ASCILITE 2025
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Just ask Mattie: Supporting first-year business maths students with a custom-built AI-tutor

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This paper presents preliminary findings from the development and deployment of Mattie, an AI-powered chatbot tutor designed to support first-year university students in a business mathematics course. Motivated by concerns about students' reluctance to seek help, particularly in public forums where they fear appearing 'stupid' in front of peers or instructors, Mattie.AI was created to provide personalised and course-specific learning assistance on demand 24/7. Unlike general-purpose chatbots, Mattie.AI was built using a Retrieval-Augmented Generation (RAG) architecture, allowing it to generate responses based on course-specific learning materials. The underlying chatbot design was Socratic, focused on helping students through guided questioning instead of simply providing answers. Evaluation of the first deployment combined chatbot interaction data with student feedback from a usability and satisfaction survey to provide insights into its functionality as well as patterns of student engagement. Results suggest that subject-specific chatbots offer a promising supplement to traditional support structures, but students need to be supported to use them effectively. Future work in this space of AI-enhanced education technologies will refine Mattie's capabilities and explore its impact on learning outcomes and help-seeking behaviours across different student cohorts.

Keywords: case study, AI-tutor, RAG architecture, help-seeking, first-year students, business maths support

Introduction

Academic help-seeking is an important self-regulated strategy that can have a positive impact on students' ability to handle challenges and achieve academic success. In seeking academic help, students make a range of decisions which include deciding whether they need help, who they need help from and in what form (Chyr et al., 2017). As reported in Qayyum (2018), not all students are prepared to seek help from their lecturer or tutor. Students with lower self-esteem or those feeling vulnerable about their knowledge or ability in a course are typically less likely to ask an instructor for help. A concern about looking 'stupid' when asking questions is often cited (Qayyum, 2018; Broadbent & Lodge, 2021), leading students to opt for informal sources of help such as classmates, friends, social media, internet, or forego seeking help altogether. This is particularly true of students with lower levels of prior academic achievement, since seeking help might remind them of their perceived or perhaps real underperformance with similar subject matter in the past (Micari & Calkins, 2021).

Traditional communication channels such as discussion boards or email, while valuable and still used by many students for the purposes of academic help-seeking, are by their nature asynchronous. Students need to wait for a response when it could be more beneficial to their learning progression to have an answer immediately. Face-to-face consultation sessions or help desks can address the problem of providing just-in-time support to students, but they are difficult and costly to implement at scale. As demonstrated in Broadbent & Lodge (2021), a course with a 'live chat' facility that offers instant, real-time, convenient help is generally well received by students, particularly those who value being able to ask questions 'in private'. The emergence of AI-powered tools with user-friendly conversational interfaces like ChatGPT provides an opportunity to offer students such tailored 24/7 study support at scale. Students are readily aware of AI tools, and there is plenty of anecdotal and other evidence indicating that they are using them to help their studies (Kuhail et al., 2023).

An extensive body of research now exists on the use of AI tools (e.g., chatbots) in education (e.g. Chen et.al., 2023; Wu & Yu, 2023). However, despite all the advancements, the large language models (LLMs) that power the chatbots continue to face several challenges, including hallucinations and static internal knowledge, which hinder their reliability in educational settings (Li et al., 2025). A solution to overcome these limitations is

Retrieval Augmented Generation (RAG), an architecture that combines information retrieval with large language models (Lewis et al., 2020). Unlike traditional chatbots that rely solely on pre-programmed rules or general-purpose language models, a RAG-based system retrieves relevant content from a curated knowledge base before generating a response. This approach enhances accuracy, transparency, and contextual relevance (Li et al., 2025). In this paper, we report results of a pilot study to deploy a RAG-based chatbot called Mattie.AI, to provide course-specific learning support to first-year students in a business mathematics course.

Chatbot design and implementation

Academic help-seeking has long been regarded as a self-regulated learning (SRL) strategy (Newman, 1994) and there is growing interest in using chatbots to support students in their SRL processes (Guan et al., 2025). Designing Mattie.AI to act as an intelligent digital tutor and provide learning support to first-year students in a business mathematics course fits with that trend. The student cohort is quite diverse, both in terms of the program of study (Accounting, Finance, Law, Management, Property, Tourism, Marketing, Aviation), and the level of confidence in maths. It was envisioned that as additional resource, complementary to the work of the course teaching team and the more traditional activities in the form of discussion forums and face-to-face help sessions, Mattie.AI would add flexibility and help improve students' chances of academic success.

