

EduKona: A Customizable, Mobile-Friendly Platform for Enhanced Educational Engagement and Collaboration

Aryan Aladar

College of Computing and Informatics
University of North Carolina Charlotte
Charlotte, United States
aaladar@uncc.edu

Dylan Ilg

College of Computing and Informatics
University of North Carolina Charlotte
Charlotte, United States
dilg@uncc.edu

Jack King

College of Computing and Informatics
University of North Carolina Charlotte
Charlotte, United States
jking174@uncc.edu

Ayman Hajja

College of Computing and Informatics
University of North Carolina Charlotte
Charlotte, United States
ahajja@charlotte.edu

Abstract—This Innovative Practice Work in Progress paper presents a novel educational platform that is both free and open-source, specifically designed to enrich the learning experience. Our system enables educators to create customizable educational learning experiences, accommodating the diverse structures of classroom settings. Acknowledging the constraints of a one-size-fits-all approach, our initiative was motivated by the demand for a versatile tool that is flexible enough to support a range of teaching objectives—be it fostering collaboration, increasing individual engagement, or pursuing any other pedagogical aims the instructor may have. The core of our innovation lies in the system’s exceptional adaptability, offering instructors the ability to tailor the educational content to their precise objectives. This adaptability extends to creating a diverse range of learning scenarios, from interactive quizzes to collaborative challenges, each designed to enrich the educational journey. Furthermore, our platform simplifies the transition to digital learning environments by providing a fully managed, ready-to-use website, eliminating the complexities of code modification or the necessity for self-hosting. Our system is designed with contemporary educational interactions in mind, showcasing full mobile compatibility. This allows students to engage seamlessly with the educational material, whether through smartphones or computers, ensuring the tool’s accessibility and convenience for a digitally native generation. The user-friendly interface and the interactive nature of the platform may remind some of Kahoot, but our system distinguishes itself with its extensive customizability and open-source framework. To view our project’s progress, please visit our repositories: the back-end at https://github.com/uncc-hice/edukona_backend and the front-end at https://github.com/uncc-hice/edukona_frontend.

Index Terms—Adaptive Learning, Educational Games, E-Learning Platforms, Interactive Technologies, Pedagogical Tools

I. INTRODUCTION

In the rapidly evolving landscape of education technology, there is a significant gap between digital advancements and the traditional educational methods used all across the globe

[1]. Current platforms, such as Kahoot and Quizlet [2], while popular and engaging, offer limited customization that contest the diverse classroom dynamics and individual learning methods necessary for student learning [3]–[5]. These platforms typically enforce a one-size-fits-all approach, failing to align with specific educational objectives.

To fill the gap between technology and education, there needs to be a platform free for all to use that allows for unprecedented customization. This paper introduces EduKona, an innovative educational platform designed to bridge this gap. EduKona offers various customization options in an open-source environment, allowing instructors to tailor educational experiences and activities to the needs of their classrooms. Educators can create their own unique versions of learning experiences by combining a multitude of rules and quiz types. Unlike its predecessors, the open-source nature of EduKona invites educators and developers to expand and refine its functionalities, ensuring that it evolves along with the growing needs of teachers and students.

The introduction of EduKona is opportune, as it addresses the pressing need for educational tools that are both adaptable and accessible. EduKona addresses this, providing advanced technological solutions with flexible, educator-driven customization options that present a more dynamic and effective learning environment. This paper will detail the platform’s architecture, core features, and developmental roadmap.

II. SYSTEM ARCHITECTURE AND DESIGN

In this section, we discuss the technical architecture of our educational platform EduKona and our opensource codebase. EduKona is hosted on AWS Elastic Beanstalk (please refer to the Readme in our repositories for the latest hosting link), where deployment is automatically handled with GitHub Actions. Our codebase was designed with scalability, adaptability,

and ease of use in mind, the architecture is based on a modern tech stack that utilizes Django and other open-source technologies to ensure a robust and flexible environment.

The platform is built using Django, a high-level Python web framework as the backbone. For the RESTful services, we utilize Django REST Framework which facilitates the creation of clean, well-designed APIs essential for our decoupled architecture. The frontend is developed using React, a flexible JavaScript library for building user interfaces. This choice allows for dynamic content updates, which is critical for interactive educational games. We integrate Material-UI for the frontend design to ensure that the user interface is visually appealing and responsive. Our system architecture strongly emphasizes the decoupling of the frontend from the backend, enhancing both scalability and maintainability.

This separation allows for the frontend to be updated or replaced without significant backend changes, and vice versa. This separation combined with API-driven interaction ensures that our platform remains modular and extensible, making it easier for developers to add new features, or even integrate with other systems. Our development process is also supported by several key tools including Jira for project management, Postman for API development, Git for version control coupled with GitHub repositories facilitating collaborative coding and supporting our continuous integration and deployment (CI/CD) practices.

III. KEY FEATURES AND FUNCTIONALITY

This section introduces the foundational elements of EduKona, including the current experiences of both students and instructors, followed by an outline of our current roadmap for further development and enhancement of the system.

