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EduEase: Real Time Learning Platform for Disabled Students

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***Abstract*— Students with dyslexia have trouble in reading, learning, and retaining fundamental concepts, which in turn affects their learning and self-esteem. A friendly and interactive early learning platform is needed for the inclusive education of these children. The aim of this project is to build an interactive, friendly, and child-friendly learning system that teaches recognition, recall, and builds confidence in dyslexic students ranging from 4 to 8 years of age. The system proposes a personalized learning platform with parent registration and child profiles to facilitate personalized learning. It offers categorized interactive modules (animals, fruits, colors, and vegetables) in increasing difficulty. The system adopts a sensory-boosted approach to conceptual learning through visuals, labels, and audio. This system includes an update mechanism to poll senses and Natural Language Processing (NLP) to assist in simplifying content. Further, an intelligent recommendation module, AI-based, assesses quiz responses to inform the learning process. Through experiments, we observed better attention, recognition, and retention with personalized recommendations aiding adaptive learning. Thus, EduEase provides a platform that is inclusive, fosters cognitive development, builds confidence, and engages the parent in the child's learning process.**

***Index Terms*— Dyslexia, Assistive learning, Interactive learning, Multisensory learning, Personalized learning, Adaptive learning system, Cognitive development.**

I. INTRODUCTION

Without proper education, a child cannot be brought up children with learning disabilities, such as dyslexia, have difficulties in adjusting to a conventional learning environment [1][14][16]. Dyslexia impairs the reading ability, pronunciation, spelling, and memory retention, which may have a detrimental effect on academic performance and confidence [2][4][19]. The numerous traditional education techniques are not personalized, and often teaching is uniform, and therefore they can hardly cope with the varying needs of learning [4][12]. Also, the absence of interactive and multisensory modes of learning makes the students less understanding and memorizing [5][9].

In recent years, online learning platforms have become the means of enhancing access in education [8][12]. However, found that the majority of the systems are based on static content deployment and do not use adaptive learning techniques, [8][15]. They also rarely offer real-time feedback, particularly where pronunciation and speech improvement are to be offered, which is important to dyslexic learners [6][13].

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There is also a lack of audio-based technologies, such as Speech-to-Text (STT) and Text-to-Speech (TTS), which further restricts auditory learning [17]. Also, there are not many analytics and reporting tools, which restrict the possibility of effective performance monitoring by educators and parents [8][12].

To overcome them, this paper suggests EduEase: Real-Time Learning Platform to Dyslexic Students, an adaptive and personalized learning platform. It is a Flutter application with Supabase as a backend, providing the necessary scalability and security for data management [18][20]. It combines Speech-to-Text technology and Text-to-Speech technology in evaluating in real-time [17], and it is compatible with multisensory learning with pictures, audio-feedback, and voice-interaction [5][9].

The platform consists of both category-based word learning and quizzes, together with gamified activities such as word building to increase engagement and motivation [10][22]. It also offers performance monitoring with the use of graphical reports to enable parents to see the progress and areas of improvement [8][15]. To ensure its use in the real world, the application was developed with accessibility characteristics like ease of interface, kid-friendly fonts, and audio instructions [7][17].

II. Literature Survey

Semra İlcer et al. (2025) investigated brain topological dysfunction in children with dyslexia using fMRI and graph theory analysis. Their findings reveal notable differences in brain connectivity among dyslexic students and demonstrate the positive impact of special education interventions [2].

John Alexander & Nelly Patricia (2026) explored multisensory mobile applications for dyslexia support. Their research shows that combining visual, auditory, and tactile methods enhances reading and writing skills while supporting personalized learning [9].

Rozetta et al. (2025) reviewed learning platforms for disabled students using technologies like speech-to-text (STT), text-to-speech (TTS), and machine learning tools. Their study highlights the importance of inclusive platforms and addresses challenges in accessibility [12].

Navid Mohammadi et al. (2025) analysed6 educational technologies using NLP, clustering, and patent mining techniques. Their research identifies key EdTech clusters and highlights the growth of adaptive learning and AR/VR technologies [15].

