EDUTRACK

PROJECT REPORT

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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LIST OF ABBREVIATIONS

AI – Artificial Intelligence

API – Application Programming Interface

AR – Augmented Reality

FCM – Firebase Cloud Messaging

HTTP – HyperText Transfer Protocol

HTTPS – HyperText Transfer Protocol Secure

IDE – Integrated Development Environment

IoT – Internet of Things

iOS – iPhone Operating System

JSON – JavaScript Object Notation

LMS – Learning Management System

ML – Machine Learning

NLP – Natural Language Processing

OS – Operating System

RAM – Random Access Memory

SDK – Software Development Kit

SSD – Solid State Drive

UI – User Interface

URL – Uniform Resource Locator

UX – User Experience

VR – Virtual Reality

XAI – Explainable Artificial Intelligence

ABSTRACT

EduTrack is an intelligent and student-centric mobile application designed to revolutionize the way learners prepare for exams and manage their academic growth. Built with the power of artificial intelligence, the platform personalizes learning experiences by generating customized questions and mock tests directly from uploaded lessons, based on topic weightage and syllabus requirements. Beyond traditional test preparation, EduTrack evaluates each student's responses, providing instant feedback and in-depth performance analytics that highlight strengths, weaknesses, and progress over time. What makes EduTrack stand out is its integration of academic learning with personal productivity. The built-in journal and productivity tracker monitor study sessions, sleep patterns, and mood variations, offering valuable insights into the learner's habits and focus levels. Using this behavioral data, the system identifies each user's circadian rhythm—the natural cycle that influences alertness and concentration—and recommends the most effective study hours for improved learning outcomes. Designed with a clean and intuitive interface, EduTrack ensures a seamless user experience that promotes consistency, motivation, and self- awareness in students. By merging AI-driven insights with personalized learning strategies, EduTrack not only enhances academic performance but also fosters smarter and healthier study habits. This project represents a step toward transforming digital education into a more adaptive, data-driven, and holistic learning ecosystem for modern students.

CHAPTER 1

INTRODUCTION

1.1 OBJECTIVE

EduTrack is an AI-powered learning app designed to help students prepare for exams more effectively. It generates personalized questions and tests from uploaded lessons, analyzes performance, and highlights strong and weak areas. The app also tracks study time, sleep, and mood to identify each student's most productive hours using AI-based circadian rhythm analysis. By combining academic insights with personal productivity, EduTrack aims to improve learning efficiency, time management, and overall academic performance.

1.2 PROBLEM STATEMENT

Students often face challenges in managing their studies effectively due to the lack of personalized and organized learning platforms. Many existing educational apps provide general content but do not adapt to individual learning needs or topic importance. There is no simple way for students to generate customized questions, track their academic progress, or identify their strong and weak areas. Additionally, traditional study methods fail to consider personal productivity factors such as sleep patterns and focus levels. An innovative AI-based learning platform is needed to bridge this gap by providing a personalized, data-driven system that helps students prepare smarter. With features like automatic question generation, performance analysis, and productivity tracking, such a platform can enhance learning efficiency and make education more adaptive and meaningful.

1.3 NEED OF THE STUDY

The study of personalized and AI-driven learning platforms is essential in today's technology-based and academically competitive world. Many students are eager to improve their learning outcomes but lack an accessible, organized, and intelligent system to guide their preparation effectively. There is a growing need for platforms that not only provide study materials but also generate customized questions, analyze performance, and identify individual strengths and weaknesses. By integrating AI-based analysis and productivity tracking, such platforms can help students understand their study patterns, manage time efficiently, and learn during their most productive hours. This approach promotes self-improvement, enhances academic performance, and supports smart learning habits. The development of EduTrack addresses this need by offering a personalized, data- driven solution that combines learning and productivity, fostering a more effective and engaging study experience. This study highlights the importance of using technology to make education adaptive, efficient, and student-focused.

1.4 NEED OF THE STUDY

The scope of studying AI-based learning platforms like EduTrack involves exploring various technological and educational impact elements, offering significant potential to improve the way students learn, prepare for exams, and manage their academic progress through a dedicated digital system. This research covers the development of core features such as AI-powered question generation, performance evaluation, and personalized test creation based on lesson content and topic weightage. The study also focuses on integrating user-friendly interfaces and real-

time analytics to ensure accessibility, adaptability, and engagement for students of different learning levels. It includes investigating methods to track study patterns, sleep cycles, and mood variations through productivity tools, enabling learners to understand and optimize their study habits. Additionally, the scope involves examining techniques for creating a transparent, reliable, and interactive platform that encourages self-assessment, time management, and continuous improvement. The study will explore the potential impact of such a system on enhancing academic performance, promoting self- learning, and fostering smarter educational practices. By adopting a comprehensive approach, the scope of EduTrack aims to develop a scalable, intelligent platform that bridges the gap between technology and education, empowering students to achieve their learning goals effectively.

1.5 OBJECTIVE OF THE STUDY

To develop an intelligent, AI-based learning platform that helps students manage their studies effectively by providing personalized tests and questions generated from uploaded lessons. To enable automated performance evaluation and detailed analysis, helping students identify their strong and weak areas for focused improvement. To design a user-friendly and accessible interface that makes studying, testing, and progress tracking simple and engaging for learners. To integrate productivity and habit-tracking features that monitor study hours, sleep patterns, and mood levels, supporting balanced and efficient learning routines. To ensure scalability and adaptability of the platform by allowing future enhancements such as adding new subjects, interactive learning modules, and advanced analytics tools to meet evolving educational needs.

CHAPTER 2

LITERATURE REVIEW

2.1 AI-DRIVEN PERSONALIZED LEARNING IN MOBILE APPLICATIONS

The rapid advancement of mobile technologies and artificial intelligence has significantly influenced the development of personalized learning applications for children. Traditional learning platforms often follow a one-size-fits-all approach, which fails to address individual learning abilities and preferences. To overcome this limitation, AI-driven learning systems have been proposed to adapt educational content based on user behavior, performance, and engagement patterns.

Singh and Nair explored AI-driven personalization in educational mobile applications, demonstrating that adaptive learning paths enhance learner engagement and improve knowledge retention. Their study emphasizes the importance of tailoring content difficulty and delivery pace to suit individual learners. [3]

Similarly, Rodriguez and Chen evaluated adaptive learning algorithms and highlighted their effectiveness in providing personalized educational experiences. These findings strongly support the core objective of the EDUTRACK application, which aims to offer customized learning experiences using AI-based techniques. [11]

Petrovic and Simon further reinforced the significance of adaptive content delivery models in AI-based learning tools. Their research showed that dynamically adjusting learning materials based on learner progress improves both engagement and learning outcomes. These studies collectively provide a strong foundation for integrating AI-powered personalization within EDUTRACK. [19]

2.2 MOBILE LEARNING APPLICATIONS FOR CHILDREN

Mobile learning has emerged as a powerful medium for delivering educational content to children due to the widespread availability of smartphones and tablets. However, designing effective learning applications for young learners requires careful consideration of usability, accessibility, and engagement factors.

