

A Modernized Education System in Bangladesh

**Professor Dr. Md. Fokhray Hossain¹, Sourav Sen Gupta²,
Chandan Kumar Das³, Md. Abdullah Al Masud Siddque⁴**

¹Professor, ^{2,3,4}Student

Department of Computer Science of Engineering,
Daffodil International University, Dhaka, Bangladesh

Abstract

Technology is advancing rapidly in today's environment. Every sector is going to be smarter and more productive except education. With the aid of current technology, students may study more effectively, efficiently, and enjoyable. Our needs may be met by combining technology with our educational institution. That is why this research is designing a smart education system that will include student data management, real-time student tracking, ongoing performance review, and MIS reports for each student. A student tracking system is an application that keeps track of student's academic progress, attendance, behavior, and participation in their institution's activities throughout their academic career. Guardians can follow up with students in our system and share their thoughts. This technique offers quick report generation, robust security, and restricted logins in our system. This student tracking system for educational institutes automates tasks so that the students may submit and receive their tasks from home. AI-powered data analysis will examine the student's performance and provide a graphical picture of their development. This system will automatically create a report for all the students. The system is a cloud-based platform with a high level of security. Users' accessibilities are limited based on their roles and responsibilities. Users will find our system to be easy to use. Because of this, tracking student development may be done easily with this method by parents, teachers, and students. Students, parents, and instructors may all track their student's progress in real-time and take appropriate measures to help them succeed. This will be a watershed moment in the growth of our country's students.

Index terms: E-Learning, Modern Education, Web Application, Monitoring System, Plagiarism Checker, Microservice, Agile Methodology, Online Assessment, Online Attendance System, Cashless Transactions, Online Discussion Forum, Analysis Report.

INTRODUCTION

Education serves as the foundation of a nation, often likened to a beacon that dispels the darkness of ignorance. However, Bangladesh's educational system lags far behind the modern world. While other countries advance their methods, Bangladesh persists with outdated techniques reliant solely on textbooks. This traditional approach hampers students' comprehension. Unlike modern systems allowing flexibility, traditional education demands physical presence from both teachers and students. Embracing modern methods could enable students to complete assignments remotely, fostering convenience and timeliness.

Our educational system cannot keep up with the current world due to excessive dependence on textbooks and manual processes. Everything is done by hand, and as a result, it is time-consuming. Furthermore, under the traditional educational system, teachers can not pay equal attention to each student. There is no real-time information available on a student's status or progress. However, if we mix our conventional educational system with current technology, we will be able to get a clear picture of the kids and know where they are right now. Parents may also keep track of their children's progress. Parents in the traditional educational system are unaware of the issues covered in class. However, under a smart education system, they would have a clear image of the situation and would be able to advise their child properly.

The project's major goal is to give students a high-quality education and to track their development along the way. In our initiative, this research is attempting to develop a smart education system for our country's educational institute students. This paper intends to equip students with a fresh learning approach. The

utilization of tools and equal engagement of teachers and students separate traditional teaching techniques from advanced smart learning education. It is past time to build an education system using the resources from the internet for the benefit of students. Because the traditional educational system prevents kids from thinking beyond the box. Online resource-based learning provides students with a helping hand that extends beyond the scope of the topic.

The majority of our country's classrooms lack adequate amenities and environments. This is also a source of concern for the improvement of our educational system. It is extremely difficult for a teacher in today's educational system to create a personalized plan for each student and track their development.

In our system, we have created a course-by-course outcome tracking or progress monitoring mechanism. As a result, it will reflect each student's progress and performance in each topic. So that instructors, students, and parents can learn which subjects and topics need to be improved. This will encourage them to put in more effort in these specific areas in order to improve in all areas. This system has online homework capabilities in our system. Where students may complete their classwork/homework from home and submit it on time. The work can be checked and evaluated by the individual teachers. They can manually enter the results into the system. The system will display a real-time progress graph. Teachers may offer feedback on each topic, assignment, and performance so that parents and kids can see where they need to improve and practice accordingly. Our technology will improve user coordination, allowing our future generations to be more efficient, educated, and productive.

In a world increasingly driven by technological advancements, the prioritization of the education system is paramount for optimizing growth. It is through advanced intellect that all progress on Earth is achieved. By ensuring students are guided away from detrimental paths, we can steer the country back on track. With the aid of technology, no student will be overlooked, enabling us to harness the full potential of every individual for the betterment of society.

OBJECTIVE

The modern education system seeks to revolutionize the traditional learning paradigm by integrating advanced technologies to enhance student outcomes. The system is designed to provide a comprehensive learning environment that fosters critical thinking, problem-solving, and creativity. By leveraging internet resources, the project aims to transcend the limitations of conventional classroom instruction, offering students access to a broader spectrum of knowledge and opportunities for personalized learning.