The large language model (LLM) behind Mattie.AI's conversational abilities is Anthropic's Claude 3.5 Sonnet. RAG architecture was chosen to ensure that students received reliable, subject-specific help consistent with course materials and mathematical reasoning. The chatbot's knowledge base was created using a curated collection of course materials (lecture notes, workshop examples, tutorial questions and solutions), plus general course structure information and mapping to allow the chatbot to provide advice where relevant resources are located within the course learning management system (LMS). When a student asks a question, the language model is used to interpret information retrieved from the knowledge base into a human-like response. RAG architecture allows the LLM to access up-to-date and domain-specific information without the need for retraining, and it reduces the risk of the model generating inaccurate or fabricated answers by grounding the responses in verified information from the knowledge base. In addition, a system prompt was developed to give Mattie.AI a Socratic tutor persona, training the chatbot to ask probing questions to help a student explore their own understanding and arrive at their own solutions to questions, rather than simply providing direct answers, unless a student asked for a concept definition. A strict character limit was imposed on user input to discourage students from pasting entire assessment task instructions.

The deployment of Mattie.AI to students commenced in Week 2 coinciding with the release of the first major assessment and the timetable for in-person help sessions. A short demonstration was given but otherwise students were encouraged to explore Mattie's capabilities on their own, with the caveat that it was still in development and that like any AI tool, may not always be accurate. Students were reminded of Mattie.AI's availability when the second major assessment was released and again in the lead-up to the final exam.

The funding for the project was provided by the University of South Australia through an Unstoppable Teaching and Learning Development Grant 2024/25. The project was approved by the Human Research Ethics Committee (HREC). Students were briefed on the study's purpose and data confidentiality measures. Access to the chatbot and participation in the study were voluntary and without impact on course outcomes. All data, including user interactions, was stored internally within a secure AWS environment and anonymised prior to analysis to protect participant privacy.

Chatbot evaluation

The design of Mattie.AI as a closed domain chatbot with user interactions stored internally, has the advantage of allowing for analysis of what students actually did rather than only what they reported doing (Guan et al., 2025). Its effectiveness as a study support tool was thus assessed using activity logs, including the timing and content of students' interactions. In addition, at the end of the study period students were invited to complete an online survey regarding their experience with using Mattie.AI. Survey questions explored overall satisfaction with the chatbot as well as more specific aspects of its usability. In addition, students were asked for their reasons to use (or not use) the chatbot, and through open-ended questions, their broader perspectives on the usefulness of AI chatbots for supporting students in their learning.

Results of the pilot study

The main aim of the plot study was to test the functionality of Mattie.AI with a 'live' student cohort and to gauge students' response to having an additional study support tool that is tailored to the course content and unlike support from the teaching team, available 24/7. Analysis of chatbot logs revealed 85 unique users engaging in 96 unique sessions with Mattie.AI. With 304 students enrolled in the course, this gives an uptake rate of 28%. A typical (median) session with Mattie.AI consisted of 7 steps (exchanges between the student and Mattie.AI), with 50% of sessions having between 3 and 17 steps. The most frequent session length was 3 steps (27% of all sessions), which corresponds to users asking Mattie a single question, for example, about a deadline or word count requirement for an assessment item. There were two extremely long sessions, consisting of 105 and 187 steps, respectively. Both sessions, by two different users, occurred before the first major assessment deadline. These two students sought Mattie's assistance with tasks in that assessment including steps needed to complete the required analysis in Excel.
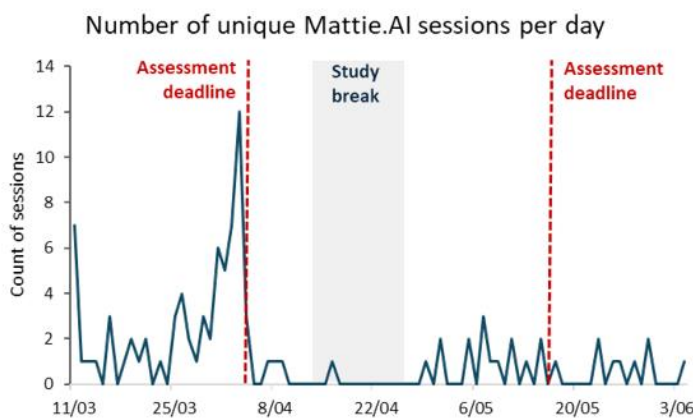

Figure 1. Pattern of engagement with Mattie.AI over time.