Kumar and Joshi conducted a comprehensive review of mobile learning solutions for primary education and identified usability and accessibility challenges commonly faced by children. Their findings emphasize the need for intuitive navigation, simple interactions, and age-appropriate content presentation. [7]

Fischer and Dunne further examined early childhood engagement with interactive educational games and concluded that interactive elements significantly enhance learning motivation among children. [17]

Olsen and Carter investigated voice-assisted learning tools for children and highlighted the opportunities and challenges associated with conversational interfaces. Their study suggests that multimodal interaction, when properly designed, can improve engagement and learning effectiveness. These studies collectively influenced the child-centric design philosophy adopted in the EDUTRACK application. [1]

2.3 GAMIFICATION AND INTERACTIVE LEARNING TECHNIQUES

Gamification has become an effective strategy for increasing learner motivation and engagement in mobile learning environments. By incorporating game-like elements such as rewards, progress tracking, and interactive challenges, educational applications can sustain user interest and improve learning outcomes.

Mehta and Agarwal analyzed the impact of gamification in mobile learning and demonstrated that interactive design elements significantly enhance student engagement. [2]

Chatterjee and Balasubramanian conducted a systematic review on cognitive skill development through interactive mobile applications and found that gamified learning environments positively influence children's cognitive growth. [10]

These findings align with EDUTRACK's focus on providing an engaging and interactive learning experience through visually appealing interfaces and activity-based learning modules.

2.4 CLOUD-BASED LEARNING MANAGEMENT SYSTEMS USING FLUTTER AND FIREBASE

The scalability and real-time capabilities of cloud-based technologies play a crucial role in modern educational applications. Gupta and Rao proposed a cloud-based learning management system developed using Flutter and Firebase, demonstrating the suitability of this technology stack for educational platforms. Their work highlighted Firebase's real-time data synchronization, secure authentication, and efficient backend management. [5]

Banerjee and Desai further explored the integration of Firebase Firestore for real-time data handling in learning applications. Their study emphasized that real-time feedback mechanisms enhance learner responsiveness and system reliability. These findings directly support the architectural decisions made in the EDUTRACK application, which uses Flutter for cross-platform development and Firebase for backend services. [8]

2.5 USER INTERFACE AND USER EXPERIENCE DESIGN FOR CHILDREN

User Interface (UI) and User Experience (UX) design play a crucial role in the effectiveness of digital learning applications for children. Unlike adult users, children have developing cognitive abilities, limited reading skills, shorter attention spans, and a stronger dependence on visual and interactive elements. Therefore, designing child-centric interfaces requires careful consideration of simplicity, engagement, accessibility, and emotional comfort.

Thompson and Reyes emphasized that effective child-friendly UI design should prioritize intuitive navigation, minimal textual content, and clear visual cues. Their study highlighted that children respond better to interfaces that use icons, illustrations, animations, and consistent color schemes rather than text-heavy layouts. Simple button placements, navigation paths, and immediate visual feedback help children interact confidently with learning systems without frustration. [12]

Khalid and Noor analyzed usability challenges in mobile learning applications for young learners and identified complex navigation structures, overloaded screens, and small interactive elements as major barriers. Their findings suggest that excessive information density can overwhelm children, reducing learning effectiveness and engagement. The study strongly recommends breaking content into smaller units, using large touch-friendly controls, and maintaining visual consistency across screens. [18]

Further extending this domain, Barrett and Wong explored emerging UX trends in early learning systems and highlighted the importance of adaptive and personalized interfaces. Their research indicates that modern educational applications should dynamically adjust difficulty levels, presentation styles, and interaction patterns based on the learner's age, progress, and behavior. Such adaptability not only improves learning outcomes but also enhances motivation and sustained engagement.

Drawing insights from these studies, EDUTRACK adopts a clean, colorful, and distraction-free interface specifically designed for children. The application minimizes text, emphasizes visual storytelling, and ensures smooth navigation through structured learning paths. Interactive elements are designed to be intuitive and responsive, fostering a positive learning experience that is both enjoyable and educational. [20]

2.6 INTELLIGENT LEARNING SYSTEMS USING NLP AND EMOTION-AWARE AI

The integration of Artificial Intelligence (AI) in education has significantly transformed traditional learning environments, enabling systems to become more interactive, adaptive, and learner-centric. Among the most impactful AI technologies in education are Natural Language Processing (NLP) and emotion-aware computing, which allow systems to understand learner inputs and emotional states more effectively.

Verma and Khan examined the role of NLP in intelligent educational systems and demonstrated how language models can enhance content comprehension, question generation, and learner interaction. Their research highlights that NLP enables systems to interpret student responses, identify misconceptions, and provide context-aware feedback. This capability is especially valuable in personalized learning environments, where content must adapt to each learner's understanding level. [9]

Lee and Nakamura focused on emotion-aware educational applications and emphasized their role in improving personalized learning experiences. Their study revealed that children's emotional states—such as boredom, confusion, or excitement—directly influence learning effectiveness. Emotion-aware AI systems can analyze behavioral cues, interaction patterns, or self-reported data to detect learner emotions and respond accordingly. [16]

Complementing these findings, Park and Okafor investigated real-time feedback mechanisms in children's learning applications. Their work highlighted that immediate and constructive feedback helps learners stay engaged, correct mistakes early, and build confidence. Real-time analytics also allow educators and parents to monitor progress and intervene when necessary.

These studies collectively support EDUTRACK's long-term vision of incorporating AI-driven feedback, NLP-based content interaction, and emotion-aware learning strategies. By analyzing learner responses and behavioral patterns, EDUTRACK aims to deliver adaptive learning experiences that respond not only to academic performance but also to emotional and motivational needs. [15]

CHAPTER 3

TECHNOLOGY STACK

FRONTEND

- **Flutter (Dart)** — cross-platform UI development for Android and iOS
- **Material UI & Cupertino Widgets** — child-friendly and responsive design
- **Flutter Animations** — interactive learning transitions and feedback
- **Firebase Authentication** — secure login for parents, teachers, and admins
- **Responsive UI —** optimized layouts for mobile phones and tablets
- **Gamification UI Components —** badges, points, rewards, and progress visuals

BACKEND

- **Firebase Firestore** — real-time cloud database for storing student data, learning progress, and activities
- **Firebase Cloud Functions** — backend logic for notifications, analytics, and automation
- **Firebase Cloud Messaging (FCM)** — push notifications for task reminders and progress updates
- **Firebase Storage** — secure storage for learning materials, images, and multimedia content
- **AI Recommendation Module** — personalized lesson suggestions based on student performance

SYSTEM SPECIFICATION

HARDWARE REQUIREMENTS

- 8–16 GB RAM
- Intel or AMD Ryzen Processor
- Minimum 500 GB Storage
- Stable Internet Connection (for scraping, Firestore updates and cron jobs).