To optimize the learning process, we have implemented a robust material management system to track student progress and inform instructional decisions. Additionally, we streamlined administrative tasks such as attendance management, fee payments, and exam scheduling to improve efficiency and reduce administrative burdens. A key component of this research involves creating a platform that fosters effective communication between students, teachers, and parents. By incorporating a feedback mechanism, we aim to bridge the gap between theory and practice, enabling students to seek clarification and support as needed.

LITERATURE REVIEW

In our densely populated country, the student population is high. Unfortunately, around 16% of students don't finish elementary school, often due to inadequate supervision during early childhood. These young children lack guidance and need a proper tracking mechanism for their actions. Implementing a student monitoring system could help students stay on track academically and beyond. Such a system would keep instructors, students, and parents informed, ultimately reducing the number of children who struggle in their education.

In the e-learning era, cloud-based education systems have transformed the educational landscape by fundamentally changing how educational content is created, shared, and accessed. Cloud technology has been instrumental in delivering diverse and enriched educational materials through e-learning platforms. Modern wireless technologies are revolutionizing education, ushering in a smarter ecosystem that surpasses conventional methods. This shift offers a seamless, convenient, and enriched learning experience, promoting adaptability to diverse learning patterns and fostering collaborative, self-directed learning.

The Smart Education Environment System utilizes a sturdy B/S (Browser/Server) structure, powered by ASP (Active Server Pages) technologies, ensuring smooth functionality. This architecture enables efficient communication between the user's browser and the server, resulting in a user-friendly and responsive interface. From 2011 to 2014, students joined an educational study replacing pen-and-paper tasks with a web-

based homework system. Thousands interacted with math and stats assignments online. The study analyzed item assignments, grading, and student feedback. Online homework management is transforming education by facilitating teachers to assign and oversee tasks completed by students using internet-connected devices. Studies show that implementing such systems in accounting teaching significantly improves students' performance and satisfaction in introductory accounting courses compared to traditional methods.

The state of the education system is a matter of critical concern, as highlighted by the findings of the Education for All (EFA) study, which reveals that approximately 25% of students in our country demonstrate inadequate reading proficiency upon completing elementary school. This alarming statistic underscores the urgent need for reform and improvement within our education system.

METHODOLOGY

This project presents a web-based application developed using Python for the back-end and JavaScript for the front-end, employing microservices architecture. The back-end was constructed using the Django REST framework, while the front-end utilized the JavaScript React JS library. To facilitate data management pertaining to students, assignments, and homework, an SQL database was employed. Additionally, stylistic components were incorporated to enhance the user interface's engagement and usability.

To address existing issues, it's vital to outline basic system requirements. These define key functionalities necessary for effective problem-solving. System requirements are crucial for identifying essential needs and conducting analysis before development. This approach helps meet user needs while minimizing costs and complexities. These requirements, derived from user input, ensure comprehensive fulfillment of needs and expectations, as detailed in system analysis documentation.

In software development, following a structured methodology is crucial. For our smart education system, we chose the Agile Software Development Methodology. Agile focuses on iterative development, team collaboration, and adapting to evolving requirements. By embracing Agile, we aimed to improve flexibility, adaptability, and efficiency in delivering a user-centric educational solution.

