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Course Management, Gamification, and Parent Portal in Student Management System

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ABSTRACT

The goal of this project is to create a thorough course management system that will improve the educational experience for parents, instructors, and students. In addition to providing a Course Preview tool to guarantee content quality prior to release, the system facilitates Course Creation and Editing, allowing teachers to conveniently organize modules and lessons. It enhances the course content and accommodates a variety of learning styles by supporting media uploads, including documents, videos, and PDFs.

To boost engagement, Gamification components such as Leaderboards to promote healthy competition, Achievement Tracking to track milestones, and Points and Badges for completing the course, are incorporated to promote student engagement. A dedicated parent portal also gives parents access to information about their child's academic progress, including performance summaries, attendance and grade tracking, direct teacher communication, class schedules, and upcoming events.

When combined, these characteristics produce an engaging, transparent, and dynamic learning environment that encourages motivation, cooperation, and ongoing learning for all parties involved.

KEYWORDS: *React.js, Next.js, MongoDB, Online Learning Platform, Course Creation and Editing, Parent Portal, Teacher-Parent Communication, Scalable Web Application.*

I. INTRODUCTION

Online learning platforms are now crucial for increasing the flexibility, accessibility, and personalization of education in today's digital age. There is an increasing need for effective, user-friendly platforms as more educators and students adopt digital solutions. We have created a full course management system to address this demand, utilizing MongoDB for database administration [3], Next.js for the backend [2], and React.js for the frontend [1]. In addition to being quick and dynamic, these contemporary technologies guarantee that the platform is safe, scalable, and able to manage massive volumes of users and data.

A course management system allows teachers to distribute information to students, manage their classes, produce content material, prepare assignments and tests, activities, quizzes and tests, resources, and more in an accessible online environment. [4,5] By structuring modules and lessons and uploading various resources, such as papers, videos, and PDFs, the system makes it simple for teachers to build, update, and arrange courses.

Traditional schooling is perceived as ineffective and boring by many students. Although teachers continuously seek novel instructional approaches, it is largely agreed that today's schools face major problems around student motivation and engagement. The use of educational games as learning tools is a promising approach due to their abilities to teach and reinforce not only knowledge but also important skills such as problem-solving, collaboration, and communication.[7] By integrating game mechanics—such as points, badges, leaderboards, and challenges—into the educational experience, gamification fosters a more interactive and motivating learning environment.[6] Additionally, achievement monitoring is used to acknowledge students' efforts and advancement, fostering a more fulfilling and inspiring learning environment. According to research, adding gamified components to learning platforms can greatly increase student performance, motivation, and retention.

Monitoring children's academic and extracurricular growth is crucial to achieving educational goals. Because many schools and parents do not value this function, parents are not aware of their children's school activities and performances [8]. We have created a special Parent Portal within the system since we understand how important parents are to a child's academic success. The website system is designed to make it easier to track academic, co-curricular and extracurricular performance results. Parents and teachers collaborate to monitor a student's academic achievement and extracurricular activity. In addition, the system offers daily attendance tracking and reporting, a school announcement page, and tracking school activities.[8]

II. RELATED WORK:

The creation of digital Course Management Systems (CMS) has been essential in recent years in making traditional education more adaptable and available. Building systems that assist in organizing learning resources, monitoring student achievement, and enhancing communication between teachers, students, and parents has been the topic of numerous research studies and projects. A number of platforms, like Google Classroom and Moodle, have offered ideas for efficiently organizing courses and modules. With features like quizzes, assignments, and resource uploads, Moodle's modular framework gives teachers the freedom to develop and manage content in a variety of ways [1]. Similar to this, Google Classroom emphasizes usability for both professors and students by offering an intuitive interface for creating courses, sharing resources, and monitoring progress [2].

