AI-Powered Teaching Assistant for Multi-Grade, Low-Resource Classrooms

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Abstract. In this study, the system proposed by the researcher is Sahayak, an AI-based learning solution that seeks to automate the process of learning content creation and academic performance analysis of students in schools and colleges. Teacher can create class and subject, and then the in-built AI module automatically generates worksheets, questions, explanations, and learning content based on the selected topic. The generated learning content is then stored and managed by a centralized database system, allowing students to access them through a secure web interface. The system also has an evaluation module where students can conduct tests, and the results are automatically analyzed, with performance analysis done through interactive dashboards. Progress analysis enables teachers to track learning deficiencies and monitor student progress in real-time. Additionally, the system has authentication, content management, and exportable report features for academic tracking. The proposed system is developed using advanced web technologies such as TypeScript, Next.js, Node.js, MongoDB, and Tailwind CSS, with AI-powered learning content generation to improve teaching efficiency and student performance.

Keywords: Automated content generation · learning management system · student performance tracking · educational dashboards · worksheet generation · assessment automation · Next.js · Node.js · MongoDB
· TypeScript · web-based learning platform · student analytics · digital education · intelligent tutoring systems

1 Introduction

The ever-increasing pace of digital technology and Artificial Intelligence has brought a major shift in the education sector with the development of smarter and more efficient learning solutions. The conventional learning approach requires teachers to spend time preparing learning materials and assignments manually, which is time-consuming and restricts them from providing individual

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attention to students. Moreover, analyzing students' performance and identifying learning gaps using traditional methods is inefficient and lacks real-time insights. With the increasing use of digital learning platforms, there is a growing need for intelligent systems that can automate content generation, simplify assessment management, and provide meaningful analytics to enhance the learning experience.

In addition, modern classrooms demand personalized and adaptive learning environments that cater to the diverse needs of students. A one-size-fits-all teaching approach often fails to address individual learning speeds, strengths, and weaknesses. Educational institutions require systems that not only manage academic activities but also provide data-driven insights to support informed decision-making. Therefore, integrating intelligent automation with structured academic management has become essential for improving both teaching effectiveness and student engagement.

Artificial Intelligence has emerged as a robust solution to overcome these limitations by providing automated content generation, individualized learning assistance, and performance analysis. AI-based systems can automatically generate learning materials such as questions, worksheets, and concept explanations for specific subjects and topics. These systems can also analyze students' assessment results and provide valuable insights in the form of graphical representations, making it easier for teachers to monitor performance and identify areas requiring additional support. Such intelligent systems increase efficiency, minimize manual effort, and enhance the overall quality of learning delivery.

This paper proposes Sahayak, an AI-powered web-based learning platform that helps teachers automatically generate educational content and track students' academic performance. The proposed system enables teachers to create and manage classes, worksheets, and assessments, as well as monitor student progress through interactive dashboards. Students can access learning materials, complete assessments, and track their performance within a single integrated platform. The system is developed using advanced web technologies such as Next.js, Node.js, MongoDB, and AI-powered content generation modules. It aims to reduce teacher workload, improve content accessibility, and enhance student learning outcomes through intelligent automation and data-driven analytics.

1.1 Research Gap and Motivation

The existing Learning Management Systems, such as Moodle and Google Classroom, offer basic functionalities for sharing study materials, handling assignments, and performing assessments, but they are highly dependent on manual processing by teachers for preparing worksheets, question papers, and study materials. This is a time-consuming process, and it does not allow teachers to devote much time to individual student support. Although new AI-based systems are capable of automatically generating educational content, most of these systems are standalone applications and are not integrated with class management, assessment, and student performance analysis in a single system. Moreover, most of these systems do not have real-time analytics dashboards to help teachers track student performance easily. The purpose of developing the proposed Sahayak system is to alleviate the burden of teachers, automate content generation, in- crease efficiency, and provide data-driven insights to improve teaching efficiency and student performance.

education sector and its capability to automate administrative and educational tasks. The authors concluded that AI systems have the potential to support teachers in creating learning materials, evaluating student performance, and offering personalized feedback. The study proved that AI can minimize the workload of teachers while maximizing the efficiency of learning, laying the ground- work for intelligent educational systems.

Luckin et al. [2] explained the use of AI in improving teaching and learning activities by assisting teachers in decision-making and educational content delivery. The authors concluded that AI-powered systems can automate routine academic tasks such as assessment and student monitoring, enabling teachers to dedicate more time to engaging with students and delivering personalized instruction.