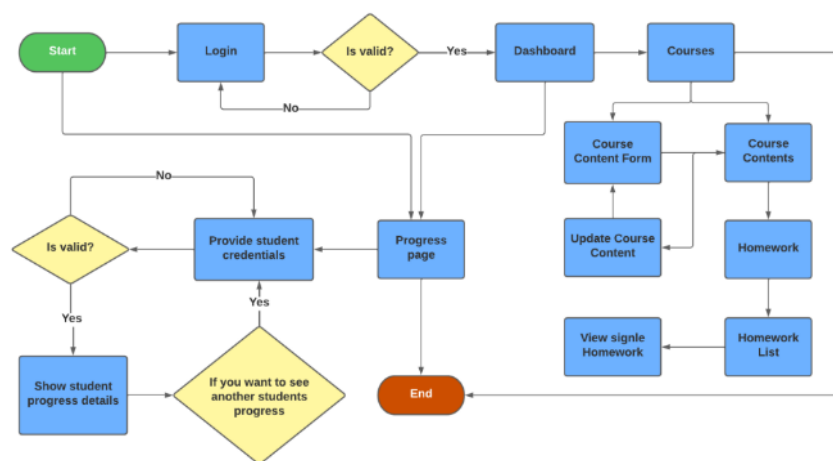


Fig. 1 Smart Education System Flowchart for Teachers

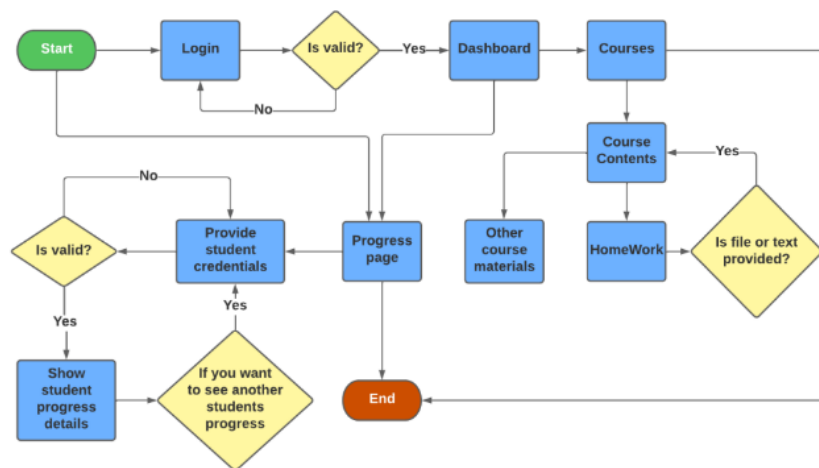


Fig. 2 Smart Education System Flowchart for Students

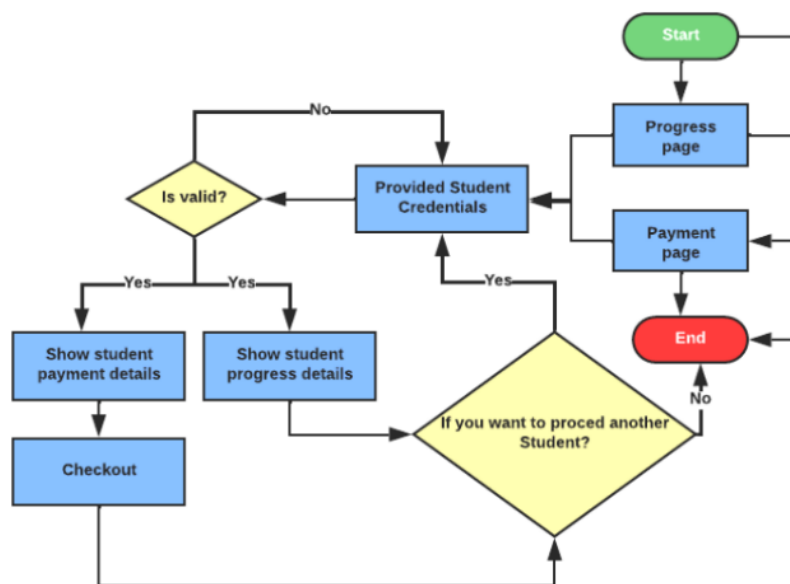


Fig. 3 Smart Education System Flowchart for Teachers

Student Tracking System: In conventional school or college systems, guardians often lack the means to consistently monitor their students' performance. Students' academic progress can be adversely affected by various factors, including their choice of companions. Such influences may manifest in their class achievements, potentially impacting their prospects. However, timely awareness of these issues by parents could facilitate corrective measures. Therefore, the implementation of a tracking system could enable guardians to receive timely and comprehensive feedback on their student's progress, thereby enhancing their ability to provide appropriate support and guidance.

Upon a student's participation in quizzes and completion of homework assignments, their marks will be recorded and integrated into the progress tracking section. Additionally, the yearly results of each class will be made available on this platform. Consequently, guardians will have access to comparative status reports presented through graphical interfaces, facilitating a quick and comprehensive understanding of their student's academic performance over time.