The overall pattern of engagement with Mattie over time is shown in Figure 1. There is a distinct peak in the number of sessions per day coinciding with the deadline for the first major assessment, declining to zero during the two-week study break in the middle of the study period, increasing slightly in the lead up to the deadline for the second major assessment and later the exam. The overall pattern is consistent with observed attendance trends throughout the study period as well as interactions with the course LMS. Assessment demands tend to intensify after the study break, shifting students' attention to those tasks as the expense of engagement with other course learning activities.
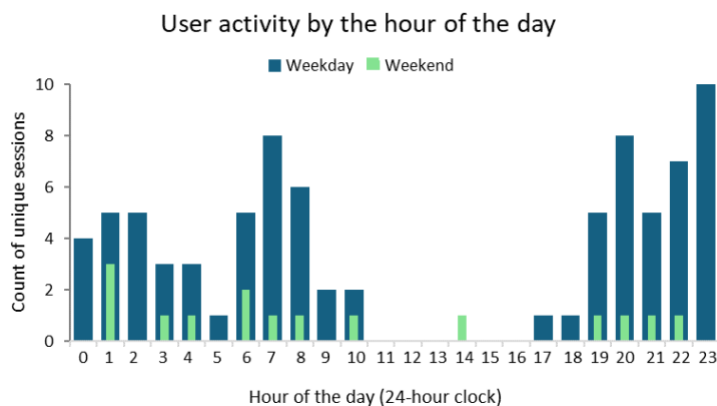

Figure 2. Time of day for unique recorded sessions of students with Mattie.AI. Shown are total counts of sessions started during each hour of the day, split into weekdays and weekends.

The pattern of interactions with Mattie.AI according to the hour of the day, shown in Figure 2, is as expected. Students tended to engage in conversations with Mattie mostly during the week, with weekend interactions being much less frequent. Sessions also tended to be in the evenings or late at night, with a smaller peak in the

early morning. Majority of conversations with Mattie were closely related to assessment tasks. Session topics were largely focused and specific, suggesting that students came to Mattie with clearly formulated questions.

The satisfaction and usability survey at the end of the study period was completed by 51 students, 17 of whom declared not having used the chatbot at all. For the students responding to the survey, familiarity with chatbots was minimal to moderate (79.25% of responses). For students who did use Mattie.AI, the primary reasons were understanding course content and preparing for assessments and exams, consistent with the content of recorded interactions with the chatbot. Responses to survey questions about overall satisfaction and usability are summarised in Figure 3. It is evident that respondents who used Mattie, found the chatbot generally easy to use. The majority believed it provided reliable responses; 56% of respondents considered the information provided by the chatbot to be either very or extremely accurate. Responses in relation to the effectiveness of the chatbot when it came to assistance with solving problems and exercises as well as help with understanding the concepts of the course were more mixed. Approximately two thirds of respondents found Mattie to be moderately effective or helpful, with another third finding it only slightly effective or helpful. Students who found Mattie to be either very or extremely effective or helpful were in the minority (approximately one quarter of respondents).
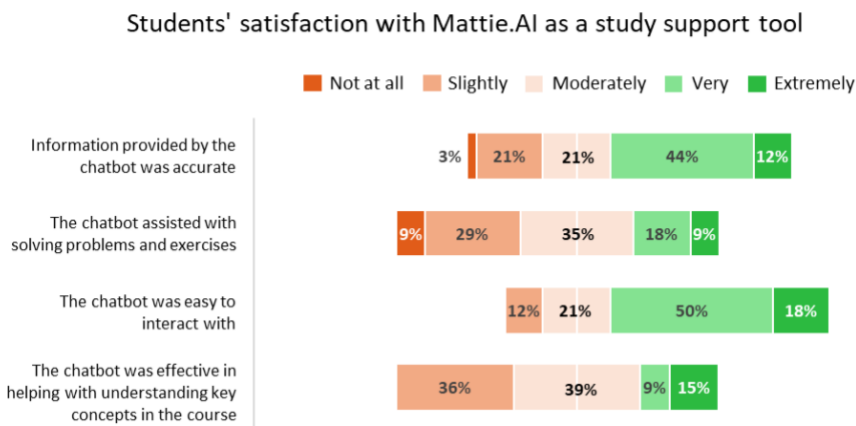

Figure 3. Summary of responses (*n* = 34) to questions about usability and usefulness of Mattie.AI. The survey was administered at the end of the study period.

Responses to open-ended questions suggest that overall students found the chatbot tutor useful but noted areas for improvement, particularly in speed, accuracy, and its ability to handle vague or initial-stage assignment queries. Suggestions to enhance usability included adding multimedia content, flashcards, and weekly summaries. While a few students encountered issues with communication ('It didn't understand what I was asking') or vague responses (possibly due to Mattie's Socratic method of questioning while a student expected direct answers), the overall feedback supports expanding the chatbot to other courses to assist with content clarification and help with assessment tasks. Students who did not use the chatbot primarily felt it was not necessary, due to sufficient support from lectures, tutorials, and their own problem-solving. Some preferred asking teachers directly or attending the in-person help desk sessions. A minor barrier mentioned was the perceived hassle of the login or access process, which discouraged use despite potential interest.