Munduru Faridah & Dr. Sekiswa Peter (2024) analysed the impact of disabilities on academic performance using multiple linear regression. Their findings show a negative correlation and highlight the importance of assistive technologies [19].

Ayezabu Amanuel (2022) compared Supabase and Firebase for progressive web application development. The study evaluates performance, scalability, and developer experience, helping in selecting suitable backend platforms [20].

Overall, the existing literature suggests that while significant progress has been made in understanding the neurological and psychological aspects of dyslexia [2][14], there remains a need for more accessible, interactive, personalized, and technology-driven learning solutions [12][15] that can effectively support students with dyslexia from an early age.

A. Research Gap

The applications that have been created so far largely target only one type of dyslexic learner, focusing on reading, writing, or receiving assistance with speech [12]. Such systems are mostly restricted to offering help systems as opposed to being a complete interactive learning system [6]. As well, they do not contain any interesting features like gamification, as quizzes and word-building activities will be necessary to enhance user participation and learning results [10]. This deficiency underscores the importance of having a unified platform that integrates various features with interactive, adaptive learning processes [13][15].

III. Motivation

The idea behind the creation of the EduEase application is the growing complexity of the existing digital based learning systems. Numerous platforms are piecemeal, and students struggle to get resources on a unified platform. Individual learning and acquisition are also deficient in personalization to influence personal understanding and advancement. Lack of interactivity and low level of engagement lower student interest in online learning. Another reason is that the communication and feedback are delayed negatively affecting the learning process. Lack of appropriate tracking of progress also has an effect on performance evaluation. All these problems underscore the importance of the integrated and effective platform. Therefore, EduEase will

focus on delivering a comprehensive, user friendly, and intelligent technology to stimulate the overall learning process.

IV. Problem Domain

The swift development of digital education has given a number of challenges of effective learning delivery. Current e-learning systems tend to be disjointed so that a user has to make changes in lots of different tools to get content, communication and assessments. Moreover, these systems are not personalized, as they do not address personal needs of learning and speed. Poverty of interaction and slowness in response makes the student interaction limited too. The communication technological disconnect between students and educators also further affects the continuity of learning. In addition, quite a high number of platforms do not offer viable progress monitoring and data-driven knowledge. That is why an integrated and user-friendly solution such as EduEase is needed to overcome these problems.

V. Problem Statement

Children diagnosed with learning disabilities, including dyslexia, usually have problems with traditional classroom-based teaching methods, not designed to address their specific learning requirements [4][16]. These students have difficulties in reading, understanding, and memorizing, which makes them less confident and engaged [1][14]. Thus, it is necessary to have a system that will offer a custom and interactive learning method that will adapt to the skills of each child and assist them to learn in an effective way with the help of a friendly and convenient approach [12][13].

VI. Proposed Methodology and System Architecture

Figure 3.1 demonstrates the general structure of the proposed system that will start with user authentication using Supabase [20]. After the successful login, the dashboard offers four modules: Home, Games, Reports, and Settings, where the learning sessions and interactive games, performance tracking, and user preferences are discussed. The Supabase backend [20] handles and stores all the data efficiently.