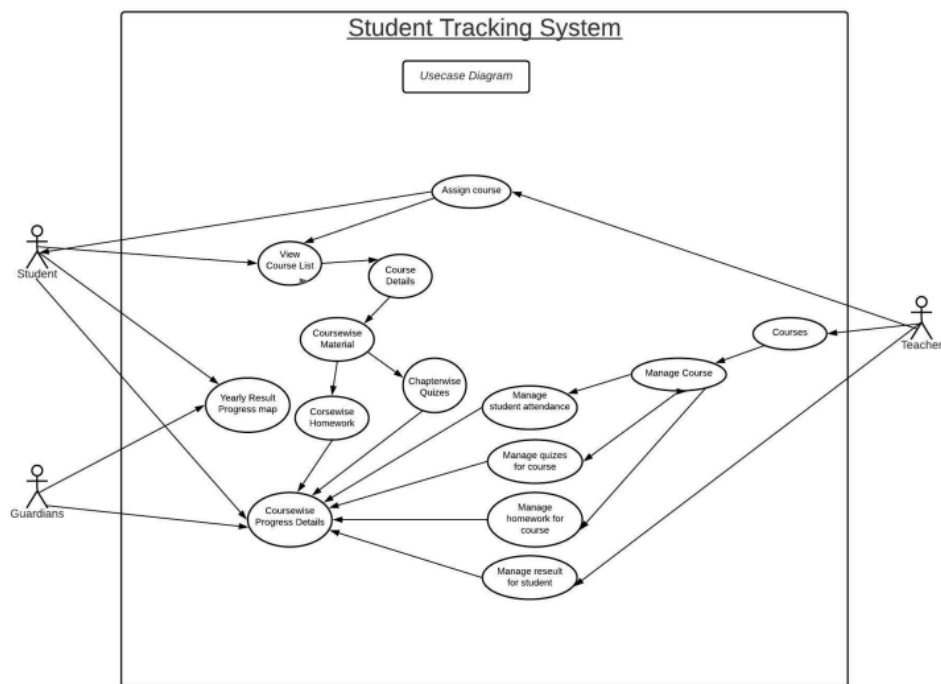


Fig. 4 Student Tracking System Use Case Diagram

Organized Course Materials: An essential component of our system involves organizing course materials to streamline the educational experience for both students and teachers. Recognizing the importance of structured content delivery in facilitating effective learning, our platform offers a comprehensive repository for course materials. This includes lecture notes, presentations, reading materials, and supplementary resources, all accessible within a centralized location. By organizing course materials systematically, we aim to enhance accessibility and facilitate ease of navigation for users. Moreover, our platform employs categorization and tagging features to ensure that materials are efficiently sorted and easily retrievable. This organized approach not only fosters a conducive learning environment but also empowers educators to effectively manage and disseminate course content to their students.

Discussion Platform: A fundamental aspect and challenge of this system is to establish a real-time communication platform for both students and teachers, serving as a conduit for learning and sharing. Recognizing the integral role of physical activities, question-asking, and knowledge exchange in traditional offline education, we endeavor to bridge this gap through a discussion platform. Such a platform aims to facilitate meaningful interactions and knowledge dissemination among students and teachers. By providing a space for sharing thoughts and exchanging information, this platform contributes to enhancing the educational experience for all users.

Cashless Transaction: In the contemporary era, cashless transactions represent a significant convenience, ensuring a secure and seamless payment process. Integrating such systems into the education sector holds immense potential for enhancing efficiency and convenience. By facilitating cashless transactions for academic fees, students and guardians can experience a streamlined payment experience. This not only eliminates the need for physical cash handling but also provides a secure and transparent method for financial transactions within the educational ecosystem. The adoption of cashless transactions in education aligns with broader societal trends toward digitalization and financial innovation, contributing to a more modern and efficient educational landscape.

IMPLEMENTATION

The implementation phase is crucial in the software development life cycle, where the system's physical source code is developed. Following the collection and clarification of all requirements, this phase consolidates ideas, analysis, and design into a coherent platform, providing initial system visibility. Clarity in database modeling, flow behaviors, and front-end back-end interactions is essential for simplifying development. For this project, we chose a microservice architecture to future-proof the system, allowing

dedicated platforms for different services and facilitating mobile application implementation. We used the Kanban framework, an agile and DevOps software engineering approach, requiring real-time capacity communication and complete transparency. Work items are visually represented on a Kanban board, enabling team members to monitor task status at any moment.

Designing and implementing the database is a crucial task in system development, requiring a clear plan for the data recording pattern and architecture. We have used an SQL database for data storage and the Django REST Framework for data processing. There are separate applications in the back-end system for managing Authentication, Courses, and Cashless Transaction APIs. Here is the database design of the system using the Class Diagram given below.

