Safwaat: A Technological Approach to Enhancing Quranic Tajweed Proficiency

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***Abstract*—Knowledge and attainment of Quranic Tajweed are paramount yet the majority of the Muslim population remains unaware of its rules hindering their ability to recite the Quran fluently and without errors. This research paper introduces Safwaat, a web application platform, designed as a solution to address these challenges by employing a comprehensive methodology that integrates knowledge with modern technology. Safwaat utilizes data collected from reliable sources and leverages a wide range of statistically proven learning techniques that cater for users of different capabilities and at different skill levels, facilitating easy comprehension of Tajweed rules. The study explores the engaging features of Safwaat that motivate users and provide an attractive and interactive learning journey. Additionally, the research paper delves into the application, benefits, and impact of learning methodologies, by casting a light on their effectiveness. Along with that, it also demonstrates thorough statistics, the current situation and how these strategies can improve the Quranic proficiency of people. By tailoring the approach to individuals with different understanding levels, Safwaat aims to foster a passion for Quranic Tajweed throughout the learning journey.**

***Index Terms*— Tajweed, Quranic recitation, Modern technology, 3D model, user engagement, Islamic education, challenges in Tajweed.**

I. Introduction

The recitation of the Holy Quran is a crucial part of every Muslim's daily life and with that comes the responsibility of reciting it in the correct manner. This will not only deepen the connection with Allah but also instil a sense of confidence and reverence in the heart of the believer. This makes acquiring atleast basic knowledge of Tajweed essential for every muslim.

Linguistically Tajweed refers to 'proficiency' or 'doing something well' [1]. In the context of Quran, Tajweed is the proper utterance of a letter from its articulation point along with all its characteristics (Sifaat). [2]

A. Significance of Tajweed

The goal of the Science of Tajweed is to enable the reciter to become an expert in reciting the Quran while paying attention to the correct pronunciation of each letter along with the associated rulings and features, without omitting or adding anything.

According to rulings of many Islamic scholars including Muhammad bin Al-Jazaree, mispronouncing the Quranic letters is a sin.[1]. Every Muslim recites the Quran, at least in Salah, hence, learning Tajweed is crucial as it prevents the reciter from making mistakes while reciting the Quran.

The Holy Prophet (PBUH) regarding this matter said: "He who does not recite the Quran in a pleasant tone is not of us."

Mispronunciation of words from the Quran also gives a wrong interpretation to the listener as in Arabic even the slightest change in pronunciation can change the meaning of the word completely. So, an understanding of Tajweed helps Muslims pronounce letters correctly which earns them rewards and also allows them to convey the intended message clearly and correctly.

It is reported by Hazrat Aishah (May Allah be pleased with her) that the Holy Prophet (PBUH) stated: "The one who recites Al-Quran cleverly will be with respectful scribes and one who recites Al-Quran with great difficulties, doing the best to recite in the best way possible, will take reward twice."

Imuin Al-Jazr states that it is mandatory for every Muslim man and woman to have an understanding of the rules of Tajweed. This alone highlights the significance of Tajweed. Studying Tajweed in great depth and detail with the intention of passing the knowledge to others is categorized as Farz-e-Kafayah.

The Holy Quran regarding this matter states: "Those who We have given the Book to, give it its right in recitation (recite it as it should be recited)" (Surah Baqarah, Ayah 121).

B. Lack of Tajweed Skills

Within the realm of recitation of the Quran, lies a concern that is not confined to a particular border, but rather manifests on a broader scale. This concern is the lack of Tajweed skills that is seen not only in people with no formal education but also in university-going students which is quite surprising.

T. Supriyadi and J. Julia mention in their illuminating study [3] that in one of the university departments in Indonesia, 70% of students from each class were unable to correctly read the Quran, even though they received Islamic Religious Education for 12 to 14 years.

Similarly, research was conducted in [3], revealing that over two-thirds of university pupils struggle to attain fluency in reciting the Quran.

A more granular study about errors made on the Tajweed errors exhibits that students have a low ability to implement Tajweed rules. Each student averaged 83 mistakes during recitation and around 50% of the mistakes constituted letter pronunciation eros and in application of the rulings of Tafkhim and Tarqiq. Surprisingly, the students involved in the study were already enrolled in a Quranic Tajweed course at the university level. [4]

From the studies, the stark reality of this challenge becomes

evident. In the field of Islamic studies, the problem of weakness of even educated students in Quranic recitation is a major concern but it is still unresolved even though multiple efforts have been carried out of different organizations and individuals to tackle the issue. (Saidi Mohd) [4]

These studies involved educated students enrolled in high-level of education and who already had exposure to Tajweed so imagine the poor Tajweed skills of people who never studied about Tajweed or who never went to a proper educational institution.