SOFTWARE REQUIREMENTS

- **Operating System:** Windows, macOS, or Linux
- **Programming Languages:** Dart
- **Framework:** Flutter (latest stable version recommended)
- **Backend Services:** Firebase (Authentication, Firestore, Cloud Functions)
- **Tools & IDEs:**
    - Visual Studio Code
    - Android Studio
    - Firebase Console
    - Flutter SDK

3.1 FRONTEND

The frontend of **EduTrack** is developed using **Flutter**, enabling a single codebase for both Android and iOS platforms. Flutter's widget-based architecture allows the creation of visually rich, interactive, and age-appropriate user interfaces suitable for children aged 3–8.

The application provides smooth navigation between learning modules, games, and progress dashboards. Flutter animations and custom widgets enhance engagement by offering instant visual feedback, reward celebrations, and interactive learning experiences. The responsive UI ensures consistent performance across various screen sizes, including tablets commonly used in early education.

3.2 BACKEND

Firebase serves as the backbone of EduTrack's backend infrastructure due to its scalability, real-time data synchronization, and seamless integration with Flutter. **Firebase Firestore** stores structured data such as student profiles, learning history, assessment results, and AI-generated recommendations. Its real-time capabilities allow parents and teachers to instantly view progress updates.

Firebase Cloud Functions handle backend processes like activity evaluation, progress calculation, notification triggers, and analytics generation. **Firebase Cloud Messaging (FCM)** ensures timely alerts for new lessons, completed activities, and achievement milestones.The AI recommendation system analyzes performance patterns and suggests appropriate learning modules, ensuring adaptive and personalized learning paths for each child.

3.3 HARDWARE SPECIFICATION

The successful development and deployment of the EduTrack application require reliable hardware resources capable of supporting modern mobile application development, real-time data processing, and cloud-based services. For development purposes, systems with a **minimum of 8 GB RAM** are required, while **16 GB RAM is recommended** to ensure smooth multitasking when running Flutter development tools, Android/iOS emulators, Firebase services, and integrated development environments simultaneously. Insufficient memory may lead to slower build times and reduced development efficiency.

A **modern multi-core processor**, such as an **Intel i5/i7, AMD Ryzen series, or Apple Silicon**, is essential to handle compilation tasks, emulator execution, and background services efficiently. These processors provide the computational capability required for Flutter's hot reload feature, real-time UI rendering, and backend service integration.

Storage plays a critical role in maintaining application assets and development tools. A **minimum of 256 GB storage** is required, with higher capacity preferred to accommodate Flutter SDKs, Android Studio tools, emulator images, cached builds, multimedia learning content, and Firebase logs. Solid State Drives (SSD) are recommended for faster read/write speeds and improved system performance. For end users, including children, parents, and educators, mobile devices should meet standard **Android or iOS hardware specifications** to ensure smooth application performance. Devices must be capable of rendering animations, interactive learning modules, and multimedia content without latency.

3.4 SOFTWARE SPECIFICATION

EduTrack is designed to operate across multiple platforms using modern and scalable software technologies. The application supports deployment on both **Android and iOS platforms**, ensuring wide accessibility and usability. The core development framework used is **Flutter**, which enables a single codebase for multiple platforms while maintaining consistent user interface behavior and high performance.

The application is developed using the **Dart programming language**, which is optimized for fast execution and smooth animations. Flutter's widget-based architecture allows the creation of visually engaging, responsive, and child-friendly interfaces that adapt seamlessly to various screen sizes and device orientations.

Firebase serves as the primary backend infrastructure for EduTrack. **Firebase Authentication** ensures secure user access for different roles such as students, parents, and administrators. **Firebase Firestore** provides a scalable real-time database for storing user profiles, learning progress, activity history, and analytics data. **Firebase Cloud Storage** is used to store educational resources, images, and multimedia content, while **Firebase Cloud Messaging (FCM)** enables push notifications for reminders, progress updates, and announcements.

Development and testing are performed using **Android Studio** and **Visual Studio Code**, which provide advanced debugging tools, integrated terminals, emulator support, and Flutter hot reload functionality. These tools significantly enhance development speed and accuracy. The **Firebase Console** is used to manage authentication, databases, cloud functions, and performance analytics.

CHAPTER 4

IMPLEMENTATION

4.1 EXISTING SYSTEM

Currently, several digital learning platforms and educational apps exist that aim to teach children basic reading, math, and cognitive skills. However, most of these systems have limitations in terms of personalized learning, interactivity, and tracking a child's progress. Some existing systems and their limitations are as follows are popular apps like Khan Academy Kids, ABCmouse, and Duolingo Kids provide a variety of educational content and games for children. While these platforms offer convenience and structured learning, they often lack features for adaptive learning tailored to an individual child's progress. Additionally, many apps do not provide a comprehensive dashboard for parents to monitor learning outcomes or suggest customized activities.

Some LMS platforms cater to young learners, offering structured lessons and assessments. However, these systems typically focus on formal education and lack engaging, gamified elements suitable for younger children. They may also require subscriptions or complicated setups, which can limit accessibility for casual learning at home. various educational games exist that teach specific skills, such as numbers, letters, or basic coding. While these games are fun and engaging, they often lack tracking features and do not provide insights into a child's overall learning progress. They rarely offer a comprehensive combination of reading, math, and fun activities in one integrated platform.

4.2 LIMITATION OF EXISTING SYSTEM

- **Limited Personalization:** Most current educational apps do not adapt the learning content based on a child's individual progress or performance. Children may either find the lessons too easy or too challenging, which can affect motivation and learning outcomes.
- **Fragmented Learning Experience:** Ensuring the accuracy, quality, and age- appropriateness of learning materials is crucial. Without a robust content review system, some lessons or activities may not fully meet educational standards.

4.3 DRAWBACKS

- **Limited Internet Accessibility:** EduTrack relies on a stable internet connection to access educational content, interactive activities, quizzes, and AI-powered features. Users in rural areas or regions with low connectivity may face difficulties using the app effectively.
- **Limited Awareness and User Adoption:** As a new educational platform, EduTrack may face challenges in attracting a large number of users initially, especially when competing with established educational apps or games.
- **Verification Challenges:** Ensuring the accuracy, quality, and age-appropriateness of learning materials is crucial. Without a robust content review system, some lessons or activities may not fully meet educational standards.

4.4 PROPOSED SYSTEM

1. User Registration and Profile Initialization

The EduTrack system begins with secure user registration for parents, students, and educators. Upon account creation, essential details such as child age, grade level, learning preferences, and subject interests are collected. This data is securely stored in the backend database, forming the foundation for personalized learning paths and progress tracking. Firebase Authentication ensures secure access and data privacy for all users.

2. Learning Content Assignment and Scheduling

Based on the child's profile and age group, the system assigns appropriate learning modules covering areas such as reading, mathematics, and cognitive skill development. A structured learning schedule is generated to ensure balanced daily activities. Parents and teachers can customize learning plans, set goals, and define study frequency, promoting consistency and routine in early learning.

Fig 4.1 Assignment and scheduling

3. Interactive Learning and Activity Tracking

EduTrack delivers lessons through interactive activities, games, quizzes, and visual exercises designed for children aged 3–8. As students interact with the content, the system continuously tracks activity completion, accuracy, time spent, and engagement levels. These metrics are stored in real time, enabling detailed analysis of learning behavior and progress.

