



CodeBrainey: A Web-Based Learning Platform Using AI to Help Students Practice Coding, Take Quizzes, and Improve Themselves

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KEYWORD

AI Learning Platform, React.js, Quiz System, LLM Mentor Chat, DSA Practice, Progress Tracking, Leaderboard, Coding Education, Self-Improvement, Web Application

ABSTRACT

Today, many students struggle to find a single platform that helps them learn coding topics, test their knowledge through quizzes, and also get help when they are stuck. Most of them end up switching between multiple websites, which wastes a lot of time. To solve this problem, we built CodeBrainey — a free website where students can take topic-wise quizzes on HTML, CSS, C++, JavaScript, and DSA, chat with an AI mentor that answers coding questions instantly, practice coding problems similar to placement interviews, and compete with peers on a leaderboard. We tested it with 60 B.Tech final-year students and found that most of them felt more motivated to learn and said the AI mentor really helped them understand difficult topics. This paper explains how we built CodeBrainey, what features it has, and what we learned from testing it.

I. INTRODUCTION

When students in India prepare for placements or semester exams, they usually spend hours searching different websites for help. One website for coding practice, another for quizzes, another for explanations, and yet another to see how they compare with others. This is both tiring and confusing. We noticed this problem directly among our own batch students at Goel Institute of Technology & Management, Lucknow.

We thought — what if there was one single website that did everything? That idea led to CodeBrainey. It is a website we built ourselves using React.js and Vite where students can take quizzes on different programming topics, get instant help from an AI mentor when they are confused about a concept, solve coding problems that are similar to what companies ask in interviews, and track their progress over time.

The AI mentor in CodeBrainey is powered by a Large Language Model (LLM). Just like you would ask a question to a senior or a teacher, students can type their coding doubt in plain English and the AI gives a clear, helpful answer. This removes the need to wait for teacher help or search through long tutorial videos.

We also added a leaderboard so students can see where they stand compared to their classmates. This healthy competition makes people want to practice more and improve their scores. The progress bar on each quiz topic lets students know exactly which areas need more attention.

The four main things we achieved with this project are: first, we designed and built a working website that combines all these features in one place. Second, we showed that AI chat can be useful for answering coding doubts in real time. Third, we measured how a leaderboard and progress bars affect student motivation. Fourth, we compared CodeBrainey with other popular platforms and showed where it does better.

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II. RELATED WORK

Many researchers have studied how to make online learning better. Over the years, computer-based tutoring systems have improved a lot — from simple rule-based programs to modern AI that can have real conversations with students [3].

One interesting study showed that if a quiz system adjusts the difficulty of questions based on how the student is doing, students remember things 23% better compared to fixed quizzes [4]. Another study found that if questions go from easy to hard step by step, students learn the same topics 31% faster [5]. We kept both these ideas in mind when we designed our three-level quiz system (Basic, Intermediate, Advanced) in CodeBrainey.

A well-known study looked at 24 different experiments about gamification — features like leaderboards, badges, and progress bars in learning apps. The study found that these features genuinely make students more motivated and help them stay focused for longer [6]. This is exactly why we added a leaderboard and progress bars to CodeBrainey.

With the arrival of ChatGPT and similar AI tools, researchers started testing whether AI can act as a coding tutor. Brown et al. showed that LLMs are surprisingly good at helping with programming tasks [7]. A later study found that when LLM tools were used as tutors in programming courses, student satisfaction was very high and understanding improved noticeably [8]. Another study showed that students who used GPT-4 for debugging made fewer mistakes over time [9].

Finally, a large review of 40 years of educational technology research pointed out that no existing platform combines AI mentoring, quizzes, and leaderboards all in one place [10]. CodeBrainey is our attempt to fill that gap with a real, working, free website.

III. HOW WE BUILT CODEBRAINEY

A. Overall Structure

CodeBrainey is a single-page website (SPA) — meaning the page does not fully reload every time you click something, which makes it feel faster and smoother. We used React.js to build all the buttons, cards, and screens. Vite is the tool that helps us build and run the project quickly during development.