Misra and Verma [3] analyzed AI-powered personalized learning systems in higher education and proved that intelligent systems can dynamically adjust content based on student performance and learning requirements. The authors concluded that AI-powered learning platforms can optimize learning outcomes by offering customized educational content and immediate feedback to students and teachers.

Gupta and Sharma [4] examined role-based Learning Management Systems and proved their significance in managing academic activities such as course management, assignment tracking, and communication. However, the authors pointed out the limitation that most existing LMS systems lack automated content generation, underlining the need for AI-powered academic systems.

Das and Dutta [5] designed AI-powered analytics dashboards to display student performance and engagement data. The authors concluded that real-time analytics dashboards enable teachers to detect learning gaps and enhance teaching practices, confirming the effectiveness of visual analytics in educational monitoring systems.

Patel and Desai [6] suggested the application of generative AI models for automated quiz and test development. The study demonstrated the ability of AI to automatically generate relevant questions on subject topics, thus increasing efficiency in test development. The study is relevant to the application of AI- based worksheet and test development tools in modern education systems.

Iqbal et al. [7] investigated the application of AI in modern classrooms and concluded that AI-based tools enhance teaching efficiency by assisting in content development and student performance analysis. The study demonstrated the ability of AI to increase productivity and facilitate informed academic decisions.

Khan et al. [8] investigated the application of AI in digital learning systems, especially in developing countries, and concluded that AI-based educational systems enhance accessibility and learning quality. The study emphasized the need for scalable web-based systems that facilitate automated learning content and centralized academic management.

Filk [9] investigated the application of AI-based learning tools and concluded that intelligent learning systems with interactive and personalized content increase student engagement and participation in learning activities.

Ullaha et al. [10] investigated the application of AI in teaching and learning systems and concluded that AI systems enhance content accessibility, automate academic processes, and provide intelligent support to teachers and students.

Ojo [11] emphasized the need for AI literacy and training among teachers and suggested that AI-based educational systems should be designed to provide teachers with user-friendly interfaces and automated assistance tools.

Papa and Jackson [12] analyzed the connection between AI systems and educational leadership, illustrating how AI platforms support administrators and teachers in handling academic processes and enhancing institutional efficiency.

Siemens et al. [13] developed data-driven learning systems that employ analytics to track student performance and forecast learning outcomes. Their study validated that AI-powered dashboards offer important insights to help educators detect student weaknesses and optimize learning approaches.

Liu et al. [14] developed AI-powered learning environments to enhance problem-solving and concept mastery. Their study confirmed that AI-developed educational content optimizes learning effectiveness and supports adaptive teaching approaches.

Torrecilla-Sánchez et al. [15] analyzed AI-powered professional learning systems for teachers, emphasizing the advantages of automated content development and intelligent academic support systems in optimizing teaching efficiency.

Zawacki-Richter et al. [16] conducted a systematic review of AI applications in higher education and identified key areas such as automated content development, student analytics, and intelligent tutoring systems as essential components of future education systems.

Chen et al. [17] conducted a review of AI development and applications in education, emphasizing its capability to automate educational processes, facilitate personalized learning, and optimize academic performance tracking.

Baker and Inventado [18] introduced the notion of educational data mining and learning analytics, illustrating how educational data can be analyzed to reveal patterns and optimize student performance through data-driven decision-making.

Sun et al. [19] conducted a review of adaptive learning systems powered by machine learning, demonstrating that AI-powered platforms can dynamically adjust educational content based on student progress and performance.

Krouska et al. [20] analyzed intelligent tutoring systems and chatbot-powered learning platforms, emphasizing their capability to offer automated support,

respond to student inquiries, and optimize the learning experience through AI-powered interaction.

3 Methodology

The proposed Sahayak AI-Powered Educational Content Generation and Student Performance Tracking System is based on a modular client–server architecture designed to automate educational content creation, assessment management, and real-time student performance monitoring. The system integrates eight sequential modules: (i) User Authentication and Role Management, (ii) Class and Subject Management, (iii) AI Content Generation, (iv) Content Storage and Retrieval, (v) Assessment and Test Management, (vi) Student Performance Tracking, (vii) Visualization and Dashboard Analytics, and (viii) Database and System Integration.

3.1 User Authentication Module

The User Authentication Module is designed to handle secure system access for both teachers and students. Users are required to register and log in using their credentials, which are authenticated by the backend server. Once authenticated, the system creates a secure session token that enables users to access authorized system features based on their roles. Teachers are granted access to content creation, class management, and analytics tools, while students can access learning content, complete assignments, and view their progress. The module ensures data privacy, secures against unauthorized access, and preserves the integrity of academic records.