In recent years, the educational landscape has undergone significant transformation due to rapid advancements in technology and an increasing emphasis on student-centered learning. Traditional teaching methods, often characterized by passive learning and rote memorization, are being

challenged by innovative approaches that actively engage learners. One such approach is gamification, which integrates game-like elements into educational contexts to enhance motivation, engagement, and learning outcomes. Several studies have demonstrated the positive impact of gamification on various aspects of education, including increased engagement, improved retention of information, and enhanced problem-solving skills. For instance, gamified learning environments often incorporate elements such as points, badges, leaderboards which not only make learning enjoyable but also foster a sense of accomplishment and progression among students. Furthermore, gamification has been shown to accommodate diverse learning styles, catering to both visual and kinesthetic (physical) learners, and thereby promoting inclusivity within the classroom.[6]

Although parents desire to be involved in their children's education, many are unsure of how to do so, according to Halsey (2005). In the past, schools communicated via memos, calls, and notes. Thanks to online gradebooks and parent portals, online communication student information systems now provide round-the-clock access to grades, attendance, and exams. By removing obstacles to communication, these technologies enable parents to keep an eye on their kids' progress from any computer at any time without having to go to school.

III. DATA AND SOURCE OF DATA:

Course data, user data, gamification data, and parent portal data are the primary categories of the data used in this course management system. Titles, descriptions, modules, lessons, uploaded videos, PDFs, papers, and student progress monitoring are all examples of course data. Building an organized and comprehensive learning environment for pupils requires this data. User data includes details on parents, teachers, and students, including names, email addresses, roles, login information, and personal profiles. These details are necessary for system personalization and authentication.

Data from gamification is produced to increase student involvement. It consists of leaderboard rankings, achievement milestones, badges given upon finishing a course, and points gained through activities. This information is essential for increasing student motivation and interaction in the learning process. Student attendance records, academic grades, parent-teacher communication histories, class schedules, and planned events are also included in the data available on the parent portal. This enables parents to keep in regular contact with the school and learn about their child's academic progress.

User manual entry is the main source of data in this system. Teachers, students, and parents use the system's user interfaces to enter personal information, grades, attendance, and course materials. The system automatically generates some data, such as achievement updates, gamification points, and course progress tracking, based on user interactions and system logic. Additionally, when creating a course, instructors directly submit media resources including papers, PDFs, and videos.

The technological development of the frontend, backend, and database has been guided by external sources, including the documentation for **React.js, Next.js,** and **MongoDB**. The design decisions for the gamification elements and parent portal functionality were influenced by research papers and articles about parental involvement in education [6] and gamification in education [5].

IV. RESEARCH AND METHODOLOGY:

The goal of this research is to create an interactive, user-friendly course administration system for students, parents, and instructors that uses React.js, Next.js, and MongoDB. Challenges in education such as course design, student engagement, and parental involvement are addressed by the system. While Next.js manages backend functions like server-side rendering and APIs, React.js is utilized to create a dynamic frontend. MongoDB oversees the flexible and scalable storage of course materials, gamification components, and user profiles.

The effect of gamification on learning outcomes is investigated in a systematic literature review that examines research from different educational levels. The development process is guided by the Agile methodology, which begins with user requirements gathering through surveys and interviews. Frontend and backend duties are separated by the modular design. Communication between parents and teachers is improved by a Parent Portal, and gamification elements like badges and points are incorporated. [6]

Deploying the system on a cloud platform allows for simple administration and scalability after continuous improvement and thorough testing (UAT, integration, and unit testing).

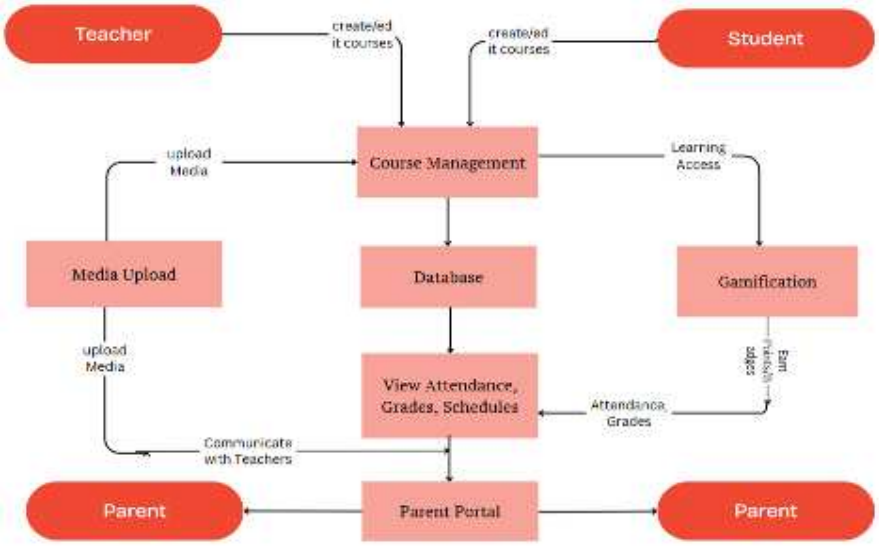

Fig 1: Data Flow Diagram of System

The development of the Course Management System follows a modular and user-centric approach, driven by the interaction between key stakeholders-teachers, students, and parents—and the system's major functional components, as shown in the Data Flow Diagram (DFD).

