

MathQuest: AI-Generated Practice Quizzes for Calculus

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Course Subject:	Mathematics (Calculus 1 and Calculus 2)
Student Level:	Undergraduate
Number of Students:	Approximately 60–90 per semester
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What the Students Did

Students used MathQuest, a custom-built AI-powered quiz platform, to practice and reinforce key concepts from Calculus 1 and Calculus 2. The tool generates customized multiple-choice questions aligned with course learning objectives, allowing students to select their preferred number of questions, difficulty level, and an optional time limit. After completing each quiz, students reviewed detailed explanations for all answer choices. Students could also use the integrated Math Buddy feature, an AI tutor that provides hints, step-by-step solutions, and feedback on student reasoning in real time.

Purpose

The activity aimed to strengthen students' conceptual understanding and problem-solving skills in calculus by providing personalized, adaptive practice outside of class. The tool was designed to create a low-stakes, flexible environment where students could build mastery, prepare for exams, and develop confidence at their own pace. A secondary purpose was to encourage metacognition through interactions such as asking the AI tutor why a particular answer was correct or incorrect and receive feedback on their reasoning process. The approach is intended to supplement instructor-led instruction and office hours, while removing financial and logistical barriers to individualized practice support.

Assessment

Effectiveness was evaluated through a combination of student feedback surveys, engagement data, and performance indicators. Short surveys collected student ratings on question quality, usefulness of the Math Buddy feature, and perceived impact on understanding. Engagement metrics tracked the number of quizzes taken, frequency of repeat attempts, and use of the AI tutor. Performance trends were monitored through quiz score improvement over time. Students who participated through an extra credit pathway completed a minimum of 30 questions per session at 90% accuracy, ensuring

substantive engagement rather than superficial use. Faculty also observed that positive student preparedness and exam performance shifted over the course of the semester.

Eighty percent of students were repeat users, engaging with the tool two or more times, and 62% used it four or more times across the semester. Seventy-seven percent used the Math Buddy chat feature, and 93% said they would use MathQuest again to study for exams or quizzes. Student feedback was overwhelmingly positive: 90% rated the quality of generated questions as Good or Very Good, and 86% of Math Buddy users rated it Very Helpful. In open-ended survey comments, 92% specifically requested university-wide adoption, with many asking whether MathQuest was available for their biology and chemistry courses.

The extra credit pathway worked better than anticipated. The 90% accuracy requirement ensured genuine engagement, and the fact that gains carried over into midterm and final exam performance confirmed it was about real learning, not just recovering points. Seeing my students perform well on the midterm, and knowing that consistent retrieval practice through MathQuest contributed to that, was deeply rewarding.

Faculty Reflections

What surprised me most was how enthusiastically students embraced voluntary extra math practice. I went in with modest expectations and found instead that students kept coming back on their own because the tool was genuinely helping them. It reminded me that students do want to improve; they just do not always connect with traditional forms of support. When given a tool that feels relevant to how they already engage with the world, especially one that incorporates AI in a purposeful and academically meaningful way, they show up.

Building the tool itself was a learning process. During development, I discovered a bug where the correct answer was always appearing as Option A. This served as a reminder that any AI-generated tool needs thorough testing and debugging before deployment.

I believe generative AI, when thoughtfully designed and intentionally integrated, can democratize access to personalized learning in ways that traditional tools cannot. MathQuest reflects my commitment to using AI not as a shortcut, but as a scaffold that meets students where they are, supports their reasoning process without replacing it, and removes financial and logistical barriers to getting help. The technology should prompt thinking, not bypass it.

Step-by-Step Directions

Step 1	Access MathQuest through the link provided on your course page or by your instructor.
Step 2	Select the calculus content you want to practice (Calculus 1 or Calculus 2 topics).

Step 3	Choose your quiz settings: number of questions, difficulty level (easy, medium, or hard), and an optional time limit.
Step 4	Begin the quiz and answer each multiple-choice question.
Step 5	After completing the quiz, review the detailed explanations provided for all answer choices—both correct and incorrect.
Step 6	Use the Math Buddy feature to ask follow-up questions, request hints, get help identifying errors in your reasoning, or explore full step-by-step solutions.
Step 7	Repeat quizzes as needed to reinforce learning, try higher difficulty levels, and track your improvement over time.

Related Materials

- MathQuest can be accessed through the [COS Dashboard](#)