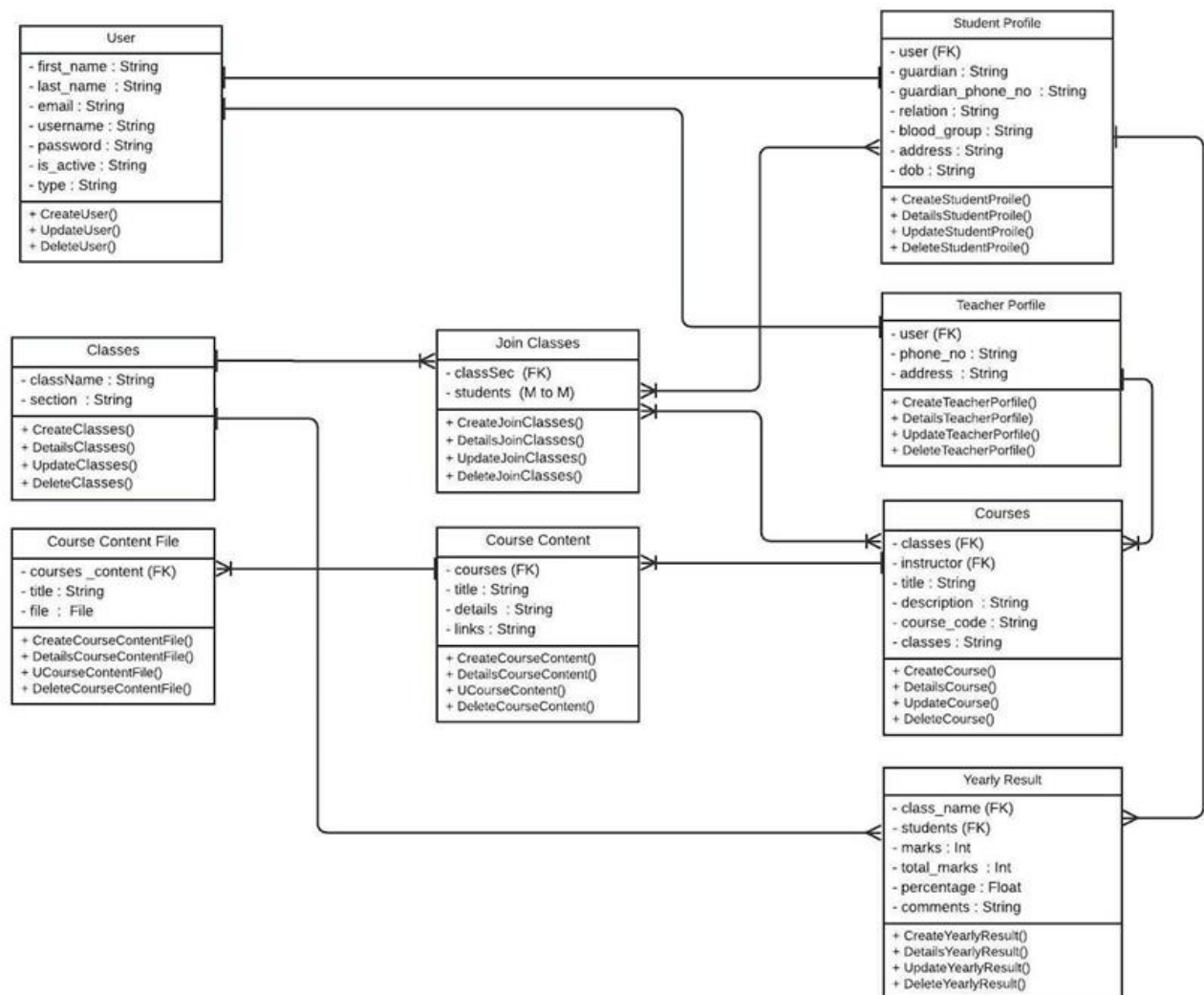


Fig. 5 Database design of the system

For the front-end design, we considered specific requirements and followed a sustainable and attractive front-end development architecture. We implemented a single-page application using React.js, which is well-suited for this purpose. For styling, we used a combination of CSS frameworks and styling components, including Bootstrap and TailwindCSS. TailwindCSS offers utility classes for design, while Bootstrap provides prebuilt components. Additionally, we utilized Ant Design to develop better user interfaces and some vanilla CSS for specific styling needs. This approach significantly improved our system design and interactivity. Below are some demos of our user interface design.