The findings demonstrate that there is a persistent gap that demands meticulous attention and innovative solutions and Safwaat aims to fill this gap.

C. Difficulty faced by people in learning Tajweed

In traditional teaching methodologies, one teacher usually teaches many students each having a different level of understanding which can not be catered to easily in a classroom environment. Also, all students are taught in the same way of teaching irrespective of their altitudes of understanding.[5]

In Addition to that, shyness and fear make them hesitant to ask questions is a big hindrance to learning. Moreover, not every student finds it easy to study from books, they need other mediums of information like videos and audio.

Studying from lengthy books takes much time, effort and utter dedication which with time may decrease. Additionally, a lack of Arabic background also contributes to the difficulty.

That is why, Safwaat is specially designed to tackle these issues and to reduce difficulties faced in Tajweed learning.

D. Proposed Solution

Through the survey results in [3], it becomes evident that students agree that extra hours are essential other than those given in formal educational institutions for improving Quranic recitation. They also agreed that Quranic recitation outside of formal school proves to be more effective in Quranic fluency.

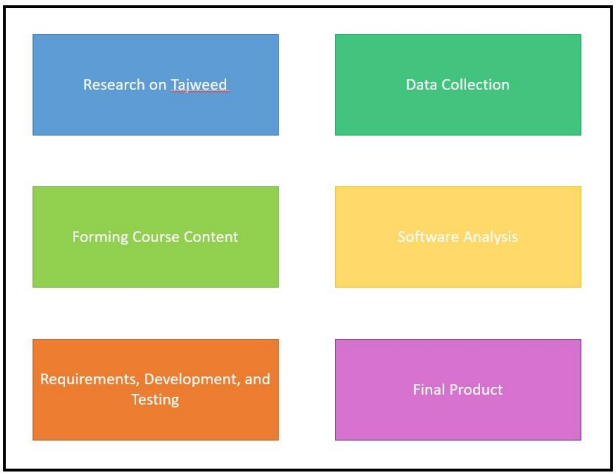

Fig. 1. Flow of Solution's Implementation

Therefore, a proper learning platform is needed to tackle each group's needs and requirements and tailor the learning methodologies according to their skill level.

People can be categorized according to their Quran reading skills. Some do not even have basic knowledge of Arabic letters, and some have the basic knowledge but lack in properly pronouncing the letters. Others are aware of the articulation points but make mistakes in the recitation of Ayahs. Another category is of those, who can recite properly but still lack the knowledge of Tajweed rulings.

For example, people at the most basic level, should be trained to learn the form of the letter like a letter ڊ is symbolized by a hook. Likewise, learning techniques to efficiently reinforce the knowledge of the articulation points to people unaware of that should be employed. Additionally, learning techniques for those with fluency should be tailored to help them master the theory of Tajweed.

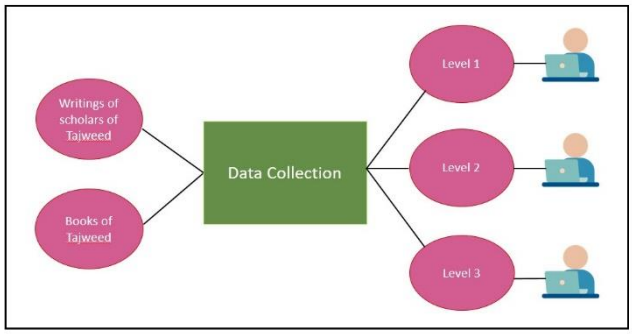

Fig. 2. Data Categorization into Levels

Safwaat brings together technology and Tajweed data together helping to provide a more immersive learning experience by also removing the problems faced in traditional learning while allowing learners to be more focused for a longer period. [6]

Sawaat provi des a web application that incorporates a wide variety of features to enhance the interactivity of users, motivate them to learn more and enhance their Tajweed skills.

Saftwaat focuses on two parts; in-depth knowledge through 'Teaching Slides' and application of that information in 'Practical Slides'.This is done because scholars of Tajweed also classify the discipline into two categories, namely theoretical and practical.

The theoretical knowledge of Tajweed should be acquired from reliable sources to learn the rules and regulations of Tajweed that have been formulated in the early age of Islam by prominent scholars. While the acquisition of theoretical knowledge is important, the other side of it is the practical aspect. Both of these aspects complement each other, one without the other would not be helpful in Quranic recitation.