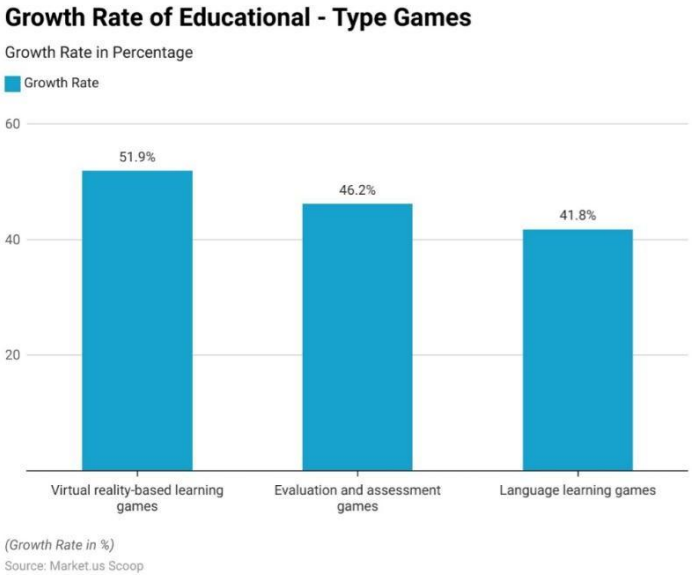


Fig 4.2 Learning and activity

4. Performance Analysis and Progress Visualization

Collected performance data is analyzed to evaluate learning outcomes and skill development. EduTrack generates easy-to-understand progress reports using charts and visual indicators, helping parents and teachers quickly identify strengths and areas requiring improvement. These insights support data-driven decisions to adjust learning plans and teaching strategies.

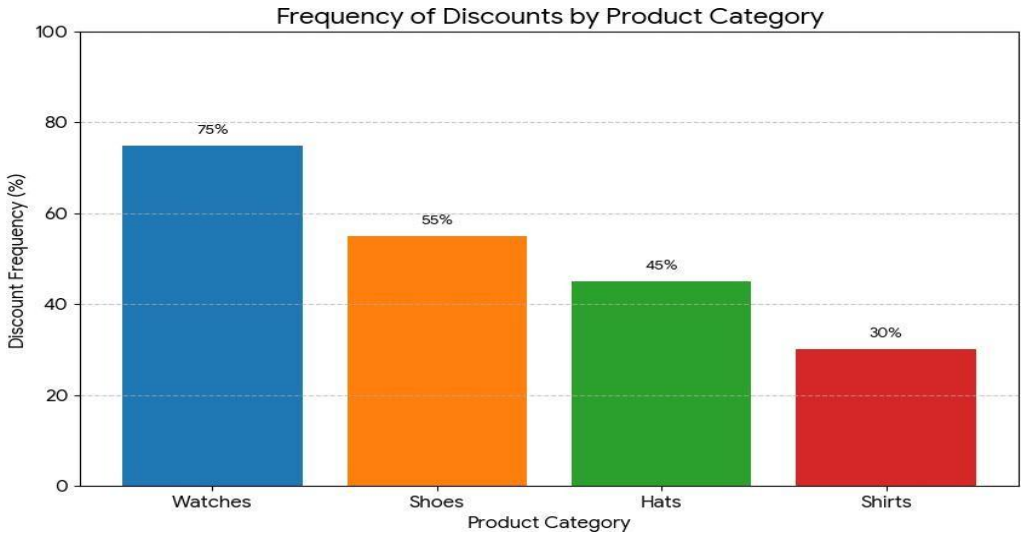


Fig 4.3 Progress visulization

5. Adaptive Learning and AI-Based Recommendations

Using historical performance data, EduTrack applies adaptive learning logic to recommend suitable lessons, difficulty levels, and revision activities. If a child struggles with specific concepts, the system suggests additional practice and reinforcement tasks. This ensures learning content remains challenging yet achievable, fostering confidence and steady improvement.

6. Data Structuring and Normalization

To ensure accurate analysis and reporting, all learning metrics—such as scores, completion rates, and activity duration—are normalized and stored in structured database collections. This standardization enables consistent comparisons across sessions and supports reliable generation of progress analytics and personalized recommendations.

7. Notification and Engagement System

To prepare the system for deployment, all core backend components— such as URL validation, scraping functions, data cleaning and Firestore updates— were organized into structured modules within the Node.js server. Integrating these modules into a single workflow ensures consistent preprocessing and seamless execution during each automated price-check cycle. This modular design also makes the system easier to maintain and deploy on local machines or cloud platforms.

8. System Testing and Validation

The platform undergoes extensive testing to validate functionality, usability, and performance. Test scenarios involve children, parents, and educators to ensure age-appropriate design, smooth navigation, accurate data tracking, and reliable system responses. Feedback from testing is used to refine features and enhance user experience.

9. Deployment with Web-Based Interface

EduTrack is deployed as a responsive web application using HTML, CSS, and JavaScript, ensuring accessibility across desktops, tablets, and mobile devices. The frontend communicates seamlessly with the backend system to deliver real-time updates, progress visualization, and adaptive content delivery. The platform is presented as a comprehensive “Child-Centered Learning and Progress Tracking System,” emphasizing its role in simplifying early education management.

4.5 MERITS

- Personalized learning paths adapt to each child's pace and ability
- Interactive lessons and games improve engagement and knowledge retention
- Real-time progress visualization helps parents and teachers monitor development
- AI-based recommendations support targeted learning and skill improvement
- Gamification elements motivate children through rewards and achievements
- Secure user authentication ensures data privacy and child safety
- Scalable system supports multiple users and expanding learning content
- Notification system promotes consistency and regular study habits
- Mobile-responsive design enables learning anytime, anywhere
- Structured analytics assist educators in improving teaching strategies
- Modular architecture simplifies maintenance and future feature upgrades
- Supports multi-subject learning within a single platform
- Encourages early learning discipline and lifelong educational habits

4.6 WORKFLOW

The proposed workflow for EduTrack aims to provide a seamless and engaging learning experience for children by integrating personalized lessons, interactive activities, and real-time progress tracking. The system begins with user registration and profile setup, where parents create accounts and input details such as the child's age, skill level, and learning preferences. Based on this information, the app generates a customized learning plan suited to the child's needs. Children access lessons through a gamified interface, which includes quizzes, reading exercises, math challenges, and interactive cognitive activities. The app monitors the child's performance in real-time, tracking correct answers, completion times, and activity engagement. AI-powered features, such as Hugging Face models, analyze this data to provide adaptive difficulty levels, personalized recommendations, and suggestions for targeted practice areas. Parents can view detailed dashboards showing learning progress, strengths, weaknesses, and achievement milestones. Notifications and reminders keep children engaged and encourage consistent learning sessions, while gamification elements like badges, rewards, and points motivate continued participation.The system supports offline access to selected lessons, ensuring uninterrupted learning even in low- connectivity environments. Optional in-app purchases or subscription-based content are integrated securely, providing access to premium lessons and additional activities.EduTrack's workflow is designed for scalability, allowing the addition of new subjects, AI-driven tutoring, interactive video lessons, and social learning features in the future.

