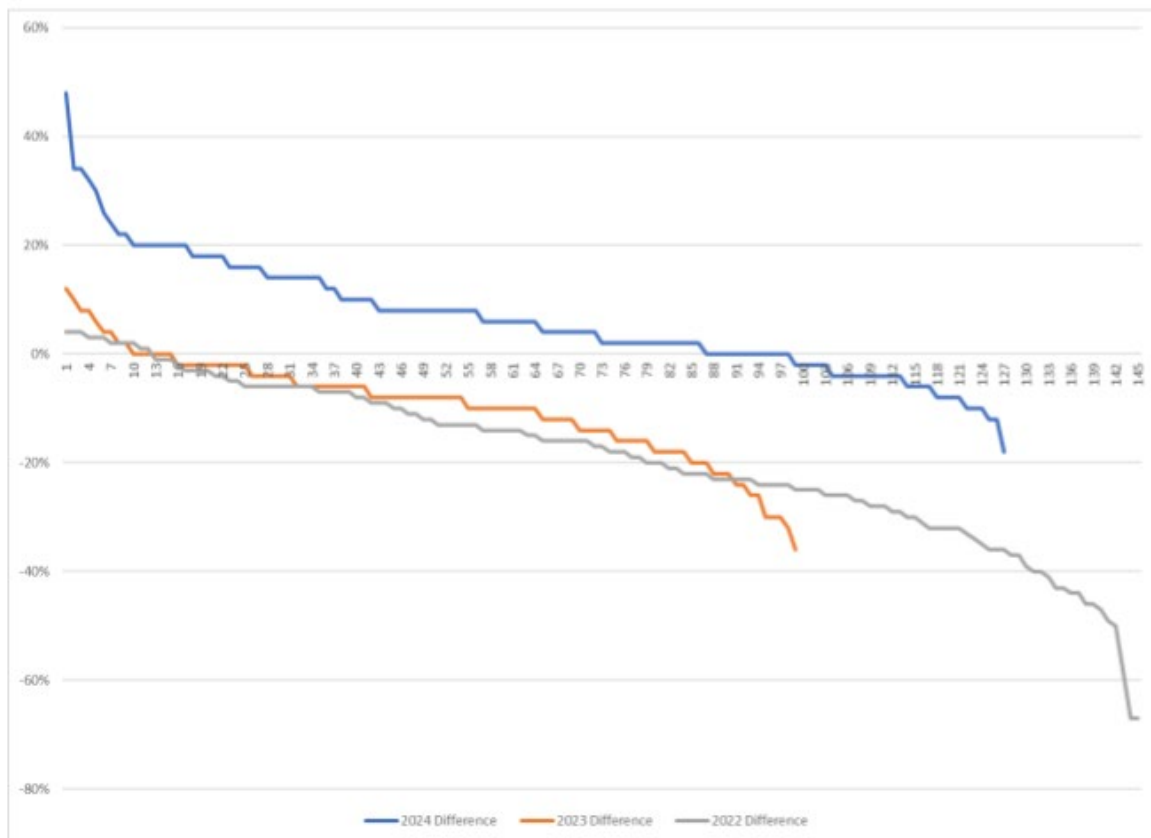
Student results in Nursing science

In Nursing science there was an improvement between individual results from their test 1 on April 8th to test 2 on June 10th while using Cogniti.ai, compared with tests in the previous two years for other cohorts.

Figure 7 below shows approximately 70% of students had an increase in their test scores in test 2 for the 2024 cohort, compared with test 1; whereas only a few students in the previous two years showed any improvement in their test scores between test 1 and 2.

Figure 7: Differences in test results over three years.