II. RELATED WORK

The After analyzing the market, it was found that an E-learning platform TajweedMate proposed a solution to the problem which incorporates the use of Artificial Intelligence to perceive and analyze the pronunciations of the user [7]. It includes lessons on essential topics which the users can complete to improve their Arabic pronunciations, along with audio examples of the topics as well.

With the use of speech recognition technology, TajweedMate allows users to assess their pronunciation skills through AI

features that provide valuable feedback and quizzes to test their knowledge. However, this platform cannot visually represent the peculiarities of Tajweed pronunciations. Furthermore, it does not incorporate a seamless and interactive learning experience because of the absence of features which attract the users to use the application.

Tajweed Quran adopts a similar approach by compiling all the necessary details of learning Tajweed in a single platform It focuses on details rather than assessments, due to which it lacks quiz sessions which[8] users can use to evaluate themselves. The platform has also integrated the content of the Quran which allows the users to implement their knowledge of Tajweed obtained from the application.

Alifbee provides an interactive platform for users to learn the Arabic language. Their lessons provide details of over 6,500 words, allowing the users to grasp the pronunciations of these alphabets firmly [9]. In addition to that, the platform comprises interactive features which include quizzes, achievements, motivating notifications etc, compelling the learners to use the application more frequently.

ISpeech Pronunciation Coach integrates the use of efficient 3D models to visualize the peculiarities while pronouncing alphabets. It provides visual aids and relevant content explaining to the user the content of the study [10].

The Learn Quran Tajweed app centers around the usage of the assistance of online Arabic teachers with whom the learners can have evaluation sessions [11]. Their one-on-one sessions create a seamless learning environment for learners to improve their Tajweed skills. Furthermore, their comprehensive lessons categorized from basic to advanced levels provide insight towards the best practices to follow while pronouncing Arabic alphabets.

In the realm of teaching Tajweed assisted by 3D models, minimal work has been undertaken. However, when examining the broader context, one can observe the utilization of 3D technology in teaching phonetics for other languages.

A study [12] shows that Mandarin Chinese lacks a system of pronunciation in 3D due to the intricate nature of articulators. The study addresses this gap by introducing a real-time text-driven 3D visual pronunciation system for Mandarin Chinese. It employs a multi-stream Hidden Semi-Markov Model for mapping speech to articulatory trajectory, utilizes a precise 3D mesh model of articulators based on MRI, and converts text into 3D animation.

Furthermore, from the perspective of model availability, it is observed that Existing 3D models of the mouth face hindrances in their suitability for Tajweed applications. These models, primarily created by artists for showcasing skills or game development, lack optimization for animations and are often costly. Even freely available models may have limitations, making them unsuitable for Tajweed education.

This scarcity of tailored 3D models underscores the need for research and development in this specific domain to harness the benefits of 3D technology for Tajweed instruction.

III. Methodology

A. *Data Collection*

This Safwaat teaches Tajweed through a large set of theoretical data that covers the rules and regulations of Tajweed. The data is collected from various reliable sources which are then divided into multiple categories and levels according to the difficulty level of individuals.

Safwaat will use different learning techniques systematically for teaching the Quran with Tajweed, with Rewaya: Hafs from ‘Aasem by the way of Shatebiyyah. Imam Hafs recitation is the most used recitation, especially in the Indian subcontinent and Arabia.

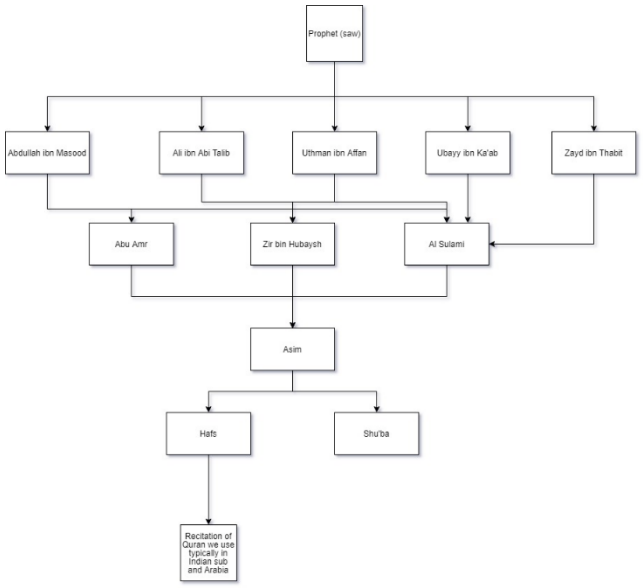

Fig. 3. Attribution of Hafs to Prophet (PBUH)

The data is mainly collected from the book Fawaid e Makkiyah by Hazrat Maulana Qari Abdur Rehman Makki. The system also includes question and answer sessions along with testing the knowledge of the users through quizzes and sessions during the learning sessions. Therefore, the system also stores the correct and wrong answers to check the answers given by users.