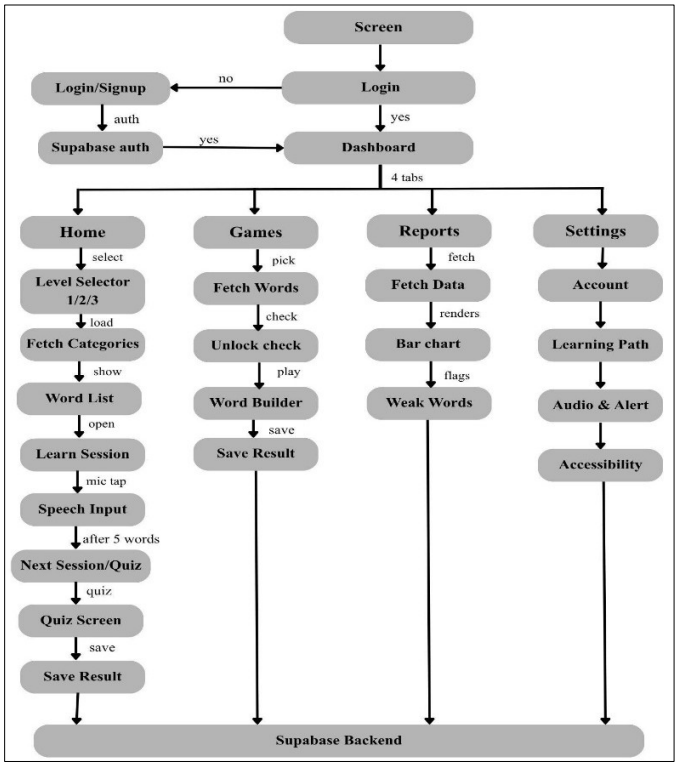

Fig. 1 Flow Diagram

Figure 3.2 displays the structure of the EduEase system, which has a Flutter-based [18] mobile frontend and a Supabase [20] back-end to manage user authentication, data, and API communication. The system incorporates the NLP applications such as Speech-to-Text and Text-to-Speech [17], and the database layer tracks user profiles, learning materials, and their performance statistics to aid the process of personalized learning.

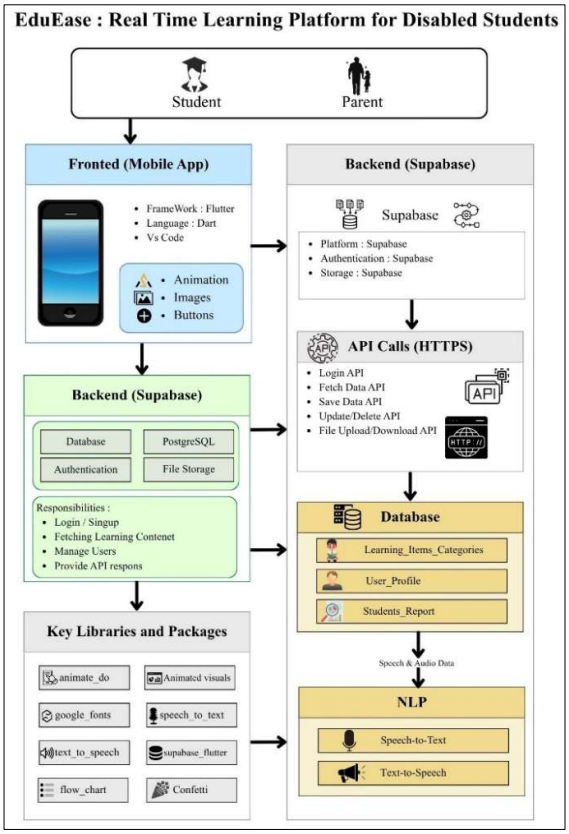

Fig. 2 System Architecture

A. Overview of the System Architecture

EduEase consists of a convenient mobile interface and a language processing device within. On-premises speech processing, as opposed to cloud speech, offers real-time reply and safeguards the privacy of children's data [17]. Supabase backend [20] is used to maintain authentication, storage, and RESTful API communication.

B. Multisensory Teaching Approach (VAKT)

The learning module will be based on the Orton-Gillingham approach, namely, on VAKT (Visual, Auditory, Kinesthetic, and Tactile) approaches [5][9]:
Visual: Vector illustrations of high contrasts that reflect the target word.
Auditory: Automated Text-to-Speech (TTS) synthesis, which reads out the word or splits it into phonemes (syllables), to facilitate decoding [17].
Tactile/Kinesthetic: The actual feel of remembering to press the microphone button and the actual physical placement of pronouncing the word.

C. Fault-Tolerant Speech Recognition

As dyslexic students tend to pronounce words incorrectly, EduEase uses a fault-tolerant matching system that is based on the Levenshtein Distance Algorithm [21], which quantifies the number of minimal character-level edits to achieve a match between spoken input and the target word. Dynamic thresholding adjusts error tolerance on the basis of word length, exact match of short words (3 or fewer), one error match on medium (4 to 6), and two errors match on long words (more than 6), serving to alleviate learning frustration without sacrificing the accuracy of the assessment.