Discussion

While there is more work to be done, the pilot release of Mattie.AI for students to use as a study support tool has been successful by providing valuable insights into the functionality of the tool as well as usage patterns by students. A key factor contributing to Mattie's effectiveness was its ability to provide personalised, context-specific support, made possible by adopting a RAG architecture. However, giving the chatbot a course-specific knowledge base came at a price of greater latency in responses, as noted by students in the satisfaction and usability survey. Another source of frustration for some students, perhaps those less experienced with AI-powered chatbots in general, was the chatbot's perceived inability to understand their questions, which points to the need to manage students' expectations of what a chatbot can do and to model effective questioning and prompting techniques to get the most out of interactions with the chatbot.

The uptake of the AI-powered chatbot as a study tool was low – only 28% of all students enrolled chose to use Mattie.AI to help them with the course. However, it should be noted that the chatbot was only one of the support tools available in the course and that the decision to use it was solely at the discretion of the student. There were no class activities or assessment tasks requiring them to interact with Mattie. A few students indicated in the survey that they did not feel the need to use it or that they preferred to talk to a teacher. This is a strong indicator of the continued importance of human expertise and a human touch in today's rapidly evolving learning environments, and that availability of varied support options is what wins the day. As one of the students attests in the course evaluation survey: 'The weekly help desk and trial run of a course-specific AI were useful in maintaining stress levels - I felt as though I never had to worry because there were so many opportunities to ask questions in a more quiet and smaller environment, whenever I needed it.'

Conclusion

Flexibility and timeliness of learning support are critical for student success, made challenging at university due to high student-teacher ratios, particularly in first-year courses. Demands of managing multiple assessment deadlines add another level of difficulty for students. Even with tailored and varied course resources, many students struggle to fully understand the material or assessment tasks but are reluctant to ask for help. An AI-powered chatbot adds flexibility to learning and seeking help by allowing students to ask questions anytime and receive course-specific, personalised feedback when they need it most, increasing their chances of success at a crucial stage of their university journey. Educators considering similar solutions should anticipate upfront effort in re-formatting course materials for the language model, manage expectations, and build in iterative rounds of testing to ensure dependable performance. Future work will refine Mattie.AI's capabilities and explore its impact on outcomes and help-seeking behaviours across different student cohorts.

References

Broadbent, J., & Lodge, J. (2021). Use of live chat in higher education to support self-regulated help seeking behaviours: A comparison of online and blended learner perspectives. *International Journal of Educational Technology in Higher Education*, 18 (1), 1–20.

Chen, Y., Jensen, S., Albert, L. J., Gupta, S., & Lee, T. (2023). Artificial Intelligence (AI) Student Assistants in the Classroom: Designing Chatbots to Support Student Success. *Information Systems Frontiers*, *25*(1), 161–182. https://doi.org/10.1007/s10796-022-10291-4

Chyr, W.-L., Shen, P.-D., Chiang, Y.-C., Lin, J.-B., & Tsai, C.-W. (2017). Exploring the effects of online academic help seeking and flipped learning on improving students' learning. *Educational Technology & Society*, 20(3), 11–23.

Guan, R., Raković, M., Chen, G., & Gašević, D. (2025). How educational chatbots support self-regulated learning? A systematic review of the literature. *Education and Information Technologies, 30,* 4493–4518. https://doi.org/10.1007/s10639-024-12881-y

Kuhail, M. A., Alturki, N., Alramlawi, S., & Alhejori, K. (2023). Interacting with educational chatbots: A systematic review. *Education and Information Technologies*, 28(1), 973–1018. https://doi.org/10.1007/s10639-022-11177-3

Lewis, P., Perez, E., Piktus, A., Petroni, F., Karpukhin, V., Goyal, N., Küttler, H., Lewis, M., Yih, W., Rocktäschel, T., Riedel, S., & Kiela, D. (2020). *Retrieval-Augmented Generation for Knowledge-Intensive NLP Tasks*. https://doi.org/10.48550/arxiv.2005.11401

Li, Z., Wang, Z., Wang, W., Hung, K., Xie, H. & Wang, F. L. (2025). Retrieval-augmented generation for educational application: A systematic survey. *Computers and Education. Artificial Intelligence*, *8*, 100417.

Micari, M., & Calkins, S. (2021). Is it OK to ask? The impact of instructor openness to questions on student help-seeking and academic outcomes. Active Learning in Higher Education, 22(2), 143–157. https://doi.org/10.1177/1469787419846620

Newman, R. S. (1994). Adaptive help seeking: A strategy of self-regulated learning. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulation of learning and performance: Issues and educational applications* (pp. 283–301). Lawrence Erlbaum Associates, Inc.

Qayyum, A. (2018). Student help-seeking attitudes and behaviors in a digital era. *International Journal of Educational Technology in Higher Education*, 15(1), 1–16. https://doi.org/10.1186/s41239-018-0100-7

Wu, R., & Yu, Z. (2023). Do AI chatbots improve students learning outcomes? Evidence from a meta-analysis. *British Journal of Educational Technology*. https://doi.org/10.1111/bjet.13334

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