The collected data spans a wide range of topics, which are also referred to in the writings of leading reciters like Al-Jazar (833H) and Al-Jamzuri (1198H). The topics include the pronunciation of the articulation point (Makhraj) of the letters, characteristics (Sifaat) of the letter, and implementation of Tafkheem and Tarqeeq. Rules of Nun Sakinah and Tanwin, Rules of Mim Sakinah and Doubled Nun and Mim.

B. *Learning Unit*

The Learning Unit feature offers a dynamic and structured educational experience that seamlessly blends teaching and practice to promote effective learning. Users progress through a well-organized sequence of slides, comprising ’Teaching Slides’ and ’Practice Slides.’ Teaching Slides deliver concise textual and visual content, ensuring that users grasp essential concepts without feeling overwhelmed.

Practice Slides reinforce and apply this knowledge through diverse assessment methods. Users must provide correct answers to advance, with incorrect responses followed by clarifications. Post-lesson summaries provide insights into

performance metrics, such as points, XP, stars earned, and completion time.

This feature is purpose-built to maximize learning outcomes, bolster knowledge retention, motivate users through rewards and level progression, and, ultimately, deliver an enjoyable and highly effective learning journey.

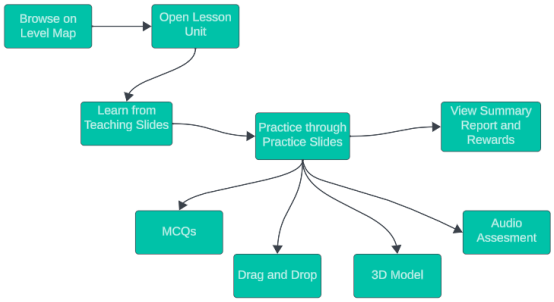

Fig. 4. Learning Unit Workflow

a) *Application and Strategies*

The Safwaat platform's core functionality lies in its comprehensive and diverse educational content and its unique method of deliverance. The application relies on mass practice, repetition and writing the learnt information in exercises for acquiring vocabulary and Tajweed skills. As McCarthy cited, vocabulary learning consists of remembering words and using them in a variety of language contexts according to specific requirements [13].

The application utilizes the theory of desirable difficulty which upholds the philosophy that the spike in storage and retrieval strength is directly proportional to the difficulty of the work required to retrieve a particular piece of memory [14]. Under this theory, the strategy highlighted that Safwaat takes advantage of while providing Tajweed insight to its users is Spaced-Repetition [15].

Gu [13] suggested that it is evident from all studies on pacing and repeating the process of learning, that forgetting a certain piece of information occurs immediately after a person's first exposure to it. Furthermore, Anderson and Jordan [16] analyzed the trend of retaining information and the time passed since its acquisition. Safwaat uses this algorithm to detect what portions of the lesson the user had answered incorrectly and increases their rate of appearance, thereby resulting in greater Arabic vocabulary and Tajweed retention amongst learners [17], [18].

Comprehensive Theory Slides provide valuable insight and information for noteworthy Tajweed concepts from authentic and certified islamic sources. Besides this, the Practice slides incorporate questions belonging to a variety of categories like MCQs, match the columns, drag and drop options, audio assessment and 3D model slides, which are coupled with the concept of Spaced-Repetition to enhance user learning experiences. The figure below provides a conceptual server-user data flow:

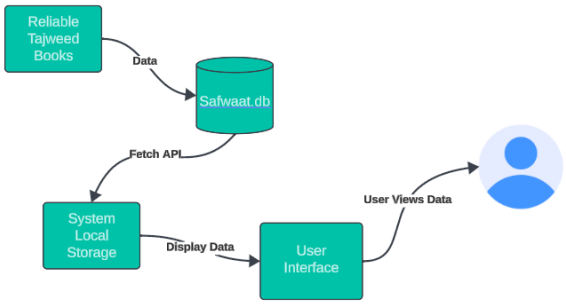

Fig. 5. Safwaat Dataflow

The main method used to assist learners in grasping knowledge is derived from the concepts of focus, logical thinking, recollection, and engagement form the basis for the instructional approach. Furthermore, Safwaat focuses on implicit statistical learning which allows users to preserve the pattern of events (questions and tasks) and devise hypotheses for predicting the outcome of the event based on repeated exposure [19], [20].