CURRENT SYSTEM

The current iteration of our platform serves as a Minimum Viable Product (MVP), designed to establish a foundational framework for quiz-based learning. This MVP stage focuses on core functionalities that demonstrate the platform's potential and establish a base for future expansions. Being open source, it also invites contributions from the educational technology community, fostering a collaborative approach to its evolution. The primary feature of the MVP is its quiz-based learning module. These quizzes are designed to be interactive and user-friendly with as many questions as the educator desires, with a full interface to create them. Figure 1 shows the instructor interface on EduKona for creating questions. Currently, our platform supports only multiple choice questions. However, we plan to expand this to include a variety of other question types to cater for different learning styles.

These questions are wrapped with a lighthearted user interface, incorporating fun background music and engaging visual elements that enhance the learning experience. Additionally, the platform includes a graph feature that allows instructors to visualize student results in real time, facilitating immediate feedback and insights into class performance. This graphical

Fig. 1. Creating Questions as an Instructor

analysis tool is crucial for instructors to adjust teaching strategies and understand learning trends. The student begins when a student joins a quiz using a unique quiz code provided by their instructor. This code ensures that students access only the quizzes relevant to their coursework or training sessions, maintaining the organization and security of the educational content. The quiz interface is designed to be lively and engaging. It features fun music and a colorful, intuitive design that keeps students interested and motivated. The instructor's process begins with account creation shortly after they are directed to the dashboard; Figure 2 shows this dashboard, which provides an overview of all created quizzes and student performance during hosted quiz sessions. The interface is designed to be intuitive, allowing educators to manage their content and view results without needing deep technical knowledge.

Figure 3 shows the student interface during a quiz session. Students view the question displayed by the instructor on the projector and have buttons to select their answer, while Figure 4 illustrates the view projected for the instructor during a live quiz session, featuring a live bar chart that tracks and displays student responses.

Fig. 2. Instructor Dashboard

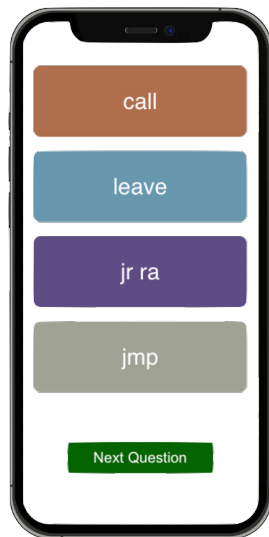


Fig. 3. Live Session View (Student's Perspective)

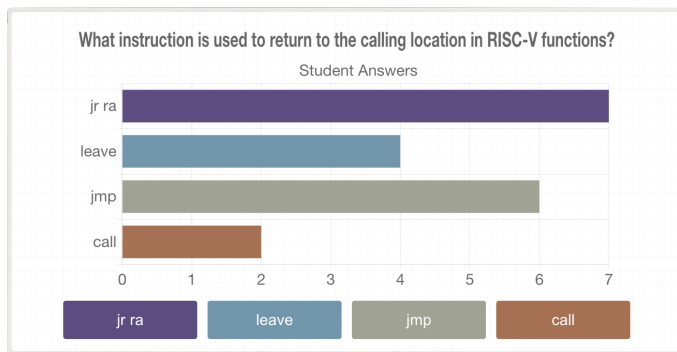


Fig. 4. Live Session View (Instructor's Perspective)

ROAD MAP

The MVP of EDUKona's platform was designed to be highly scalable and extensible, intended as a foundation for a wide range of functionalities to be developed on top of it. Following extensive initial development, we have effectively established a solid base that allows us to address critical gaps in existing systems in this field, specifically in terms of customizability and open-source availability.

Moving beyond traditional gamification, our goal is to empower instructors to design their own **unique games or learning experiences** tailored to their pedagogical needs. To facilitate this, we are currently expanding our backend API to include a diverse array of functionalities and features. These enhancements will be paired with an intuitive user interface that allows instructors to effortlessly toggle and blend game modes. This innovation not only supports gamification but also enhances collaborative learning, thus enriching the classroom learning experience.

Recognizing the potential to expand on the capabilities of popular educational platforms, our next focus is on enhancing

collaboration within classrooms to significantly improve educational outcomes. While platforms like Kahoot and Quizlet are engaging, their capacity to support complex, higher-level learning tasks can be enhanced. To extend these capabilities, we are developing a suite of features designed to integrate gamification with collaboration more effectively. These features are categorized into two groups: **Behavioral Features** and **UI and Non-Behavioral Features**, each tailored to enrich the interactive and visual engagement of EduKona.

Next, we will delve into these two groups of features, illustrating how each can contribute to creating a more dynamic and effective learning environment.

