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Design and Implementation of a Secure, Interactive, and Customizable Web-Based Trivia System

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Abstract
Quizo is web-based quiz system that is built using React for frontend and planned integration of backend database technologies. It is secure, interactive and customizable. Various components of the system allow the user multiple functionalities like creating a quiz, gameplay and tracking result. Keeping security in mind, the system makes use of various web security practices like Cross-Origin Resource Sharing (CORS) configurations. This helps in preventing unauthorized requests and safeguarding API endpoints. The project leverages basic database management, including hashing of sensitive data like user credentials. React JS helps improve user experience by using a React-based router that supports smooth navigation across pages such as game story, quiz setup, instructions, and result screens. Overall, this trivia system serves as a template for building an interactive educational platform that has an immersive storyline aimed at attracting people from all demographics, which makes use of frontend technologies and secure backend practices.
Keywords: *Web-based Quiz System, React.js, Trivia DB API, Tailwind CSS, Gamification, CORS, Data Security.*

1. Introduction
In this rapid era of urbanization, most children come into contact with technology early in their life. Oftentimes via entertainment, these tools help to engage children. They can range from nursery rhymes to interactive games. These games are often colorful, immersive and educational in nature. An ideal game is one that not only serves entertainment but also provides the player with some knowledge or skills. In fact, these game shows have also been very relevant amongst all generations with shows like "Who Wants to be a Millionaire?" being extremely popular and a worldwide phenomenon. These games are not only addictive but also educational. Such games and shows do not hamper the user's skills in any way as compared to various famous video games. Nowadays even schools have adapted to quiz systems [1]. Students tend to take such quiz games as a challenge which in turn has a positive impact. There are several quiz platforms like Kahoot which are well-known [2]. Now there is a growing demand for interactive, user-friendly, and web-based quiz applications with each increasing day as a number of digital learning platforms come into the market every day. We have observed that a major issue is many systems lack customization features or offer limited engagement due to their static nature. An immersive and dynamic quiz can not only increase engagement from the user's side but also make the entire process more appealing to the wider audience. This research aims to design and implement a secure, interactive and customizable web-based quiz system named as Quizo [3].

1.1. Security in our Web-Based Application
Security is vital in any web-based application, especially when user data is involved. To prevent threats like Structured Query Language Injection (SQLi), Cross-Site Scripting (XSS), and Cross-Site Request Forgery (CSRF), we used HyperText Transfer Protocol Secure (HTTPS), secure authentication, JSON Web Tokens (JWT) tokens, and followed safe coding practices. Our system also uses Cross-Origin Resource Sharing (CORS) to restrict

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access and hashing to protect sensitive data. User scores, timestamps, and partial IP addresses are securely stored in results. json, ensuring data privacy and integrity.

1.2. Interactive Features and User Engagement:

One of the key reasons why users enjoy trivia platforms is because of their interactive nature. Features like play or create quizzes, real-time question updates, and instant feedback in our Alien-Spaceship Story-based interactive quiz application help create a fun and competitive atmosphere. We used modern frameworks like React.js that allow for building responsive and dynamic user interfaces, making the platform more appealing and user-friendly.

1.3. Customizability in Learning and Trivia Systems

Customization is another important factor that adds value to a trivia platform. It allows both users and administrators to personalize the experience. Customization may include options to select total number of questions, question topics, difficulty levels, and format of questions – whether multiple choice questions or true and false. Research has shown that personalization can improve learning outcomes and increase user satisfaction. However, many current trivia systems offer limited options for such customization. Quizo is an Alien spaceship-based storyline where users are supposed to escape the unknown planet named Quizo by answering a quiz also with added features where users can create their own quiz as well, this provides our users with at most personalization.

1.4. Review of Existing Online Trivia Platforms

Popular platforms such as Kahoot!, Quizizz, and Mentimeter provide some of these features but also have limitations. For example, Kahoot! offers good interactivity but limited options for in-depth customization and enterprise-level security [2]. Quizizz allows for customization but lacks some real-time interaction features [4]. Also, many of these platforms are closed-source, which restricts further modification or integration into other systems. This highlights the need for an open, flexible, and secure trivia platform that can be used in a variety of settings, such as our application, Quizo.

1.5. Identified Gaps in Literature

Based on the review of existing systems and academic literature, it is clear that there is still a need for a platform that brings together security, interactivity, and customization in a well-balanced way. While many existing systems do well in one or two of these areas, it is rare to find a platform that provides all three effectively. There is also a lack of solutions that offer an open and modular architecture, that made us easier to extend and integrate the trivia system into larger applications. Quizo has been designed to address these gaps and provide a more complete solution.

2. Method

We built the application using React.js as it provides dynamic component rendering [5]. A good application must have a good and attractive user interface as well as be able to adapt to different screen sizes. To achieve that we used Tailwind CSS [6]. It enabled us to give the website a fun alien-themed look to especially attract the younger demographics. Secure cross-origin requests were managed through proper Cross-Origin Resource Sharing (CORS) handling. At the end of the game user score were hashed and saved in a result.json file so that it can be retrieved at any time. The question-format including multiple choice or true-false can be selected by the user. Each question carries 10 points. The application displays a modal that displays the user-submitted answer and the actual answer. This promotes learning amongst the players.

2.1. Technology Stack and Frontend Design

We chose to implement frontend development by using technologies like HTML5 and JavaScript. React.js has a component-based approach which allowed reusability, modular development, easy customization of components and state management.