D. Network Telemetry and State Preservation

The system constantly checks the status of the network in real time to be reliable even in low-connectivity situations. When problems, like a packet loss or DNS breakdown, are detected, a kid-friendly overlay is instantly displayed to avoid interruption, and important session information, such as the lesson underway, fuzzy-matching progress, and quiz scores, is kept in local short-term memory. When the connectivity is re-established, the session is re-established in a seamless manner, and no data is lost.

VII. Results

This section discusses the EduEase application evaluation based on quantitative user survey results. Teachers were surveyed using a Google Survey Form, which was then downloaded in .csv format, data cleansed and transformed, and then analysed via an interactive Power BI dashboard. The evaluation examined the following performance indicators: Accuracy (Goal Attainment Rate), Knowledge Confidence Index, Net Promoter Score (NPS), Average Rating, Positive Rating %, and Inclusive Design Score.

VIII. Interpretation of Results

The quantitative survey of 26 educators (mostly early-career, with the experience of 0-2 years, 61.54) shows good performance of the EduEase system in all the dimensions evaluated:

Goal Attainment Rate (92.31%): EduEase proves to be very successful in reaching the learning objectives, which proves that the multisensory, structured approach to dyslexic children's learning [5][9] works rather well.

Knowledge Confidence Index (93.85%): The users said that there was a great improvement in confidence, which confirms that the adaptive feedback and gamification features of the platform [10] play a significant role in enhancing learner self-efficacy.

Net Promoter Score (96.15%): NPS is very high, which means that most users would suggest EduEase to other users, being completely satisfied with the overall learning process.

Inclusive Design Score (82.31%): Accessibility is considered to be good and can be improved. This is in line with the disability and academic performance research [19] that reiterates the need to keep on advancing assistive technology interfaces.

Average Rating (4.65/5): The indicator shows that the overall user satisfaction level with the app is high in terms of usability and functionality.

Mean Rating (88.46%): The majority of the users have rated or submitted positive comments confirming the applicability of the platform in the real world in the learning process navigation as Excellent when compared to 3.1 rated 2 as on Average and 4.7 as Good, it will be concluded that there is a direct correlation between perceived accessibility and intuitive navigation. Based on the distribution chart of teaching experience, most of the interviewees are preoccupied by the young teachers (02 years) with the highest percentage of 61.54, and that means that EduEase can be used to support young teachers who have only recently adopted technology-based inclusive education methods [7][8].

Overall, the system has been supported in terms of its effectiveness, usability, and scalability. The test establishes EduEase as a viable real-world system to support dyslexic students, and greater access features and user integration processes can be improved in future versions.