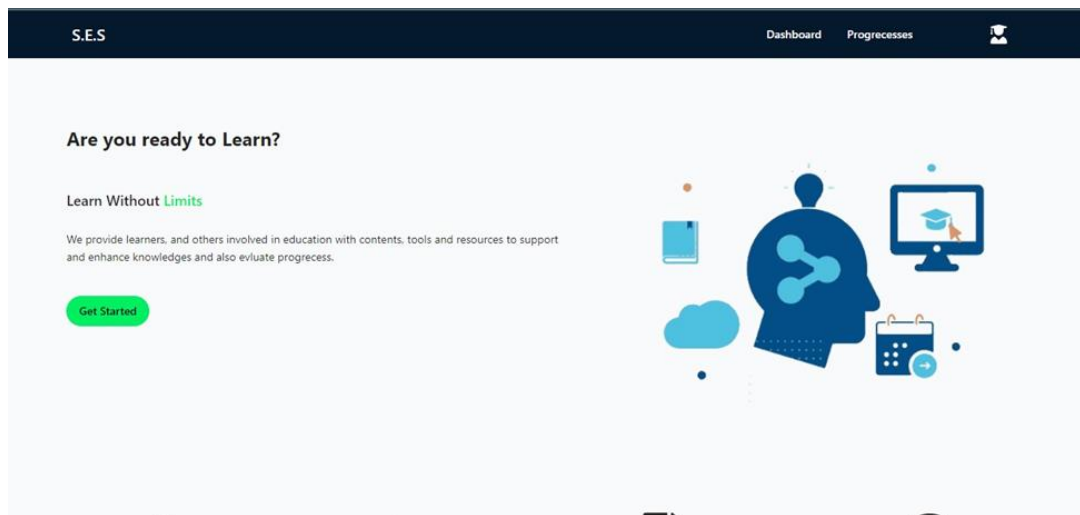


Fig. 6 User-interface of the Homepage of the System

Landing page of the system. User has to verify with their ID (student ID or teacher ID) to access all the features.

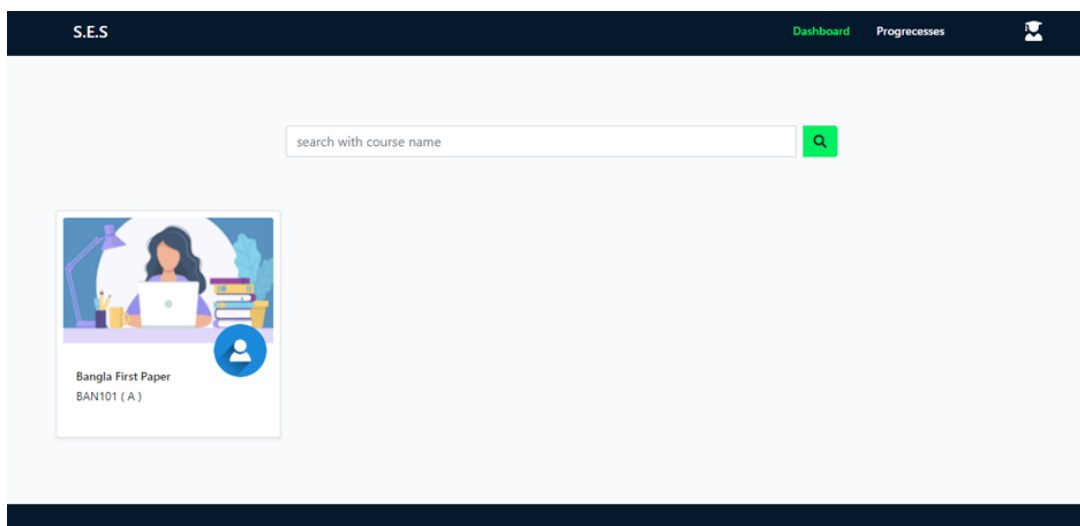


Fig. 7 User-interface of the Dashboard of the System

All the classes joined by the particular student will appear into the Dashboard. For the teacher it will be the classes which is supervised by them.

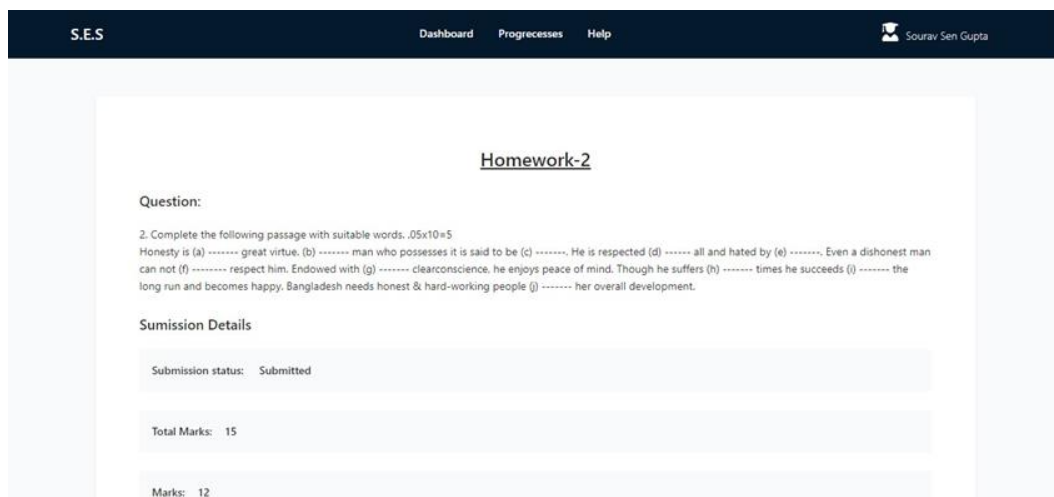


Fig. 8 Homework details and submission page (for Student)

Fig. 9 User-interface of Student information verification page

This is the student verification page. To track the progress of student's need to verify using student ID and date of birth.