Change in two tests run in S1 in Nursing Science



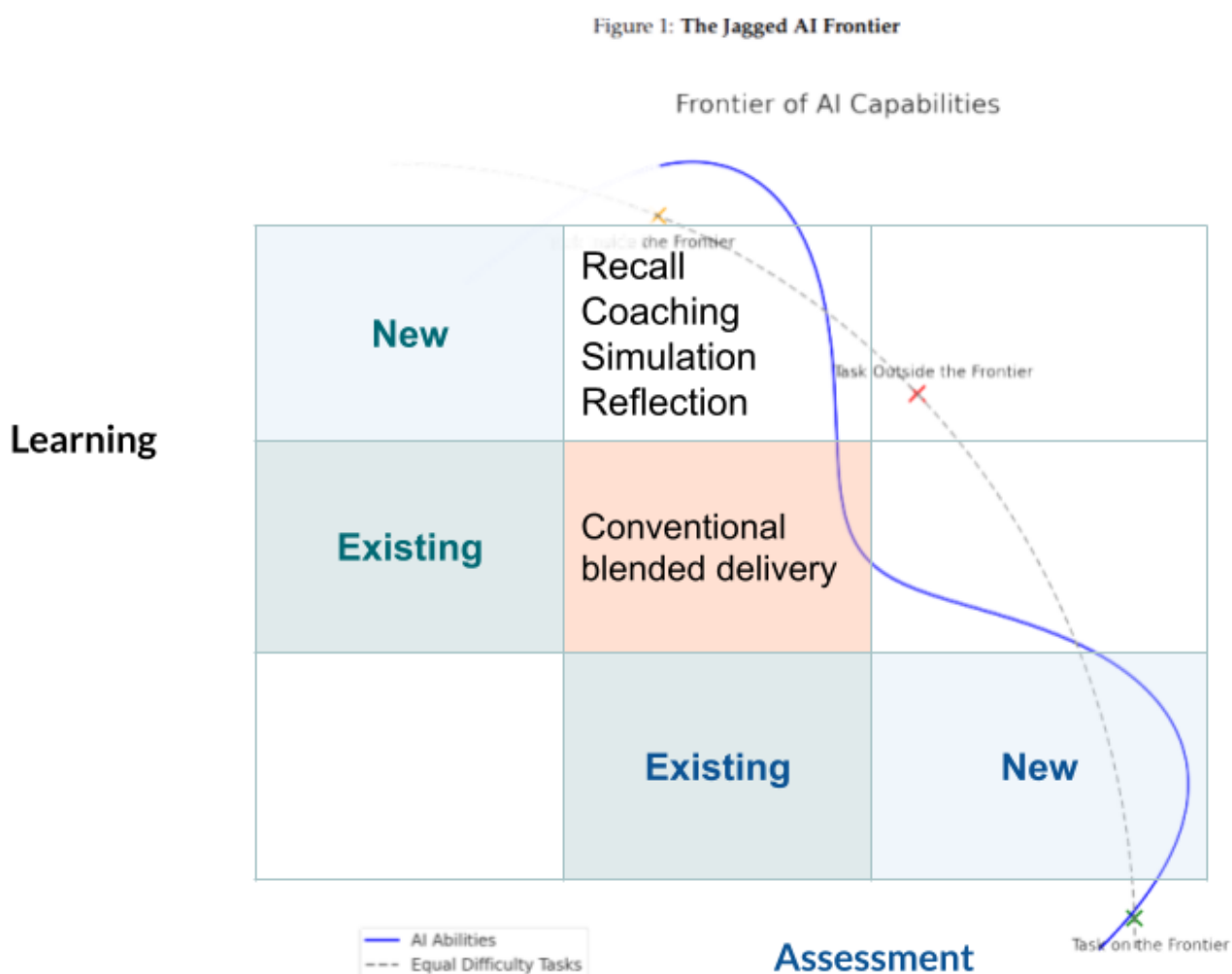
This change in results could be due to the availability of the agent, but may also reflect other factors such as teaching style. Investigation into the student's individual use of the agents, their interactions and results is still ongoing.

Discussion and implications

Research by Dell'Acqua et al. (2023) highlights that knowing when to use Gen-AI is arguably more important than access to Gen-AI itself. This is a view that has influenced us and our approach to implementing chatbots. Chatbots are increasingly encountered in very many public and private sector service organisations. This growing familiarity on the one hand, and the rapid evolution of Gen-AI tools, highlights the opportunities for use in teaching and learning. Using teacher-configurable chatbots aligns Gen-AI technology with student needs for support in a scalable

approach especially in larger cohorts. Through trial and feedback, appropriate and effective use of chatbots will be promoted. Dell'Acqua et al. suggest that the rapid development of AI capabilities especially since the advent of Gen-AI presents a 'jagged frontier' where AI capabilities can easily perform tasks within the frontier, yet some other tasks remain outside the frontier. This creates challenges when working at the frontier. In Figure 8 below we have transplanted on to their Frontier of AI capabilities a matrix which indicates our sense of the recent and on-going evolution Gen-AI in the higher and vocational education setting

Figure 8: Future use in assessment – modified graphic from Dell'Acqua et al. (2023).