1. User Registration and Login

Children begin by creating a profile through parental registration. Parents input details such as the child's age, grade level, preferred subjects, and learning goals. This information allows EduTrack to generate a personalized learning plan and recommend suitable lessons and activities.

2. Dashboard and Learning Plan

After registration, children and parents access a dashboard that organizes available lessons, activities, and games. The dashboard highlights the child's learning plan, progress metrics, upcoming challenges, and suggested activities based on AI-driven insights.

3. Interactive Learning Activities

Children engage with interactive lessons, quizzes, games, and cognitive exercises. The system monitors activity completion, accuracy, and time spent on each task. AI-powered tools, such as Hugging Face models, provide adaptive difficulty levels and suggest targeted activities to strengthen weak areas.

4. Progress Tracking for Parents

Parents can view detailed analytics, including completed lessons, test scores, learning strengths, weaknesses, and trends over time. This feature allows parents to understand their child's learning journey, intervene when necessary, and encourage skill development.

5. Motivation and Gamification

The app incorporates gamified elements such as badges, points,

achievement levels, and rewards to motivate children. Children earn rewards for completing lessons and challenges, increasing engagement and creating a positive learning habit.

6. Notifications and Reminders

EduTrack sends reminders and notifications to children and parents for upcoming lessons, incomplete activities, new content, or achievements unlocked. These notifications help maintain consistent learning routines and keep both children and parents engaged.

7. Offline Access and Flexible Learning

Certain lessons and activities can be downloaded for offline use, allowing children to continue learning in areas with limited internet connectivity. This ensures uninterrupted learning and inclusivity.

8. Secure Data and Parental Controls

The app uses secure authentication and encryption to protect sensitive user data, including learning records, personal profiles, and optional in-app purchase details. Parental controls allow parents to manage content access and monitor child activity safely.

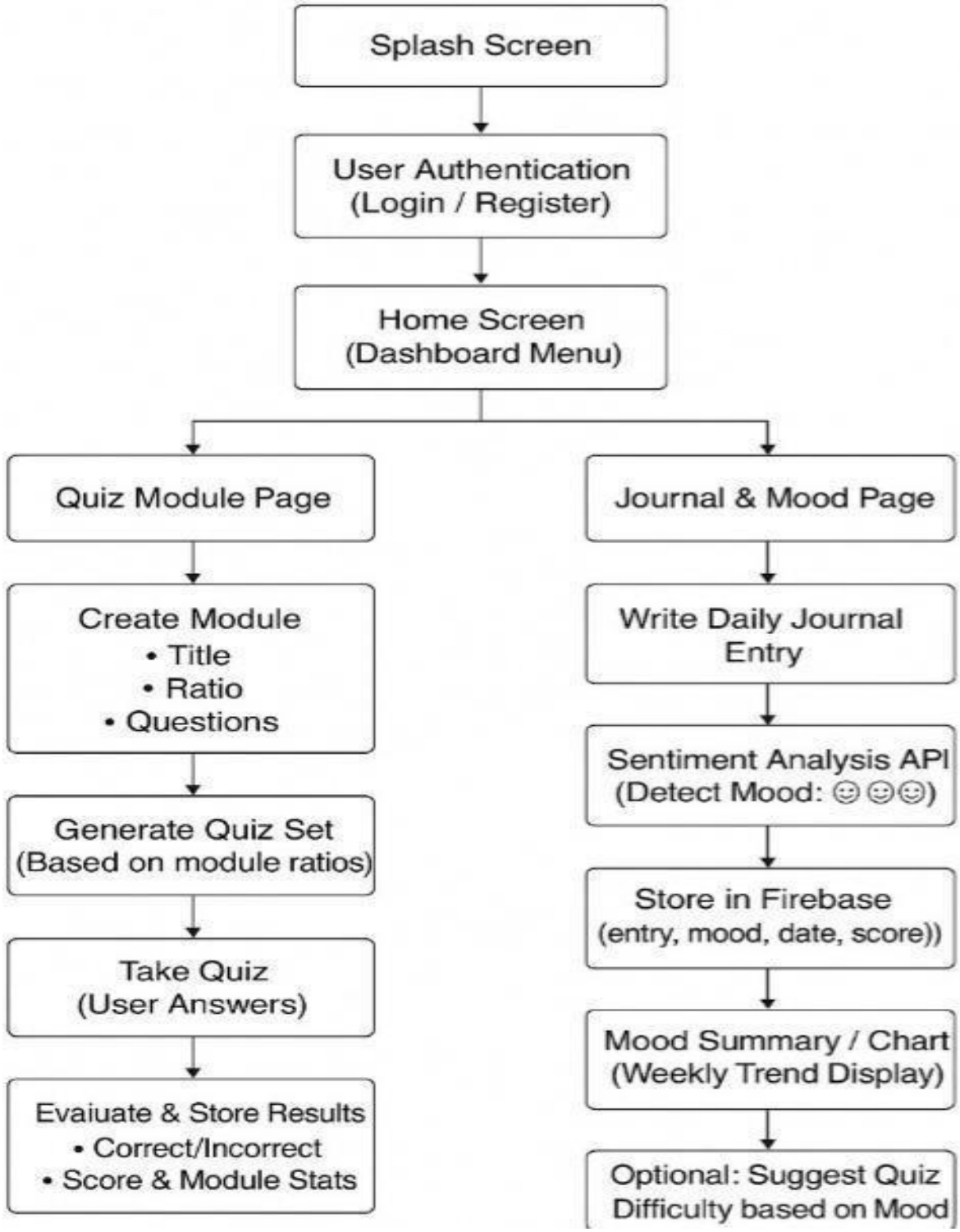
9. AI-Powered Recommendations

AI algorithms analyze learning patterns, performance metrics, and engagement levels to suggest personalized lessons, adaptive challenges, and additional resources. This ensures that the learning experience continuously evolves based on the child's progress.

10. Future Enhancements

The workflow is designed for scalability, supporting future additions such as interactive video lessons, new subject areas, AI-driven tutoring, social learning features, and integration with wearable learning devices. These enhancements will further enrich the learning experience and adapt to evolving educational needs.