Another peculiar methodology to imbed the knowledge of Arabic pronunciations into the learners is the usage of analogies supporting the context of the concept being provided [21]. Furthermore, the use of affordance-based design allows the users to know where to look and interact with the screen, for example; the usage of specific text colors, pleasant designs and appealing transitions, draw the attention of the users towards important Tajweed aspects [22].

Additionally, embodied cognition permits the learners to integrate their perception and physical interactions to represent abstract ideas, thereby elevating their capability to physically manipulate the information presented to them to create the required answer [23]. The drag and drop questions and matching columns practice slides implement this idea, thereby elevating the information retention capability of the learners.

Consistency is an important aspect when it comes to learning new or unknown information and is often disregarded due to high levels of difficulties associated with its acquisition. Safwaat handled this peculiar case through gamification techniques, compelling the learners to repeatedly indulge themselves in the learning process, through the Expectancy value theory [24].

b) *Impact on Learning*

The use of the Spaced-Repetition strategy in assessing the user during the practice slides has proven to result in longer knowledge retention and adaptability according to research conducted on learning [15].

According to a research conducted by Anderson and Jordan[16], at week 1,3 and 8, the rate of learning words was 66%, 48% and 39% respectively. They concluded that the most efficient method of overcoming this downside was the use of Spaced-Repetition.

Additionally, the dynamics of the application through gamification techniques, motivating slides and praising gestures, keeps in view the Expectancy value theory while handling user expectations and goals since it correlates the success associated with the achievement of the goal and how much they value achieving it [24].

The resulting parameters permit the deduction of effective procedures and mechanisms to attract users towards the application. Bite-sized lessons, maintaining streaks, ranking up on leaderboards and notifications constantly motivate action among the users, providing them with a noteworthy and important experience while using the platform.

C. *3D Model*

The utilization of Three-dimensional (3D) models presents a significant advancement in educational technology, offering a more immersive learning experience compared to traditional 2D images and videos. These models, with features such as rotation, zooming, and real-time manipulation[25], prove ideal for visualizing complex concepts like makhraj (Articulation Points),

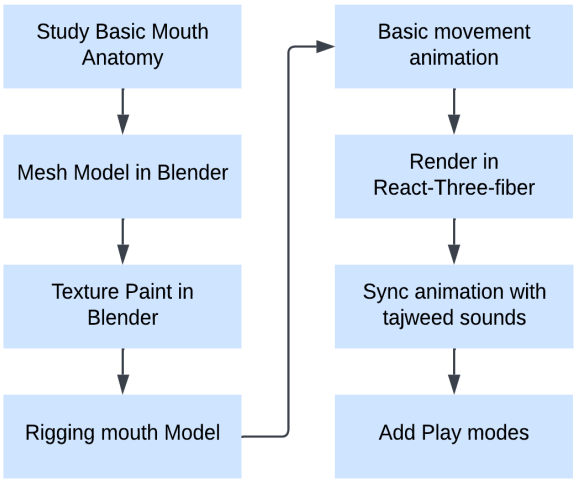

Fig. 6. 3D Model Development Process

In developing our Tajweed Application, we started by understanding oral cavity anatomy from Kenhub[26]. Using Blender, we created a precise 3D mesh model, emphasizing anatomical accuracy. Assigning colors and textures in Blender enhanced realistic materialization.

Rigging the model for lifelike movements, we animated mouth and tongue motions. Rendering seamlessly in a React application with React-three-fiber, we synchronized animations with Tajweed sound samples from Al-Dirassa Institute[27] using Howler.js. Implementation of single and loop play modes further enriched the interactive and visually immersive learning environment.

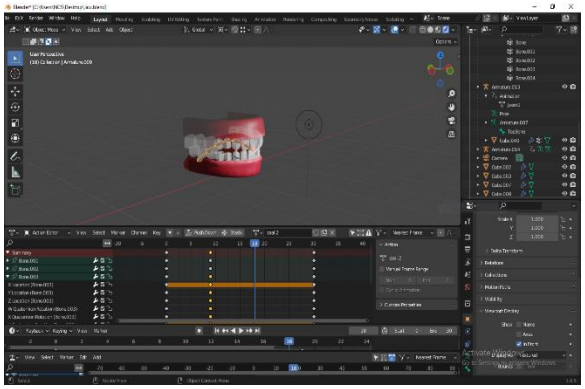

Fig. 7. Blender Environment

a) *Application and Strategies*

In the context of Tajweed applications, existing platforms like TajweedMate[28], while rich in textual knowledge, lack clarity in defining how the voice is properly articulated to pronounce makhraj. This gap is effectively addressed by Safwaat, our Tajweed application, which provides a holistic learning experience.