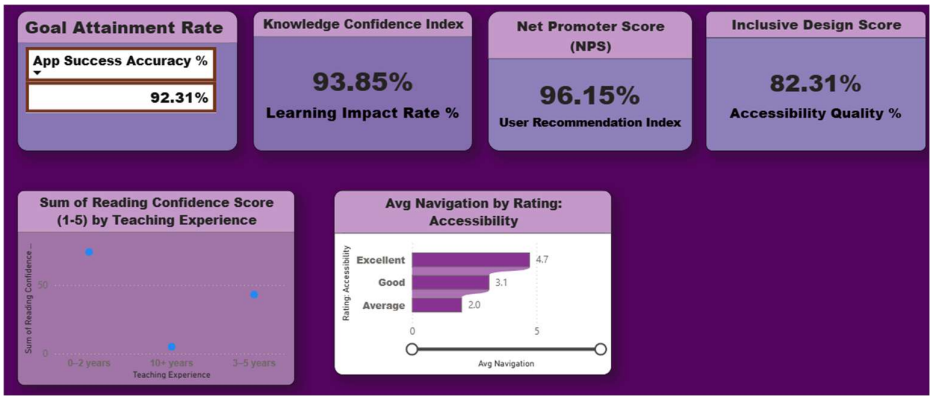

Fig. 3. Result

TABLE I: DAX FORMULAS USED IN POWER BI DASHBOARD

Metric Name	Purpose	DAX Formula
Goal Attainment Rate %	Accuracy of app	DIVIDE (COUNTROWS (FILTER (Data, Data [Goal Achieved] = "Yes")), COUNTROWS(Data)) * 100
Knowledge Confidence %	Confidence Index Score	AVERAGE (Data [Confidence Score]) * 20
NPS	Net Promoter Score[25]	DIVIDE (Promoters - Detractors, Total) * 100 where Promoters = Rating >= 9; Detractors = Rating <= 6
Avg Rating	Average Rating	AVERAGE (Data [Rating])
Positive Rating %	Positive Feedback	DIVIDE (COUNTROWS (FILTER (Data, Data [Rating] >= 4)), COUNTROWS(Data)) * 100

A. Results Summary

TABLE II: EDUEASE APPLICATION EVALUATION RESULTS

Metric	Value	Description	Interpretation
Goal Attainment Rate (Accuracy)	92.31%	Ratio of individuals who achieved their learning goal.	High - it is effective when using the application.
Knowledge Confidence Index	93.85%	Average rating of the users.	High - users feel strongly assured with returns achieved with the use of the platform.
Net Promoter Score (NPS)	96.15%	The system would most likely be recommended by users. [25]	Very High - high recommendation plan.
Average Rating	4.65 / 5	Mean of level of educator satisfaction.	High — means that there is a high degree of user satisfaction.
Positive Rating %	88.46%	Proportionality of those which provide rating 4 and above.	High - majority of users are content.
Inclusive Design Score	82.31%	The accessibility of the users.	Good - could be improved.

IX. JUSTIFICATION OF THE RESULTS

The quantitative survey of 26 educators (mostly early-career, with the experience of 0-2 years, 61.54) shows good performance of the EduEase system in all the dimensions evaluated:

- Goal Attainment Rate (92.31%): EduEase proves to be very successful in reaching the learning objectives, which proves that the multi-sensory, structured approach to dyslexic children learning [5][9] works rather well.
- Knowledge Confidence Index (93.85%): The users said that there was a great improvement in confidence, which confirms that the adaptive feedback and gamification features of the platform [10] play a significant role in enhancing learner self-efficacy.
- Net Promoter Score (96.15%): NPS is very high, which means that most users would suggest EduEase to other users, being completely satisfied with the overall learning process.
- Inclusive Design Score (82.31%): Accessibility is considered to be good and can be improved. This is in line with the disability and academic performance research [19] that reiterates the need to keep on advancing assistive technology interfaces.
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Overall, the system has been supported in terms of its effectiveness, usability, and scalability. The test establishes EduEase as a viable real-world system to support dyslexic students, and greater access features and user integration processes can be improved in future versions.

X. CONCLUSION

This paper introduces EduEase, an adaptive and interactive learning tool that aims at helping dyslexic students by providing them with real-time learning [4][12][13]. The system is constructed with Flutter and Supabase and

can be scaled, secure, and perform well smoothly [18][20]. It combines Speech-to-Text and Text-to-Speech to examine pronunciation in real time and provide audio aid [6][17]. Engagement and retention of knowledge are increased with the help of multisensory learning tools such as visual aids, audio feedback, and gamified activities [5][9][10]. It also has performance tracking and analytical reports to parents and educators [8][15]. On the whole, EduEase offers a way to reconcile the old and the new methods of learning by offering a personalized, accessible, and efficient mode of learning to dyslexic students [7][9][13].

FUTURE WORK

Improvements to EduEase include AI-assisted personalization, more extensive speech recognition to maintain correct pronunciation and assist in multiple languages, and offline learning [13][15][17]. A teacher dashboard to track student progress [8] and better accessibility features like voice navigation and customizable interfaces will also be introduced by the system [7][9][17].

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