2.2. Backend and API Integration

The application fetches quiz data from the Trivia DB API, allowing real-time retrieval of category-wise questions and difficulty levels. API responses are handled via asynchronous JavaScript functions and stored in state variables for rendering.

2.3. Data Logging and Storage

User-related data such as hashed username, quiz, score, time and date of play, and partial IP address get

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stored in results. json. This lightweight JSON file serves as a backend-free storage mechanism suitable for development or low-scale deployments, shown in Table 1.

Table 1 Overview of Technologies Used in Application

Technology	Purpose
HTML5	Structuring basic layout and elements of the application
CSS3	Base styling of components
Tailwind CSS	Utility-first framework for rapidly styling components and layouts
JavaScript	Core programming language to handle logic and interactivity
React.js	Frontend framework to build a dynamic and responsive single-page app
React Router	For navigating between routes (home, quiz, result, etc.)
Trivia API	Source of dynamic quiz questions
CORS Handling	Ensuring secure cross-origin requests from the Trivia API
Hashing	Saving user results securely using hashing and storing to JSON file
Custom Quiz Module	User-defined quiz questions and answer validation

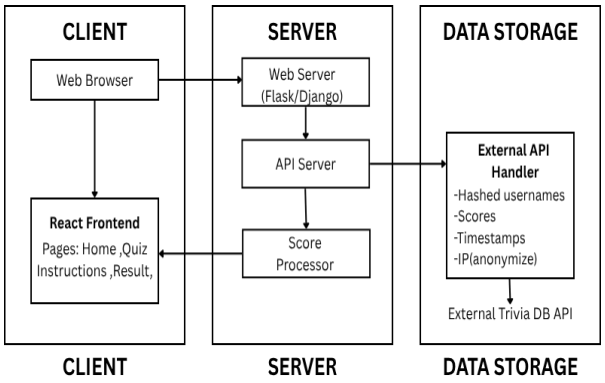

Figure 1 System architecture of Quizo

3. Results and Discussion

3.1 Results

Working on this project opened our eyes to new and innovative ways of thinking. While the project itself was not highly complex, the development process and the resulting minimalistic design taught us how to approach simple projects creatively generating thoughtful ideas, identifying problems, and crafting effective solutions. The implementation of our application, Quizo, has yielded significant results, showcasing its effectiveness in delivering an engaging software experience with strong system performance, user interaction, responsiveness, and overall educational value, shown in Figure 1.

3.1.1 System Performance Reliable Frontend and Backend Quiz Handling

The system allows users to seamlessly create and attempt quizzes through smooth frontend and backend integration. Quizo provides a highly interactive quiz platform that combines real-time question loading with a user-friendly interface, transforming traditional assessments into enjoyable and engaging learning experiences.

3.1.2 User Interaction and Usability Simple and Easy to Use

The clean and intuitive design of the interface makes it easy for users to navigate through various options, resulting in a more accessible and attractive experience.

3.1.3 Engaging User Experience

The interface is crafted to ensure an enjoyable and interesting experience. The story-based design enhances user engagement by increasing student interest and motivation to solve quizzes, thereby fostering a deeper educational impact.

3.1.4 Educational Impact Enhanced Learning

The system significantly supports students' learning processes. The alien-spaceship story-based interface successfully encourages active participation, helping achieve the project's goal of transforming traditional pen-and-paper learning into a gamified and immersive experience [7].

3.1.5 Knowledge and Time Management

Consistently solving quizzes helps students expand their knowledge and improve their time management skills.

3.1.6 Device Compatibility

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The platform is responsive across various screen sizes, ensuring a seamless and uninterrupted user experience on all devices.

3.2 Discussion

In response to the COVID-19 pandemic in 2020, all the institutes, schools, and colleges were forced to find an alternative to offline classroom-based classes [7]. Online meetings, online classes, and online tests came into the picture after the pandemic to solve the above problem. It was a very effective solution but had some drawbacks like the students decreasing interest in studies and increasing interactions on social media and games. Teachers often observed that students joined the virtual classes without actively participating in them. The usual strategy of asking questions and waiting for the students to start the discussion proved ineffective. Making the quiz application was not the only goal but also making it equally interactive led to a growth in interest shown by students in solving the quizzes to earn points and thereby gain knowledge [8]. This gamified quiz platform positively influenced interactions between teachers and students and also became a medium to serve effective knowledge [9-10].

Conclusion

Through our project, we gained valuable experience, both technically and in working as a team. Developing Quizo allowed us to apply many of the web programming concepts we had learned — for example, the modern UI effects like the navigation bar and button hover animations. Building this system helped us understand how to connect theory with real-world practice, which gave us more hands-on experience than we would have otherwise gained. One key learning was how even simple tools and concepts can lead to creative and effective solutions. Since we were working with a basic set of tools, we had to think carefully about design and functionality. This taught us to appreciate the beauty of simplicity and to make the most of the resources we had. Overall, Quizo has helped us grow not only in terms of technical skills but also in project management, problem-solving, and teamwork. While the current version of the system works well, there is still room for improvement. In the future, we plan to explore adding new features such as AI-driven question generation, more advanced analytics, and the ability to scale the platform for larger audiences. We believe that Quizo is a strong step forward in the development of secure, interactive, and customizable trivia platforms, and we hope it will inspire further innovations in this space.

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