Safwaat utilizes Three.js and React-Three-fiber web libraries to visualize makhraj in 3D space, enabling learners to interact with a 3D model of the mouth through powerful orbiting controls. The application employs transparency techniques in the 3D model to clearly demonstrate the pronunciation behind the teeth and precisely pinpoint articulation points, enhancing the overall learning experience.

b) *Impact on Learning*

A 2019 study[29] involving 565 Czech students (aged 11–19), the integration of 3D models and animations in learning has demonstrated a substantial improvement in students' comprehension of these concepts.

Additionally, research[30] highlights the variability in spatial skills for mental rotation, emphasizing the importance of 3D models in facilitating the mental rotation of 2D information to 3D.

In a related study[31] focusing on medical education, particularly ophthalmology, a comparative analysis involving 100 medical pupils at the Vienna University revealed that the use of 3D animation led to boost in student's performance by (80%) compared to the control group (63%).

D. *Streak Board*

The streak board helps to motivate the users to remain consistent even when complexity increases, as the longer the winning streak, the more valuable it becomes [32].

a) *Application and Strategies*

Safwaat application motivates the user to remain consistent, by completing at least one lesson a day to retain their precious streaks, through a streak board that shows the learning consistency of the user, the application also maintains a global streak leaderboard to provide user insights into other's streaks and a comparison with their peer learners.

b) *Impact on Learning*

The research on streaks psychology shows that the commitment to streaks is an individual function, and is dependent on various factors such as results [33], and learning a language is of great value providing users with immediate results of their learning, and also, the application is maintaining a streak leaderboard which ranks all the users in the application on basis of their streaks, providing sense of motivation for achieving the highest streak and then maintaining their rank, which makes them consistent, as it leverages a psychological phenomena called loss aversion, which increases people's motivation and attachment to stick with a streak even when it involves intangible losses. Psychologically speaking, streaks transform into goals and the excitement of working towards these objectives equals the satisfaction of actually accomplishing them [34].

E. *Leaderboard*

Leaderboards provide a sense of a competition, which motivates

the individuals to learn more in less time to get on the top of the list by gaining more XP points.

a) *Application and Strategies*

SAFWAAT came up with the leaderboard feature to encourage users to study more by giving them XP points on lesson and challenge completion, which are then used to rank them on the leaderboards.

b) *Impact on Learning*

A study conducted with over 100 university students suggests an average increase in students' interaction with the assignment by the introduction of leaderboards is 30 times [35] and every study reviewed in learning context shows a high positive impact on learning through gamification by increasing user engagement and providing motivation, and the leaderboards are one of the most common variants of gamification [36].

F. Chatspace

SAFWAAT promotes community formation by enabling safe real-time communication within these private venues.Friend Requests and ChatSpace elements are perfectly integrated to offer a comprehensive social networking experience, with the purpose of enriching the online Tajweed learning. Users can initiate connections by sending friend requests to others through a user-friendly search interface, emphasizing ease of use and accessibility.

The ChatSpace feature introduces a private room environment where users can engage in group chat activities seamlessly. SAFWAAT employs cutting-edge web socket technology to create and manage private rooms, establishing secure connections between users.[37] Recognizing the critical necessity of creating connections, the Friend Requests function provides users with an easy-to-use interface for initiating connections, emphasizing accessibility and usability.

a) *Application and Strategies*

The Chatspace feature is implemented using cutting-edge WebSocket technology through socket.io for real-time communication and MongoDB as the database management system. Node.js was used to develop the server, together with the express framework and the MongoDB database. [38]

b) *Impact on Learning*

These features not only stimulate collaborative discussions but also play a crucial role in the memorization process by providing a social context for learners to share and reinforce information. The thoughtful exchange of words in ChatSpace and the cultivation of online friendships promote a creative atmosphere where diverse perspectives converge, encouraging learners to think critically.