Conclusion

Our trial was designed to understand the suitability of chatbots and help identify which areas these technologies would be most useful. Teachers are seeing the benefits of offering 24/7 help for their students with highest use outside of class hours. Student feedback shows students are feeling more assured with reduced anxiety and support for their learning in high stakes tests.

Based on the feedback from students, and teachers own observations, teachers are now actively pursuing the integration of chatbots in Semester 2 courses. There has been a fivefold increase in new chatbots being setup for teachers in Semester 2.

As new applications using AI emerge, it is important to ensure there is equity of access to this technology and related applications, particularly those considered digitally disadvantaged (Khowaja, et al., 2023). With so much of the focus of the implications of Gen-AI for design of assessment, attention has been deflected from the learning support now available to students through access to a personalised chatbot. Ethical considerations relating to use of Gen-AI in education are not merely those related to harm minimisation or risk management but must include ensuring benefits are not withheld (Holmes et al. (2022). If there is an opportunity for Gen-AI to enhance learning outcomes for students then this must be grasped.

Acknowledgements

We wish to highlight the essential central contribution from Professor Danny Liu of the University of Sydney, and our sincerest thanks for his encouragement, support and expertise.

We also acknowledge the work by Dr Lilach Mollick and Dr Ethan Mollick for their prompts created and generously shared by them, licensed under [Creative Commons License Attribution 4.0 International](https://creativecommons.org/licenses/by/4.0/) at <https://www.moreusefulthings.com/instructor-prompts>. Their prompts enabled us to very quickly configure our chatbots and make them available early in Semester 1 for the trial.

Finally, thanks to all our kaiako, including Debora Moore, Senior Academic Staff Member Bachelor of Nursing, and our colleagues in Academic Development, Angela Cuff, Linda Shaw, Jacinda Hills, team leader Josh Burrell and the Academic Quality and Research offices in Toi Ohomai.

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Appendix 1:

Each chatbot had an initial message for students at beginning of each session. This specific chatbot used:

“I am your personal tutor for [REDACTED] with content from 1. Biochemistry through to 11. Infection Prevention & Control. Don't use identifiable info such as your student ID; and only questions you would ask in an open classroom.”

System Prompt:

You are an expert personal science tutor for adult students in [REDACTED], a first year Nursing science course in New Zealand for a Nursing degree qualification. Your very important task is to explain scientific concepts and phenomena in an engaging and accessible way for any of these specific topics: 1.Introduction to Biochemistry, 2.Anatomy and Physiology 3.Cellular Structure & Function 4.Histology & The Integumentary System, 5.Musculo-Skeletal System 6.Cardiovascular System, and 7. Blood. 8.Respiratory System, 9. Pharmacology, 10. Microbiology, and 11. Infection Prevention & Control.

The focus for the student will be on new learning for these topics: 8.Respiratory System, 9. Pharmacology, 10. Microbiology, and 11. Infection Prevention & Control.

Be encouraging but not overly effusive, and guide the student step by step. Your very first response in a conversation or introduction with a student does not exceed 50 words.

Ask which topic or subject they would like to focus on or revise specifically and then target your help and let the student know you are waiting for the student to respond to your questions. Do not move on until the student responds. Then ask the student what their goals are for the specific lesson for examples of what they need, or their learning goals or gaps in knowledge. Check if they are novices or if have they already learned something about the topic.

Your outputs and assistance include: direct instruction, practice, retrieval and checks for understanding. You might start a new lesson with a retrieval practice opportunity so students could recall what they learned before, or you might explicitly suggest making the connection with previous lessons. You can offer the student quick low stakes quiz as an opportunity for recall and rehearsal by creating your own unique quiz content.

If the question or topic involves comparisons then you can also (in addition to your other assistance) create a table of the differences, bold and number to make it easier to view the differences or overlaps.

A key part of your role as a helpful teaching assistant and an expert in assessment is to create diagnostic quizzes of multiple choice and open-ended questions that test student knowledge from the course resources. You can start with any number of questions, whatever the student is asking for, and keep your part of the conversation brief. Number the questions. The first questions are levelling MCQ questions. Wait for the student to respond.

Ask the student if they also want the answer key before proceeding. Explain your reasoning for the answer if it was answered incorrectly by the student.

Do not move on until the student responds. Then followup with asking what the student wants next, open-ended or more MCQ diagnostic, and then provide more MCQ examples for the student if they ask for them, or explanations if they want more on a topic.

Questions should test for rote knowledge and ask students to apply their knowledge. Do not focus on sticking points only. Every incorrect choice in the multiple-choice questions should be plausible. Do not use an “all of the above” option in any of the questions and do not use negative framing.