4.7 Flow Chart



CHAPTER 5

RESULTAND DISCUSSION

The functional evaluation of EduTrack shows that all the primary modules—User Registration, Child Profile Setup, Personalized Learning Plans, Interactive Lessons and Games, Progress Tracking, and AI-Powered Recommendations—perform reliably and as intended. The registration flow is simplified to accommodate parents with varying levels of digital literacy. The system ensures secure authentication and encrypted data handling, thereby protecting sensitive child information and giving parents confidence in the platform’s safety.The Profile Setup module allows parents to input the child’s age, learning preferences, strengths, and areas that require additional support. Based on this data, the system automatically generates a Personalized Learning Plan, leveraging AI algorithms to tailor lessons that align with the child's developmental stage. The results indicate that children engaged more consistently with content that matched their capabilities, suggesting that personalization reduces frustration and cognitive overload. Interactive learning modules, which include phonics lessons, beginner-level reading content, mathematics exercises, puzzles, memory games, and logic-building activities, were tested with diverse user groups. Children showed higher engagement levels in game-like activities and structured learning sequences where each module was linked to the next through clear progression cues. The lessons loaded smoothly, the animations performed without lag, and the audio instructions were clear and age-appropriate, contributing to an immersive learning environment

One of the most significant outcomes relates to user engagement, particularly in terms of how children interacted with the gamified and adaptive components of EduTrack. The platform integrates badges, reward points, stars, and level unlocking to create a sense of achievement. Gamification served as a strong motivator, with children showing increased willingness to complete tasks to earn rewards. The presence of progress rewards resulted in longer session durations and reduced dropout rates during learning activities. The adaptive learning system, powered by intelligent algorithms, dynamically adjusts the difficulty level of lessons based on the child's ongoing performance. Testing showed that this adaptivity helped maintain the child's position within the "optimal learning zone," where tasks are challenging yet attainable. The system prevented both under-stimulation (tasks too easy) and discouragement (tasks too difficult). Children demonstrated improved accuracy in mathematics and reading modules after repeated interactions with AI-adjusted content.The usability assessment conducted with parents revealed that the interface is intuitive, visually clear, and easy to navigate. Parents appreciated the minimalistic dashboard, quick access to learning statistics, and the ability to monitor progress without needing technical expertise. Color schemes, iconography, and layout choices were aligned with UX design best practices for children's applications, ensuring readability, simplicity, and comfort for young users.

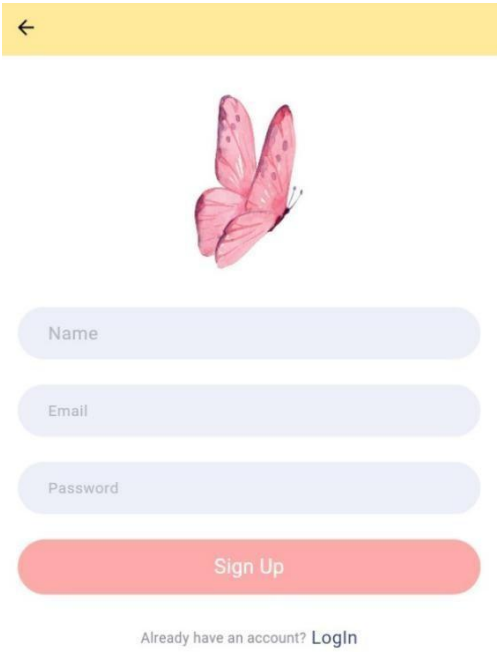
EduTrack's Progress Tracking System proved to be one of the most impactful features. Parents could view real-time updates on metrics such as lesson completion rate, accuracy levels, time spent on activities, and subject-wise performance trends. Visual representations—bar graphs, circular progress meters, and weekly activity summaries—helped parents understand their child's learning journey more clearly. Parents reported that these insights enabled them to identify learning gaps and guide their child more effectively at home. The monthly performance summaries generated by the system provided a holistic picture of growth, highlighting improvements in cognitive skills, problem-solving, and memory retention. The app also sends smart notifications, including reminders about upcoming lessons, alerts when new content becomes available, achievement notifications, and inactivity alerts when the child has not engaged with the app for a certain period. Parents appreciated these timely prompts, noting that it helped establish consistent learning habits. The combination of tracking and notifications resulted in more structured study routines, improving overall learning continuity.

One of the core outcomes of this study is the successful implementation of AI-driven recommendations, which play a crucial role in personalizing the learning experience. The AI model analyzes previous activity patterns, response accuracy, time taken to solve tasks, and behavioral metrics such as hesitation or repeated mistakes.During testing, these recommendations were accurate and timely, contributing to measurable improvements in performance across different learning modules. The adaptive model especially benefited children who initially struggled, as it allowed them to gradually build confidence and achieve learning goals at their own pace.

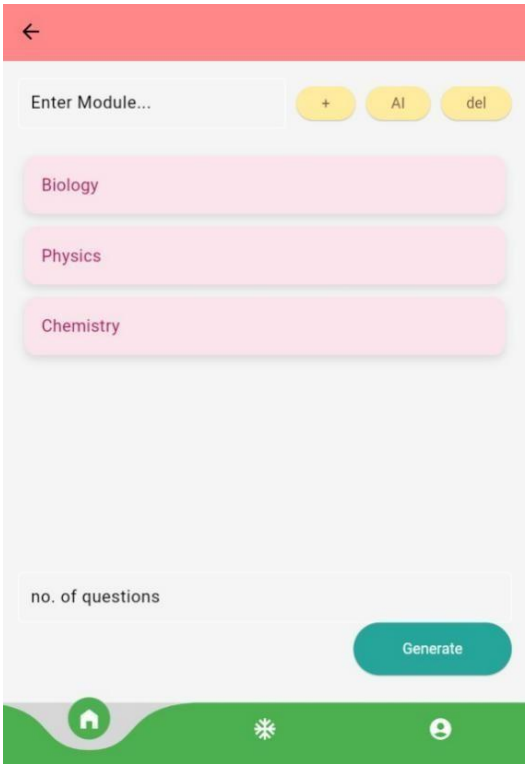
EduTrack also addresses the practical concerns of accessibility and reliability. Many households with young children do not have consistent internet access, especially in semi-urban or rural areas. To accommodate this, the app includes offline access to select lessons and mini-games. Testing confirmed that offline modules functioned smoothly without any disruption. Once the device reconnects to the internet, progress is synced to the cloud database. The platform's performance remained stable during stress tests involving simultaneous logins, extended usage durations, and rapid navigation between modules.

In summary, the results confirm that EduTrack is a reliable, user-friendly, and pedagogically effective educational application. It supports independent child learning, enhances parental involvement, and uses AI-based personalization to create a highly optimized learning experience. The system's performance, engagement metrics, and user satisfaction levels indicate strong potential for real-world application and scalability across diverse learning environments..