Research findings from experiment on Use of live chat in higher education indicate a significant reliance of students on live chat functionality, especially during crucial periods such as assessment times, where urgent responses are imperative. Participants acknowledged the value of live chat in seeking clarification on assignments, highlighting its utility in addressing immediate concerns related to coursework.[39] This aligns seamlessly with the core philosophy of Safwaat, recognizing the importance of real-time communication and support within a learning environment

A study conducted in 2007 revealed that students expressed a desire to respond to others who assisted them in advancing their learning. Additionally, they felt socially obligated to respond to queries from fellow students when the latter received no replies to their posts. [40] This intrinsic drive for interactive and social learning aligns with Safwaat's overarching aim.

G. Achievements

In the pursuit of enhancing the learning experience, Safwaat introduces a robust Achievement and Reward System designed to elevate user engagement and motivation within the app dedicated to pronunciation learning. The system aims to transform the conventional learning journey into an immersive and rewarding adventure by incorporating a diverse array of challenges and quests accessible through the 'Challenges' section and from the user's journey through the lesson unit.

a) *Application and Strategies*

According to SDT, human motivation is categorized into three primary types: extrinsic motivation (performing an action for a distinct outcome), intrinsic motivation (engaging in an activity for enjoyment, optimal challenge, or aesthetic satisfaction), and motivation (lack of intention to act)[41].

In SAFWAAT, the implementation of Self-Determination Theory (SDT) through our reward system is a strategic initiative to enhance learner autonomy, competence, and relatedness through extrinsic motivation in form of rewards.By aligning challenges and achievements with individualized learning objectives, users gain a sense of autonomy and control over their pronunciation learning journey. The reward system, including XP points, gems, and unique badges, reinforces users' competence and master.

b) *Impact on Learning*

In a 2019 experiment[42], participants demonstrated significant learning improvements when exposed to a learning environment that offered a reasonable degree of autonomy support, coupled with moderate-to-high levels of external regulation, such as a rewards system, and minimal intrinsic motivation.

A Study done in 2019 [43], showed that Individuals under the experimental settings (Redeemable Rewards and Badges) demonstrated increased engagement in tasks related to rewards. With the Badge system proving to be 3-8% more engaging than just a reward/control system.

Another study conducted by Shieffield Hallam University shows that dopamine release from the midbrain is crucial for reinforcement learning and reward learning because it helps strengthen declarative memory formation and help learn to correlate rewards and actions.[44]

H. Taqraar

Taqraar, revolutionizes the collaborative learning experience by introducing an engaging and interactive quiz session platform as personalization of gamifed educational learning system.[45] Any user hosting a personal room can initiate a quiz session, customizing it to their preferences. By incorporating rounds, timers, and a user-friendly interface, Taqraar transforms pronunciation learning into an exciting and rewarding communal experience. Through this unique feature, we aim to create a

vibrant and supportive community of learners, encouraging active participation.

a) *Application and Strategies*

Safwaat focuses on creating a dynamic and secure infrastructure to facilitate a personalized quiz session experience within users' personal rooms. The system employs a unique identifier system for each room, ensuring efficient management and user association. Robust authentication protocols are integrated to guarantee privacy and restrict access to authorized users.

The backend logic for Taqraar employs a microservices architecture to facilitate the creation and management of personalized quiz sessions within users' personal rooms. Authentication mechanisms utilizing JSON Web Tokens (JWT) ensure secure access, with encrypted channels established for data privacy. The backend logic utilizes WebSocket communication for real-time interaction, enabling seamless updates and notifications between the quiz host and participants. Quiz settings customization is handled through RESTful APIs, ensuring persistent storage and retrieval of user preferences.[46]

b) *Impact on Learning*

A study aimed at mean score of participants before and after the treatment differed significantly, according to a study that looked at the efficacy of Quiz-Demonstration-Practice-Revision (QDPR) as an alternative learning paradigm in pronunciation instruction.[47]

A experiment conducted by the researchers on the effectiveness of quizzes to improve the mastery of Arabic vocabulary showed N-Gain test with a low category of 27.22% which is still significant in terms of improving vocabulary.[48]

A research endeavor engaged 120 students as participants in an experiment, revealing that the incorporation of a competitive gaming scenario coupled with a personalized assistance approach led to enhancements in students' vocabulary acquisition.[49]

I. *Analytics*

Analytics empowers learners with personalized insights to enhance their learning experiences [50].

a) *Application and Strategies*

SAFWAAT application provides the user with analytics of their streaks history, and their performance analytics after lesson completion and Taqraar session completion, which helps to detect their weak points and practice more on that area while the streaks analytics show the users their highest streak, inspiring them to increase it.

b) *Impact on Learning*

The analytics helps the users in their learning journey, by providing them with their soft spots, so that users can specifically target these spots and practice them.