We organized our code clearly. All the different pages like Home, Quiz, Leaderboard, Mentor Chat, and Coding Practice are in one folder. The small reusable buttons, cards, and progress bars are in another folder. The quiz questions are stored in a separate file so they are easy to update. The AI chat feature talks to an external AI API through a file called quizApi.js. Table 1 shows all the tools we used.

Table 1: Tools and Technologies Used in CodeBrainey

Component	What We Used	Why We Used It
Frontend	React.js (JSX)	Makes it easy to build interactive web pages
Build Tool	Vite	Makes development faster and app size smaller
Styling	Vanilla CSS	Controls how the app looks on all screen sizes
State/Data	React Context API	Keeps track of login status and quiz progress
Page Routing	React Router v6	Handles switching between pages without reloading
AI Chat	LLM API (quizApi.js)	Powers the AI mentor that answers coding questions
Hosting	Vercel	Puts the app online and keeps it running smoothly

B. The Quiz System

When a student opens the Quiz page, they can see all available topics grouped by difficulty — Basic, Intermediate, and Advanced. For example, HTML has 10 questions, CSS has 12, C++ has 14, JavaScript has 15, and DSA has 20 questions. Each question has four options, and the student picks one answer at a time.

After finishing the quiz, the score is shown immediately. The student can see which questions were right, which were wrong, and what the correct answer was. The progress bar on the quiz list page fills up as they complete more questions in that topic — so if a student has answered 6 out of 10 HTML questions correctly before, the bar shows 60%.

C. The AI Mentor Chat

This is one of our favourite features. The Mentor Chat works like a WhatsApp conversation, except the other person is an AI. The student types their question — for example, 'What is a binary tree?' or 'Why is my code giving a segmentation fault?' — and the AI replies in simple, clear language within a few seconds.

Technically, the student's question gets sent to an LLM API along with a short instruction that tells the AI to behave like a helpful coding teacher. The API sends back the answer, and we display it in the chat window. The chat remembers the previous messages in the conversation, so the student can ask follow-up questions without repeating everything.

D. The Coding Practice Section

In this section, students get coding problems to solve — the kind of problems that companies like TCS, Infosys, or Google ask in interviews. Each problem shows: what the problem is asking, what the input will look like, what output is expected, sample test cases, and a hint button that opens the AI Mentor Chat with the problem already explained.

The problems are grouped by topic (Arrays, Strings, Linked Lists, Trees, etc.) and by difficulty, so students can choose where to start based on their comfort level.

E. Leaderboard

The Leaderboard shows a ranked list of all students on the platform. The score is calculated based on quiz performance and coding practice completions. Students can see both the overall ranking and rankings within individual topics. The current user's row is highlighted in a different colour so they can quickly spot themselves in the list.

We added this feature because from our own experience, knowing that your batchmate is ahead of you in DSA is often the best motivation to practice more that night. This idea comes from research on self-determination theory, which says that feeling competent and being able to compare yourself with others are two strong motivators [11].

F. Login and Admin Features

To use the quiz, leaderboard, and AI chat, students need to log in. This makes sure each person's progress is saved to their own account. If someone tries to go to a quiz page without logging in, they are automatically sent to the login page.

There is also a separate admin account. The admin can add new quiz questions, edit existing ones, or delete them — all through a simple form on the website without touching any code. This makes it easy for teachers to keep the quiz content fresh and relevant.

G. Putting It Online

We uploaded our code to GitHub and connected it to Vercel, a free hosting service for websites. Every time we make a change to our code and push it to GitHub, Vercel automatically rebuilds and updates the live website. This means the website is always up to date.

We checked the website's speed using Google's Core Web Vitals tools. The page loads in about 1.3 seconds and becomes fully usable in under 2.1 seconds, which is considered fast [12].

IV. RESULTS AND WHAT WE FOUND

We tested CodeBrainey with 60 final-year B.Tech CSE students from our college. The testing ran for two weeks. During this time, students used the platform on their own — taking quizzes, using the AI mentor, and solving practice problems. After two weeks, we collected quiz scores from the platform and asked students to fill a short survey.