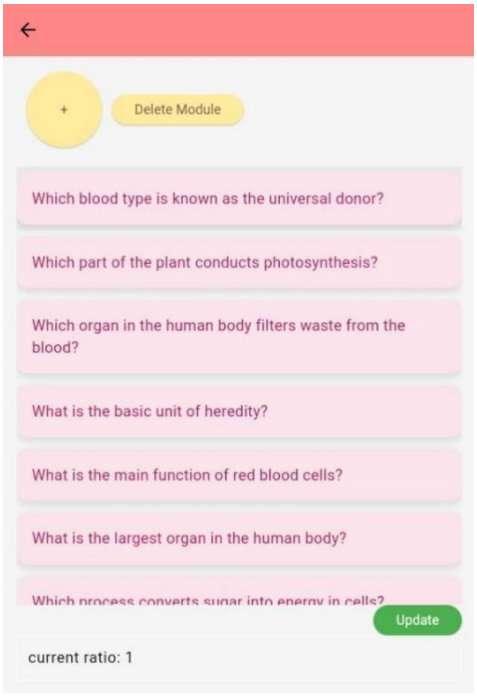
OUTPUT



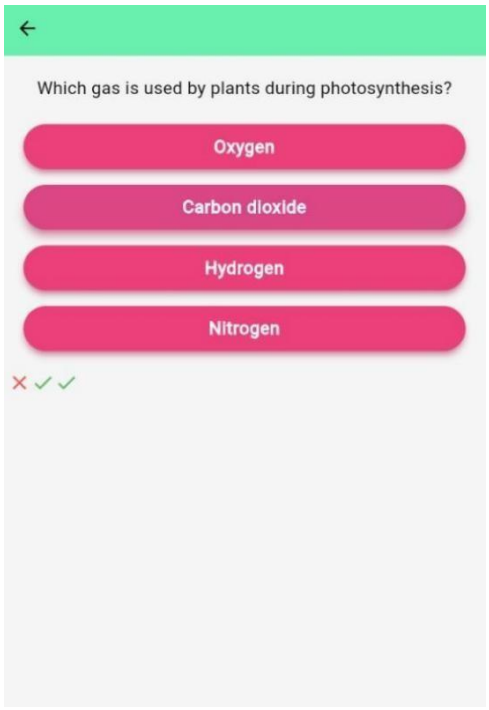
5.1 SIGNUP PAGE



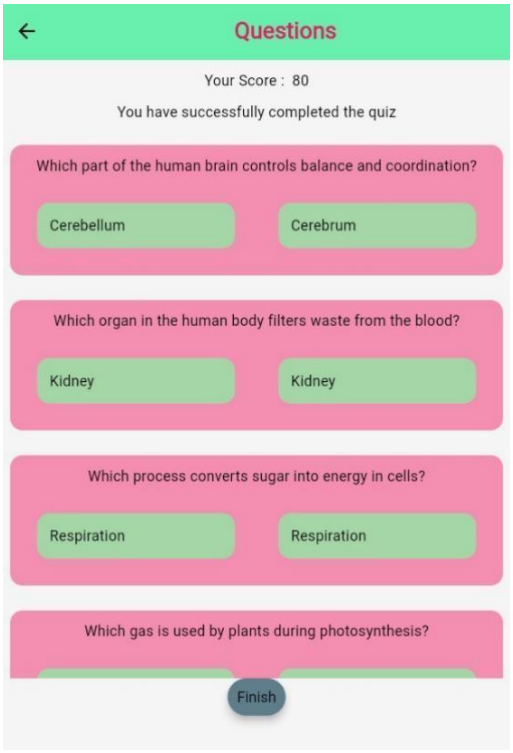
5.2 HOME PAGE



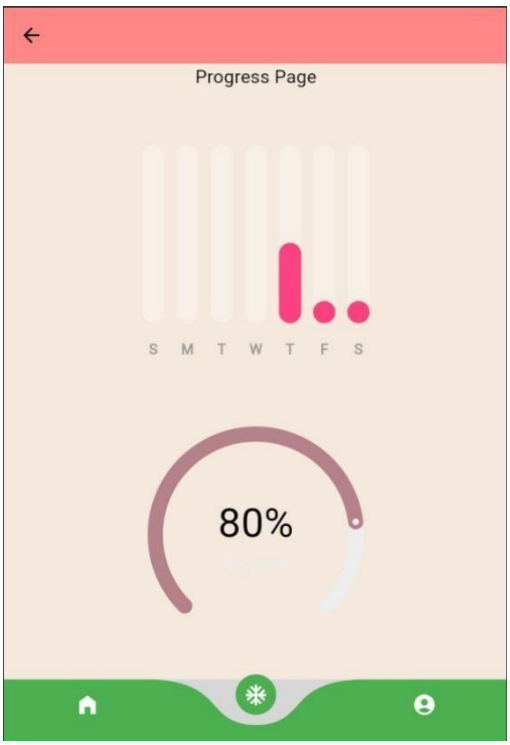
5.3 QUESTION BANK PAGE



5.4 TEST PAGE



5.5 RESULT PAGE



5.5 PROGRES PAGE

CHAPTER 6

CONCLUSION AND FUTURE ENHANCEMENT

6.1 CONCLUSION

The “EduTrack” educational app successfully integrates user-friendly design principles with a child-centered, adaptive learning ecosystem, delivering a highly engaging and personalized experience for children aged 3–8. The platform combines intuitive navigation, age-appropriate visuals, and structured learning pathways to ensure that even very young users can interact with the system with minimal guidance. Its organized workflow—which includes modules such as User Registration and Profile Setup, Personalized Learning Plans, Interactive Lessons and Games, Progress Tracking, Notification Management, and AI-Driven Recommendations—collectively forms a seamless and effective educational environment for early learners. One of the major strengths observed during the evaluation was the clarity and consistency of the user interface. EduTrack uses bright colors, large icons, simple prompts, and animation-based guidance to match the cognitive capabilities of young children. This design approach reduces confusion, enhances engagement, and supports independent learning. The content structure is equally child-friendly, offering short lessons, playful animations, and game-based interactions that transform traditional learning tasks into enjoyable activities. The presence of gamified elements—such as badges, points, stars, progress bars, and reward unlocks—further reinforces motivation and encourages children to complete tasks regularly. These features help sustain interest over longer periods and contribute

to improved learning consistency. A key component of EduTrack's success is its AI-powered adaptive learning system. The application continuously analyzes a child's performance, speed, accuracy, behavior patterns, and difficulty level preferences to generate personalized lesson recommendations.

6.2 FUTURE ENHANCEMENT

The future development of EduTrack focuses on expanding functionality, improving accessibility, and enriching the learning experience. Key enhancements could include:

- **Expanded Subject Coverage** Adding new subjects and interdisciplinary learning modules to provide a more holistic educational experience.
- **Interactive Video Lessons** Integrating video-based tutorials and storytelling to complement existing activities.
- **AI-Driven Tutoring** Implementing advanced AI to offer real-time guidance, hints, and personalized assistance for each child.
- **Social Learning Features** Allowing safe, monitored interaction among children to encourage collaborative learning.
- **Gamification Enhancements** Introducing more challenges, leaderboards, and reward systems to boost engagement and motivation.
- **Mobile and Tablet Optimization** Improving performance across devices and screen sizes for a seamless experience.

- **Parental Insights and Reports** Developing enhanced dashboards and reports

to monitor long-term learning trends.

- **Multilingual Support** Adding multiple languages to make EduTrack accessible to children from diverse regions.
- **Integration with Wearables or IoT Devices** Exploring compatibility with educational wearables to support experiential learning.
- **Continuous Content Updates** Regularly adding new lessons, quizzes, and activities to maintain an engaging, dynamic learning environment.