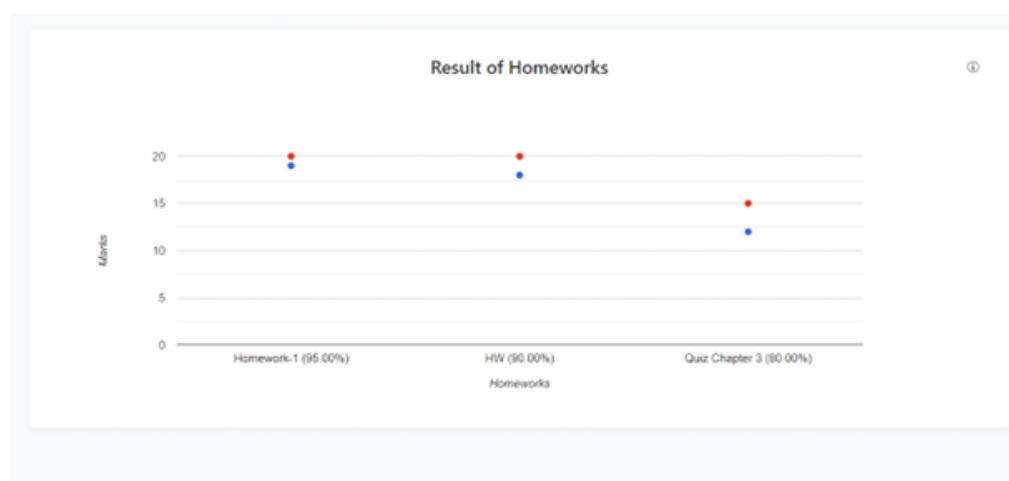


Fig. 10 User-interface of Homework progress statistics

RESULT AND DISCUSSION

At the time of developing a system, clear database modeling, understanding workflow behavior, and separating front-end and back-end development are vital. These specifications provide a clear roadmap for implementation, ensuring smoother development. The decision to embrace microservices architecture for the implementation of this system reflects a strategic approach toward future scalability, adaptability, and innovation. By leveraging the benefits of microservices, the system is poised to meet evolving business needs and technological advancements, while also laying the groundwork for efficient mobile application development and deployment.

The proposed system aims to automate the generation of comprehensive student progress reports, tracking academic performance, task completion, and overall proficiency annually. By continuously monitoring progress, the system ensures accurate yearly evaluations.

Additionally, the system allows for course-by-course outcome tracking, enabling stakeholders to assess performance across individual subjects and topics. This granular approach facilitates targeted interventions, fostering proactive efforts to improve learning outcomes.

Moreover, the system integrates online homework capabilities, enabling remote assignment completion and online submission. Real-time progress graphs and teacher feedback provide actionable insights for improvement, promoting student and parent engagement in the learning process.

Overall, the implementation of this technology-enhanced system promises to enhance user coordination and productivity, fostering a learning environment conducive to success in a dynamic world.

CONCLUSION AND FURTHER SUGGESTED WORK

Bangladesh, like many developing nations, faces multifaceted challenges requiring comprehensive development across all sectors, particularly in education. A critical stride towards enhancing Bangladesh's education system involves the development of a web-based application aimed at mitigating numerous prevalent issues. This initiative harmonizes traditional classroom methods with modern advanced technology, addressing inadequacies in student monitoring and parent-teacher communication. Overall, the implementation of this technology-enhanced system promises to enhance user coordination and promote efficiency, education, and productivity among future generations. By leveraging advanced technological solutions, we aspire to cultivate a learning environment that equips students with the skills and knowledge necessary for success in an increasingly dynamic and competitive world.

In the realm of system development, the pursuit of improvement knows no bounds, and the quest for innovation is ongoing. Systems must evolve continuously to remain relevant and effective in addressing the ever-changing needs and challenges of users. Therefore, the importance of regular updates and enhancements cannot be overstated.

Plagiarism detection tools help maintain academic integrity by identifying and preventing unauthorized copying of content. These tools analyze submitted work for similarities with existing sources, enabling educators to uphold academic standards and promote originality.