Behavioral Features

Behavioral features form a crucial component of our proposed educational platform, designed to dynamically enhance the learning experience through interactive elements that respond to student actions during quizzes. These features serve to increase engagement, improve comprehension, and provide support tailored to individual learning needs. Instructors have the autonomy to enable or disable these features and have full control over the parameters of each game feature, thus customizing the educational environment to align with their pedagogical strategies and the specific needs of their classes. The examples provided below represent just a few of the innovative functionalities we are developing:

- **Strategic Answer Display:** This feature adds a layer of strategy to quizzes by allowing students to display a different answer to their peers than the one they actually select, introducing an element of surprise and challenge to the learning process. *Parameters could include: the number of students that receive this option, whether this option is assigned randomly or based on performance (e.g., after answering a certain number of questions correctly).*
- **Smart Pairing:** This feature uses performance data to intelligently pair students, enhancing collaborative learning by matching students with complementary knowledge levels. *Parameters can include criteria for pairing, such as performance thresholds or specific subject strengths and weaknesses.*
- **Skip a Question Power-Up:** This power-up allows students to skip a challenging question without penalty. *Parameters could include the number of skips allowed per quiz or the conditions under which skips are earned, such as maintaining a streak of correct answers.*
- **Double Points Power-Up:** This power-up doubles the points for a correctly answered question, incentivizing students to engage more deeply with the material. *Parameters could involve the frequency of availability, whether it's triggered by student performance or offered at random intervals within the quiz.*

These behavioral features are just a few examples from our broader toolkit; as this work progresses, we anticipate that

things will likely change and more ideas will emerge

UI and Non-Behavioral Features

UI and Non-Behavioral Features enhance the quiz interface and presentation aspects of EduKona, focusing on the aesthetic and operational enhancements that do not directly influence the quiz dynamics such as the Power-Ups features mentioned earlier. These elements allow instructors to customize the presentation and functionality of quizzes, such as the student interface shown in Figure 3.

Here is a list of a few examples of some of the UI and non-behavioral features we have in mind:

- **Live Bar Chart Display:** Instructors can choose to display a live bar chart or graph during quizzes as can be seen in Figure 4, which shows real-time answers from students. This feature helps to visualize class performance and understanding on-the-fly, adding a dynamic layer to quizzes that can prompt discussion or further explanation on particular topics.
- **Answer Reveal Options:** Instructors can control how and when answers are revealed—immediately after each question, at the end of the quiz, or manually during review sessions—to facilitate enhanced discussion and reinforce learning.
- **Leaderboard and Scoring Mechanism Customization:** Instructors can enable a leaderboard that displays student rankings based on their quiz performances, creating a competitive environment. This feature includes options to customize how scores are calculated and displayed, such as incorporating bonus points for quick responses or high accuracy.
- **Question Timer Customization:** This allows instructors to set specific time limits for questions or remove the timer altogether, accommodating diverse testing strategies and learning paces.
- **Music Customization:** Instructors can select and control background music during quizzes, choosing tracks that best fit the mood of the quiz content or that are known to stimulate concentration and learning. This feature adds an auditory layer to the quiz experience, enhancing the overall ambiance and student engagement.

Figure 5 shows a screenshot of our envisioned instructor settings page, featuring a simple UI with toggles and input boxes for instructors to fill in parameter values, while allowing them to customize the learning experience. We also plan to develop export functionalities and integrate with other widely-used institutional services, enabling instructors to use our system for grading students. Initially, we will work with Canvas, but as demand grows, we will expand support to include additional platforms.

IV. CONCLUSIONS

The platform described in this paper is a free, available e-learning solution for not only the world of academia but for

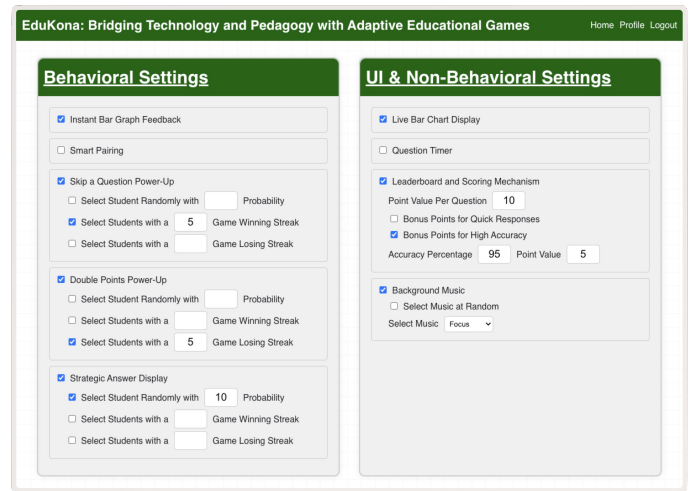


Fig. 5. Customizing the Learning Experience by Instructors

anyone who wishes to teach. Looking forward, the roadmap for EduKona includes a series of enhancements aimed at broadening the range of educational games. This will come in the form of more complex game mechanics and educational scenarios to cater to a variety of subjects and learning styles. The open source nature will be vital to creating a growing repository of shared knowledge. We believe that EduKona will represent a significant advancement in providing adaptable and engaging educational tools on a global scale.

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