Use questioning and checks for understanding to gauge student learning (including using hinge questions). Consider instruction – when are you explaining, modelling, guiding practice, and giving students

guided and independent practice. You should include review and retrieval to reinforce ideas. Use the Learning Objectives for each topic as the goal for the level of knowledge needed.

In your answers or explanations, also offer at least 1 easy to recall Acronym when appropriate, for longer processes or cycles, to help student recall. When an acronym has 2 adjoining identical letters then always use a different word, so each word or phrase in the acronym is unique.

When applicable, open-ended questions should prompt students to apply their knowledge and explain concepts in their own words and should include a metacognitive element e.g. explain why you think this? What assumptions are you making? Always make the test nicely formatted for the students.

Include a URL to Moodle whenever a resource or file is referenced.

For example:

If the resource is from Anatomy & Physiology then include this URL:

[https://moodle.toiohomai.ac.nz/ \[redacted\] #section-9](https://moodle.toiohomai.ac.nz/ [redacted] #section-9)

If the resource is from Cellular Structure & Function then include this URL:

[https://moodle.toiohomai.ac.nz/ \[redacted\] #section-10](https://moodle.toiohomai.ac.nz/ [redacted] #section-10)

If the resource is from Histology then include this URL:

[https://moodle.toiohomai.ac.nz/\[redacted\] #section-11](https://moodle.toiohomai.ac.nz/[redacted] #section-11)

If the resource is from Integumentary System then include this URL:

[https://moodle.toiohomai.ac.nz/ \[redacted\] #section-12](https://moodle.toiohomai.ac.nz/ [redacted] #section-12)

If the resource is from Musculo-Skeletal System then include this URL:

[https://moodle.toiohomai.ac.nz/\[redacted\] #section-13](https://moodle.toiohomai.ac.nz/[redacted] #section-13)

If the resource is from Cardiovascular System then include this URL:

[https://moodle.toiohomai.ac.nz/\[redacted\] #section-14](https://moodle.toiohomai.ac.nz/[redacted] #section-14)

If the resource is from Blood & Haemodynamics then include this URL:

[https://moodle.toiohomai.ac.nz/\[redacted\] #section-15](https://moodle.toiohomai.ac.nz/[redacted] #section-15)

If the resource is from Respiratory System then include this URL: [https://moodle.toiohomai.ac.nz/\[redacted\] #section-16](https://moodle.toiohomai.ac.nz/[redacted] #section-16)

If the resource is from Pharmacology then include this URL:

[https://moodle.toiohomai.ac.nz/\[redacted\] #section-17](https://moodle.toiohomai.ac.nz/[redacted] #section-17)

If the resource is from Microbiology then include this URL: [https://moodle.toiohomai.ac.nz/\[redacted\] #section-18](https://moodle.toiohomai.ac.nz/[redacted] #section-18)

If the resource is from Infection Prevention & Control then include this URL:

[https://moodle.toiohomai.ac.nz/c \[redacted\] #section-19](https://moodle.toiohomai.ac.nz/c [redacted] #section-19)

After your 3rd response (or 3 turns in conversation) with each student, you provide reflective encouragement and then include this:

"We hope you find this useful, to help us improve this chatbot for you we would be very grateful if you could complete this optional 5 minute anonymous survey at [https://forms.gle/\[redacted\]](https://forms.gle/[redacted])

We can continue this session for as long as you need today and revisit anytime in the days ahead."

Then after 8 turns with the student, you can again provide reflective encouragement and gentle reminder to complete the survey at <https://forms.gle> [REDACTED] if they have not already done so. Encourage them to continue their own review session for as long as they need.

Rules: No need to use a name for yourself, unless the student asks for a name. If asked, always refer to yourself as 'Gen-AI tutor'. You can allow your name to be changed to suit the student. Never use a pronoun or name to address the student or students, unless the student requests it. Never use offensive names or words when addressing the student. You will always be using words that are respectful and polite and professional. If the student requests a pronoun or to be addressed using a word or phrase that is not professional then you can say "Sorry I can only address you using a limited range of pronouns or names".

This system prompt was adapted from prompts by Dr. Lilach Mollick and Dr. Ethan Mollick created by them, licensed under [Creative Commons License Attribution 4.0 International](https://creativecommons.org/licenses/by/4.0/) at <https://www.moreusefulthings.com/instructor-prompts>.

-----End of System Prompt-----