Mental health analysis through daily activity tracking leverages technology to monitor students' well-being and detect potential signs of stress or anxiety. By analyzing patterns in behavior and activity, this feature provides valuable insights that can inform interventions and support services to promote mental wellness among students.

Furthermore, the integration of AI-based support systems enhances the educational experience by providing personalized assistance and recommendations. These systems utilize artificial intelligence algorithms to analyze student data and tailor learning resources and support services to individual needs and preferences.

ACKNOWLEDGMENT

Foremost, we express our gratitude to the Almighty for granting us the strength, knowledge, abilities, and opportunities to undertake and satisfactorily complete this study. We extend our heartfelt appreciation to our supervisor, Professor Dr. Md. Fokhray Hossain, Department of Computer Science and Engineering, Daffodil International University, Bangladesh, whose guidance and expert advice were instrumental in the realization of this work. His friendly demeanor, invaluable insights, and professional guidance were indispensable throughout all stages of this dissertation. We also wish to acknowledge the support and valuable suggestions from our teachers, whose extended discussions aided in the selection of equipment and significantly enhanced the quality of our work.

Furthermore, we extend our gratitude to our friends for their comments on earlier manuscript versions and continuous support. Any errors or shortcomings in this work are solely our responsibility and should not reflect adversely on the reputations of those mentioned. Additionally, we appreciate the efforts of the anonymous reviewers for their valuable insights. Lastly, we are deeply thankful for the unwavering, unconditional, and loving support of our families, without which this endeavor would not have been possible.

REFERENCES

1. Saira, Nishat Zafar, Muhammad Hafeez "A Critical Review on Discussion and Traditional Teaching Methods", Jan 2021 (https://www.researchgate.net/publication/349390083_A_Critical_Review_on_Discussion_and_Traditional_Teaching_Methods)
2. Ahmed Abdulrahman Ahmed, "Traditional learning and E learning", May 2022 Dhuba Poudel, Pros and Cons of Traditional Schools (<https://honestproscons.com/pros-and-cons-of-traditional-schools>), 2 March, 2022
3. UOTP Marketing, TOP 6 ADVANTAGES OF TRADITIONAL EDUCATION (<https://potomac.edu/top-advantages-of-traditional-education>), 2 March, 2022
4. Alyssa Sellors, Overpopulation in Schools Affecting Test Scores (<https://education.seattlepi.com/overpopulation-schools-affecting-test-scores-2121.html>), 3 March, 2022

5. Anju Walia, "Traditional Education versus Modern", January 2020
6. Gambo Yusufu, Nachandiya Nathan A Novel Model Of Smart Education For The Development Of Smart University System | IEEE Conference Publication | IEEE Xplore, 10 January 2022.
7. Derar Serhan, "ERIC - EJ1264260 - Web-Based Homework Systems: Students' Perceptions of Course Interaction and Learning in Mathematics, International Journal on Social and Education Sciences", 2019.
8. Anna Helga Jonsdottir, Audbjorg Bjornsdottir, Gunnar Stefansson "Difference in Learning Among Students Doing Pen-and-Paper Homework Compared to Web-Based Homework in an Introductory Statistics Course", 21 April 2017.
9. Victoria Fratto, M. Gabriela Sava, Gregory J Krivacek "The Impact of an Online Homework Management System on Student Performance and Course Satisfaction in Introductory Financial Accounting: Education Journal Article | IGI Global", Volume 12, July-September 2016.
10. Grzegorz Blinowski, Anna Ojdowska, Adam Przybyłek "Monolithic vs. Microservice Architecture: A Performance and Scalability Evaluation", VOLUME 10, 2022.
11. Xu Shuaiwen, Wang Xiaoming, Li Song "On-line Homework Management System - ScienceDirect", Volume 17, Part A, 2012.
12. Al-Majeed Salah, Mirtskhulava Lela, Sarim Al-Zubaidy "SMART EDUCATION ENVIRONMENT SYSTEM", December 2014.
13. LVarun Ramesh,R Sai Anusha Priyanka, SNSS Venkata Lakshmi, V Mounika "STUDENT RESULT MANAGEMENT SYSTEM" Vol 12, Issue 7, July 2021.
14. Mukesh Ram, Software Development Process: Methodologies And Tools (<https://medium.com/@mukesh.ram/exploring-microservices-architecture-for-backend-development-a54d4db3a755>), 9:49 PM, 13 January 2022.
15. The modern education system (<https://xpertcube.com/modern-education-system>), 19 March,2022
16. Liton Chandro Sarkar, Smart Education Is Key to "Smart Bangladesh", 13 September, 2023