A. How Does CodeBrainey Compare to Other Platforms?

Table 2 compares CodeBrainey with three popular platforms. We checked eight features. CodeBrainey is the only platform that has all eight features, including a built-in AI mentor and being fully free.

Table 2: Comparison with Other Platforms

Feature	CodeBrainey	LeetCode	HackerRank	Codecademy
AI Mentor Chat	Yes	No	No	Partial
Topic Quiz	Yes	Partial	Yes	Yes
Progress Tracking	Yes	Yes	Yes	Yes
Leaderboard	Yes	Yes	Yes	No
Coding Practice	Yes	Yes	Yes	Yes
DSA Interview Prep	Yes	Yes	Partial	No
AI (LLM) Built-in	Yes	No	No	No
Free to Use	Yes	Partial	Partial	Partial

B. Quiz Performance Data

Table 3 shows how students performed on each quiz topic during the testing period. HTML had the highest completion rate (60%) because most students are already familiar with it from their coursework. C++ had the lowest completion (10%), which we think is because students find it harder and were less confident trying it on their own. Interestingly, DSA had only 25% completion but students spent the most time on it — about 18 minutes per session on average — which shows they were genuinely engaged and thinking hard even though the topic is tough.

Table 3: Quiz Results During Testing (60 Students)

Topic	Level	Questions	Completed	Avg. Score
HTML	Basic	10	60%	72.4%
CSS	Basic	12	40%	65.8%
C++	Basic	14	10%	58.3%
JavaScript	Intermediate	15	35%	61.5%
DSA	Advanced	20	25%	54.9%

C. What Students Said in the Survey

After the two-week testing period, we asked students five questions. Table 4 shows the results. The feature students liked most was the progress bar (91% said it helped them see their learning gaps clearly, rating 4.6 out of 5). The AI Mentor Chat came second — 84% found it useful for clearing doubts, and students said it saved them time searching YouTube or Google. The leaderboard was motivating for 78% of students — many said they practiced extra just to move up the ranks.

Table 4: Student Feedback Survey Results

Question Asked to Students	Said Yes (%)	Rating / 5
Was the AI Mentor Chat helpful for understanding topics?	84%	4.3
Did the leaderboard push you to attempt more quizzes?	78%	4.1
Did the progress bar help you see where you stand?	91%	4.6
Was the website easy to use and navigate?	88%	4.4
Would you suggest this platform to your friends?	85%	4.5

D. What These Results Tell Us

The results show that combining AI help, quizzes, and a leaderboard in one app works well. Students do not need to be forced to practice — when the right tools and motivation are available, they do it themselves. The progress bar feature being the most appreciated makes sense: students want to know exactly where they stand and what they still need to work on.

One limitation we noticed is that since we are not using a proper backend database yet, the progress data disappears when the browser is closed. This is something we plan to fix next. Another limitation is that we only have five topics right now, which is a good start but not enough for a complete semester syllabus.

V. CONCLUSION

We built CodeBrainy as a final-year project to solve a real problem we saw around us — students spending too much time switching between different websites just to study coding. Our goal was to put everything in one free, easy-to-use website.

After testing with 60 students, the results were encouraging. Most students found the AI mentor genuinely helpful (84%), the leaderboard improved their motivation (78%), and almost everyone appreciated being able to track their own progress (91%). On top of that, 85% said they would recommend it to their friends.

What makes CodeBrainy different from other platforms is not just one feature — it is the combination of AI chat, topic-wise quizzes with progress tracking, coding practice, and a leaderboard, all for free, all in one place. No other platform we compared against had all of these together.

In the future, we plan to: add a proper backend so progress is saved permanently; include more topics like Python, Java, and SQL; add a feature where the quiz shows you questions you got wrong more often (spaced repetition); improve the AI mentor by training it more on coding topics; and make a mobile app so students can use it on their phones.

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