J. *Justification of Tools Used:*

a) *React*

In the development of Safwaat, React serves as our chosen frontend framework [51]. Its component-based architecture promotes modular code, encapsulating styling and state within each component.

Operating as a Single Page Application (SPA) library [52], React optimizes resource loading during the initial page load, dynamically updating content in response to user interactions without the need to reload the entire page. Leveraging JSX (JS + XML) for UI rendering and implementing one-way data binding, React provides enhanced flexibility in our application development approach.

b) *Blender*

Our selection for creating the 3D model in Safwaat involves the use of Blender[53], a 3D modeling tool known for being open-source. This choice is influenced by Blender's expansive user community and its regular updates, contributing to a dynamic and well-supported environment.

Notably, Blender's modeling features operate in a non-destructive manner, enabling modifications to be made at any stage without causing permanent alterations to the fundamental geometry of the models. This flexibility enhances the adaptability and ease of refining the 3D model throughout the development process.

c) *Express & NodeJS*

NodeJS is used for server-side programming with combination of Google V8 Engine [54], and became a widely known backend programming language, due to its asynchronous nature, reliance on non-blocking I/O, and the familiarity of Javascript [55]. Currently, it is the most popular language [56]. The comparison between Node.js and ASP.NET in the category of web based calculation performance, shows that Node.js is better at backend for performing extensive calculations [57].

Node.js is a lightweight language, making it capable for I/O intensive applications, as Node.js can handle much more requests than Python and PHP [58], and provide better performance than Nginx [59]. The wide support available by the community for Node.js and the numerous packages available through npm(Node Package Manager) attracts the developer’s attention [60].

SAFWAAT application’s backend is developed on Node.js, as it is a learning platform with gamification implementation, enhancing the learning journey of users, as it provides user-driven content, which requires a large number of calculations to be done on server-side for providing user-specific content, and large number of requests handling by the server is required, as the website provides user analytics, leaderboards and streak management features along with the learning unit.

It uses Mongoose from npm as the driver provided by MongoDB community to connect the Node.js application with the NoSQL document-based MongoDB database, leverages the functionality of the node-cron package for scheduling jobs in leaderboard, and email notification modules, and some other packages for security and authentication purposes.

d) *Mongodb*

Safwaat being a data intensive application with heavy reliance on integrity and uniformity of entities, a promising selection of the database which fulfills the requirements of the application was MongoDB. This database in contrast to relational databases, is document-oriented and does not rely on fixed schemas, rather it emphasizes data storage in collections as BSON files [61]. Such peculiarities allow the development of the database in accordance with the requirements of the software rather than a fixed schema, which has proven to be flexible for Safwaat due to its data-driven nature.

Another reason for opting MongoDB is the facility of data embedding within one document instead of referencing the fields of two databases. This results in extremely fast data retrieval and manipulation as compared to traditional relational JOINS, as they take longer to operate queries and fetch results [62]. This allows Safwaat to perform swift operations to retrieve and display data to the user, thereby providing a pleasant learning experience to the users.

Scaling of the database is an important aspect especially when data is subject to continuous change and improvements. Due to the horizontal scaling property of MongoDB, it serves as the ideal database for this platform for storing and adding surplus amounts of Tajweed and other conceptual data on a large scale [63]. It also supports sharding which allows the distribution of data across multiple databases or servers, consequently improving the scope of the application and its ability to cater diversified data sources and operations [64].

IV. CONCLUSION

This research paper provides comprehensive insight towards learning Tajweed skills and concepts, and introduces an innovative platform, providing methods to overcome the associated difficulties in the Tajweed learning process. It further describes the significance of Tajweed by highlighting its importance from the perspective of Islamic Scholars and Hadeeth of the Holy Prophet (PBUH).

The web application platform, Safwaat, which caters the problems of lack of Tajweed skills among individuals due to inconsistent exposure to the Arabic language. Furthermore, individuals which do not have a firm background incorporating Islamic studies face extensive hardships when reciting the Quran or pronouncing Arabic alphabets.

Safwaat utilizes a plethora of strategies and methodologies to overcome the hardships of its learners and making their endeavors easy through its features. It incorporates a comprehensive Learning Unit with extensive Teaching and Practice slides, 3D models of Arabic phonetics and a ChatSpace for collaborative environment for learners.

Through various motivating aspects like Achievements, Streaks and Leaderboards, Safwaat provides an efficient solution for enhancing the Tajweed skills through a encouraging and motivating learning environment, thereby resulting in substantial increase in the acquisition of Tajweed and pronunciation skills.

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