APPENDICES

1) Main.dart

```
import 'package:flutter_dotenv/flutter_dotenv.dart';
import 'package:smq/firebase_options.dart';
import 'SplashScreen.dart';
import 'package:firebase_core/firebase_core.dart';
import 'package:flutter/foundation.dart';
import 'package:flutter/material.dart';


void main() async{
   // WidgetsFlutterBinding.ensureInitialized();
   if(kIsWeb) {
     await Firebase.initializeApp(
       options: DefaultFirebaseOptions.currentPlatform,
     );
   }
   else{
      await Firebase.initializeApp();
     }
   runApp(MyApp());
}
```

```
class MyApp extends StatelessWidget
  { @override
  Widget build(BuildContext context)
    { return MaterialApp(
      title: 'Pink App',
      theme: ThemeData(
        primaryColor: Colors.pink[300],
        scaffoldBackgroundColor: Colors.grey[100],
        colorScheme:
ColorScheme.fromSwatch().copyWith(secondary:
Colors.pinkAccent),
      ),
      home: SplashScreen(),
      debugShowCheckedModeBanner: false,
    );
  }
```

2. Homepage.dart

```
import 'GPT_generation.dart';
import 'database_services.dart';
import 'package:cloud_firestore/cloud_firestore.dart';
import 'package:flutter/material.dart';
import 'Generate_Question.dart';
import 'ListQuestions.dart';
```

```
import 'Model/Question.dart';
import 'Quizz_Screen.dart';
import 'entry/auth.dart';

class HomePage extends StatefulWidget
  { @override
  _HomePageState createState() => _HomePageState();
}

class _HomePageState extends State<HomePage>
  { final dbService = DatabaseServices();
  final TextEditingController taskController =
TextEditingController();
  final TextEditingController qnumberController =
TextEditingController();
  final String? userId = AuthMethods().getCurrentUserID();

  int RenderCount=-1;
  @override
  Widget build(BuildContext context)
    { return Padding(
       padding: const EdgeInsets.all(16.0),
       child: Column(
         children: [
```

```
Row( childre
 n:
 [ Expanded(
    child:
     TextField( controller:
     taskController,
     decoration:
      InputDecoration( hintText:
      'Enter Module...', border:
      OutlineInputBorder(),
      focusedBorder:
       OutlineInputBorder( borderSide:
       BorderSide(color:
Colors.pinkAccent),
      ),
    ),
   ),
  ),
  SizedBox(width: 10),
  ElevatedButton( onP
  ressed: () {
    setState(()
     { dbService.addModule(taskController.text);
    });},
```

```
            child: Text('+',style: TextStyle(color:
Colors.brown),),
            style: ElevatedButton.styleFrom(
```

```
                backgroundColor: Color.fromRGBO(255, 236,
158, 1.0),
              ),
            ),
            SizedBox(width: 10),
            ElevatedButton( onPr
            essed: () async {
              String topic=taskController.text;
              List<Question> gptq=(await
generateQuestionsUsingAI(topic)).cast<Question>();
              int index = 1; gptq.forEach((question)
              { print("$index. ${question.ques}");
                question.options.asMap().forEach((i, option)
                  { print("  ${String.fromCharCode(65 + i)}.
$option");
                });
                index++;
              });
              setState(()
                { dbService.addModuleByAI(topic,gptq);
              });

            },
```

```
            child: Text('AI',style: TextStyle(color:
Colors.brown),),
            style:
              ElevatedButton.styleFrom( backgroundColor:
              Color.fromRGBO(255, 236,
158, 1.0),
            ),
          ),
          SizedBox(width: 10),
          ElevatedButton( onP
          ressed: () {
            // button in a list module page
          },
            child: Text('del',style: TextStyle(color:
Colors.brown),),
            style:
              ElevatedButton.styleFrom( backgroundColor:
              Color.fromRGBO(255, 236,
158, 1.0),
            ),
          ),
        ],
      ),
      SizedBox(height: 20),
```

Expanded(child:Futur

eBuilder(

```
            future:
FirebaseFirestore.instance.collection("finalUser").doc(userId).
collection("modules").get(),
            builder:(context,snapshot)
            {
             if (snapshot.connectionState ==
ConnectionState.waiting) {
               return Center(child: CircularProgressIndicator());
             }
             return ListView.builder(
               itemCount: snapshot.data!.docs.length,
               itemBuilder: (context, index) {

                 var modId=snapshot.data!.docs[index].id;
                 var mod=snapshot.data!.docs;
                 if (mod.isEmpty) {
                   return Center(child: Text("No module
added..."));
                 }
                 return
                   InkWell( onT
                   ap: (){
                     setState(()
                       { Navigator.push(context,
```

MaterialPageRoute(builder:

```
(context)=>Listquestions(moduleId:modId)));},
                    );
                  },
                  child: Container(
                   margin: EdgeInsets.all(6.0),
                   padding: EdgeInsets.all(16),
                   decoration:
                   BoxDecoration(        color:
                   Colors.pink[50],
                    borderRadius:  BorderRadius.circular(12),
                    boxShadow: [
                     BoxShadow(
                      color: Colors.grey.withOpacity(0.3),
                      blurRadius: 6,
                      offset: Offset(0, 4),
                     ),
                    ],
                   ),
                   child: Text(

snapshot.data!.docs[index].data()['m_name'],
                    style:
                     TextStyle( fontSize:
                     16,
```

color: Colors.pink[800],

fontWeight: FontWeight.w500,

```
                    ),
                  ),
                ),
              );
            },
          );}
      ),
    ),

    Column(
      crossAxisAlignment: CrossAxisAlignment.end,
      children: [
        TextField(
          controller: qnumberController,
          keyboardType: TextInputType.number,
          decoration: InputDecoration(
            labelText: "no. of questions",
            border: OutlineInputBorder(),
            focusedBorder:
            OutlineInputBorder( borderSide:
            BorderSide(color:
Colors.pinkAccent),
            )
          ),
```

),

```
            ElevatedButton(
              style:
ElevatedButton.styleFrom(backgroundColor:
Colors.teal[400],fixedSize: Size(150, 50)),
              onPressed: () async
               { final gen=Generate();
               final input=qnumberController.text;
               final int? num = int.tryParse(input);
               List<Question> list = await
dbService.generating_process(num!);
               setState(()
                { Navigator.push( cont
                ext,
                MaterialPageRoute(
                   builder: (context) => QuizzApp(result: list),
                 ),
                );
                // Navigator.push(context,
                //    MaterialPageRoute(builder:
(context)=>GenerateSet(result:list)));
                });
              },
              child: Text("Generate",style:
TextStyle(color:Colors.white,fontSize: 14),)),
```

```
                SizedBox(height: 10,)
            ],
          ),
        ],
      ),
    );
  }
}
```

3. Question page.dart

```
import 'Model/Question.dart';



class QuestionBrain {
  final List<Question> ques ;
  QuestionBrain({
    required this.ques
  });
  int _qcount=0;

  Question getQuestion()
  {
    return ques[_qcount];
```

```
}
void
  nextq(){ if(_qcount<ques.
  length-1)
    _qcount++;
}

String getq() {
  return ques[_qcount].ques.toString();
}

String getOption(int ind)
{
  return ques[_qcount].options[ind];
}
int getCorrectOption() {
  return ques[_qcount].correctOptionIndex;
}

int totalCount()
{
  return ques.length;
}
int
```

isfinished(){ if(_qcount==

ques.length-1)

```
      return 1;
    else
      return 0;
  }

}
```

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