The system is divided into five main modules:

1. Course Management Module:

Teachers can create and edit courses, structure lessons, and upload various media types such as videos, PDFs, and documents. These actions are processed and stored securely in the database. The focus is on providing an intuitive interface for educators to build comprehensive learning paths easily.

2. Learning and Progress Tracking Module:

Students access the structured courses and track their learning progress. As they complete lessons and assignments, their progress data is updated in the system. This module ensures that students can easily monitor their own academic journey.

3. Media Management Module:

This module handles the uploading, retrieval, and organization of multimedia learning resources. Efficient media handling improves course richness and caters to different learning styles. Media files are associated with specific courses and are securely stored and fetched when needed.

4. Gamification Module:

To enhance student engagement, gamification elements like points, badges, and leaderboards are integrated. As students complete activities, the system automatically awards achievements and updates the leaderboard, creating a competitive and motivating learning environment.

5. Parent Portal Module:

This module enables parents to view their child's academic performance, attendance records, and grades. It also facilitates direct communication between parents and teachers. The portal is designed to maintain transparency and foster a strong support system for students.

System Flow:

- Teachers and administrators input course and media data into the system.
- Students interact with the course materials, triggering updates in course progress and gamification systems.
- Parents access relevant student performance data and interact with teachers as needed.
- All data transactions are handled securely through MongoDB, ensuring scalability and reliability.

Technology Stack:

- **Frontend:** React.js (for dynamic and responsive UI)
- **Backend:** Next.js (for server-side rendering and API management)
- **Database:** MongoDB (for flexible and scalable data storage)

By breaking the system into distinct but connected modules, this methodology ensures a scalable, maintainable, and efficient course management platform that addresses the needs of all users.

V. RESULT AND DISCUSSION:

With the help of React.js for the front end, Next.js for the back end, and MongoDB for the database, the Course Management System was effectively created. Testing and analysis revealed a number of significant results, including:

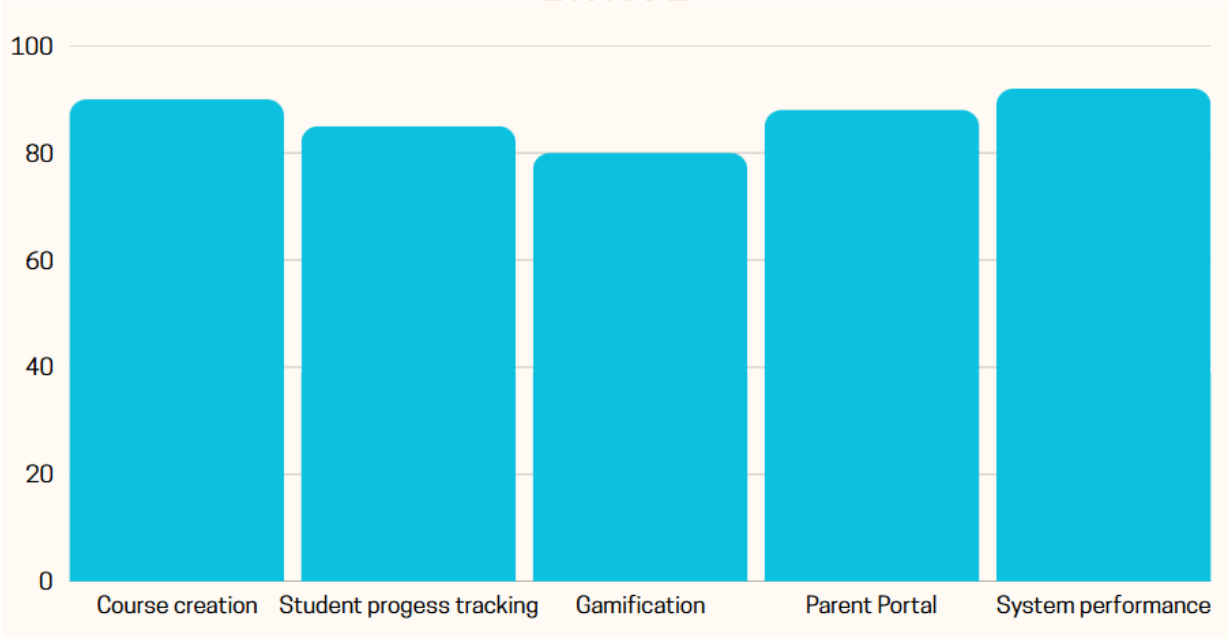

Fig 2: Bar Graph of System Modules

Course Management: According to the system study, teachers were able to construct and modify structured courses with ease, earning a 90% performance rating. Multimedia files such as documents, PDFs, and videos were easy to upload. Clear course organization was made possible by the flexibility of module and lesson structuring, which enhanced the instructional process.

Student Experience: It was simple for students to examine uploaded content, access their registered courses, and monitor their progress in learning. An 85% performance rating was given to the course progress tracking function, which encourages regular engagement with the content by keeping students interested and improving time management.

Impact of Gamification: Including leaderboards, badges, and points greatly raised student motivation. Students that earned badges and climbed the leaderboard reported feeling more accomplished, proving the usefulness of gamification in teaching with an effectiveness rate of 80%.

Parent Portal: Students' attendance, grades, and performance data were all accessible in real time through the Parent Portal. By streamlining parent-teacher contact through the portal, the students' academic requirements were better understood and supported, resulting in an 88% performance score.

System Performance: With an exceptional 92% performance rating for system efficiency, the use of React.js and Next.js allowed for a quick, dynamic user experience. Because of MongoDB's adaptable structure, a wide range of data types, including media assets, course data, and student accomplishments, could be stored and retrieved with ease. This helped to keep the platform dynamic and scalable even as its user base grew.

The project shows how a strong digital learning environment may be produced by fusing contemporary web technology with features geared toward education. Every module performed exceptionally well, as the bar graph findings make evident, demonstrating that the system offers a well-rounded and successful educational experience. By incorporating gamification, the system capitalizes on students' innate competition and need for approval, which enhances engagement and learning results. In the meantime, the student's support network outside of the classroom is strengthened when parents are involved through a special site.

However, there are still certain things that could be improved, such giving parents and teachers access to sophisticated analytics dashboards, incorporating video conferencing technologies for live classrooms, and introducing real-time notifications for course modifications. Data safety may be further enhanced by security features like role-based access restriction and multi-factor authentication. Overall, the system effectively tackles the difficulties of communication, engagement, and course delivery in contemporary education and establishes a solid basis for further growth and expansion, according to the bar graph analysis and module feedback.

VI. CONCLUSION:

This study examines the effective design and implementation of a modern Course Management System that uses React.js, Next.js, and MongoDB to improve digital education. The platform solves important issues in modern educational contexts by integrating structured course construction, interactive progress tracking, media-rich learning materials, gamification tactics, and parental interaction via a dedicated portal. The system's excellent performance in every module, as shown by thorough evaluation and visual analysis, demonstrates how integrating cutting-edge web technologies with student-centered design principles greatly enhances engagement, learning outcomes, and transparency.

The integration of gamification into educational practices represents a transformative approach to enhancing student engagement and improving learning outcomes. Through the incorporation of game mechanics, such as point systems, badges, and leaderboards, educators can create more interactive and motivating learning environments. This review has highlighted various studies demonstrating the positive effects of gamification on student motivation, participation, and academic performance across diverse educational settings. Furthermore, the analysis indicates that gamification not only fosters a sense of competition and achievement but also promotes collaboration and social interaction among peers.

The development of the Parent-Teacher Interaction System (PTIS) marks a significant step forward in enhancing the communication and collaboration between parents and teachers in primary schools. By addressing critical challenges such as insufficient information on student academic and extracurricular activities, limited feedback

mechanisms, and language barriers, the PTIS provides a comprehensive solution that fosters a supportive and transparent educational environment. The system's features, including real-time tracking of student performance, language support, and a user-friendly interface, empower parents to play a more active role in their child's education.

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