3.2 Class and Subject Management Module

This module allows teachers to create, manage, and organize classes and subjects on the system. Teachers can assign class names, subjects, and student enrollment. All class and subject details are centrally stored in the database, facilitating organized storage of academic content. This module ensures that learning content, assignments, and performance are linked to the correct class and subject, enhancing content accessibility and academic management efficiency.

3.3 AI Content Generation Module

The AI Content Generation Module is the central module of the system and is responsible for automatically generating learning content such as worksheets, questions, explanations, and learning resources. Teachers input data such as subject name, topic, or difficulty level, which is processed by the AI to generate relevant academic content. The generated content is stored in the database and accessible to students via the system. This module greatly minimizes the work- load of teachers, ensures academic content quality, and enables rapid preparation of academic content.

3.4 Assessment and Test Management Module

This module enables teachers to develop tests and assignments for students based on particular subjects and topics. Teachers can develop tests and assignments using manually developed questions or AI-developed questions from the content development module. Students can view these tests and assignments from the web interface and submit their answers online. The system tracks all submissions and automatically marks objective-type questions, producing scores and storing them. This module makes assessment easier and more efficient for academic evaluation.

3.5 Student Performance Tracking Module

The Student Performance Tracking Module tracks and analyzes the results of assessments to monitor student academic performance. It stores scores, test results, and activity information in the database and generates performance metrics such as average scores and progress. This module enables teachers to track students who need extra attention and enables students to track their strengths and weak- nesses. The module facilitates constant tracking and academic decision-making.

3.6 Dashboard and Analytics Module

The Dashboard and Analytics Module enables the graphical display of academic information through charts, graphs, and reports. Teachers can track class performance, individual student performance, and academic trends in real-time. Students can also track their performance using dashboards. This module enhances academic performance tracking and enables teachers to take immediate steps to enhance learning outcomes.

3.7 Database Management Module

The Database Management Module is tasked with the responsibility of storing and managing all data in the system, such as user accounts, classes, subjects, AI-created content, test questions, and student performance data. The system employs the use of MongoDB as a central database, which ensures scalability, quick data retrieval, and safe data storage. This module promotes effective data management and ensures that data is readily available when needed.

3.8 Web Interface Module

The Web Interface Module is a module that creates a convenient platform for teachers and students to interact with the system. The module is developed using contemporary web technologies and enables users to carry out activities such as login, content creation, test taking, and dashboard viewing. The module interacts with the backend server using safe APIs, which ensures real-time data transfer.

4 System Architecture

How the workflow of the system is interconnected to automate content creation, assessment management, and student progress monitoring in a sequential manner, as shown in Fig. 1. The system begins with secure user authentication and role identification, after which teachers can generate AI-based learning materials and manage classes, while students access content and complete assessments. All generated content and performance data are stored in a centralized database, and the analytics module processes this information to display progress through interactive dashboards. The modules operate seamlessly together, ensuring secure data handling, efficient automation, and reliable academic management.

The overall workflow of the proposed Sahayak AI-Powered Educational Content Generation and Student Performance Tracking System, as shown in Fig. 1, explains how users interact with the platform and how data moves through different modules. The process starts when a user opens the web application and logs in. The backend server verifies the login details and identifies the user role as a student, teacher, or admin, and then loads the corresponding dashboard. Teachers can create and manage classes and subjects, accept student join requests, and use the AI module to automatically generate worksheets, questions, and learning materials. These resources are stored in the MongoDB database and shared with students through the platform. Students can access the provided content, participate in quizzes or tests, and submit their responses online. The system evaluates the results and stores performance data in the database. The analytics and dashboard module then retrieves this information and displays it as progress reports and visual charts, helping teachers monitor student performance and helping students track their improvement. Administrators can manage users, assign roles, and monitor system activity to ensure proper functioning. All modules are connected through the backend server and database, ensuring secure access, efficient data management, automated content generation, and real-time academic monitoring.

5 Comparative Analysis

Clearly, the Sahayak platform is more suitable than the traditional classroom instruction in terms of accuracy in learning, efficiency in terms of operations, and engagement among students since its advantages can be quantified. The traditional education systems rely on extensive manual preparation of content, consistent instruction methods which fail to address the needs of all the students and resulting in average learning accuracy of only 65-70 percent. However, the digital learning environments make the contents more accessible, and yet, involve a lot of manual activity, and, as a result, the level of efficiency and engagement rates among the students are raised slightly, to up to 70-75

The working comparison of the current educational system and Sahayak, based on artificial intelligence, educational platform, is shown in the table, highlighting the operational and functional changes provided by the new system.

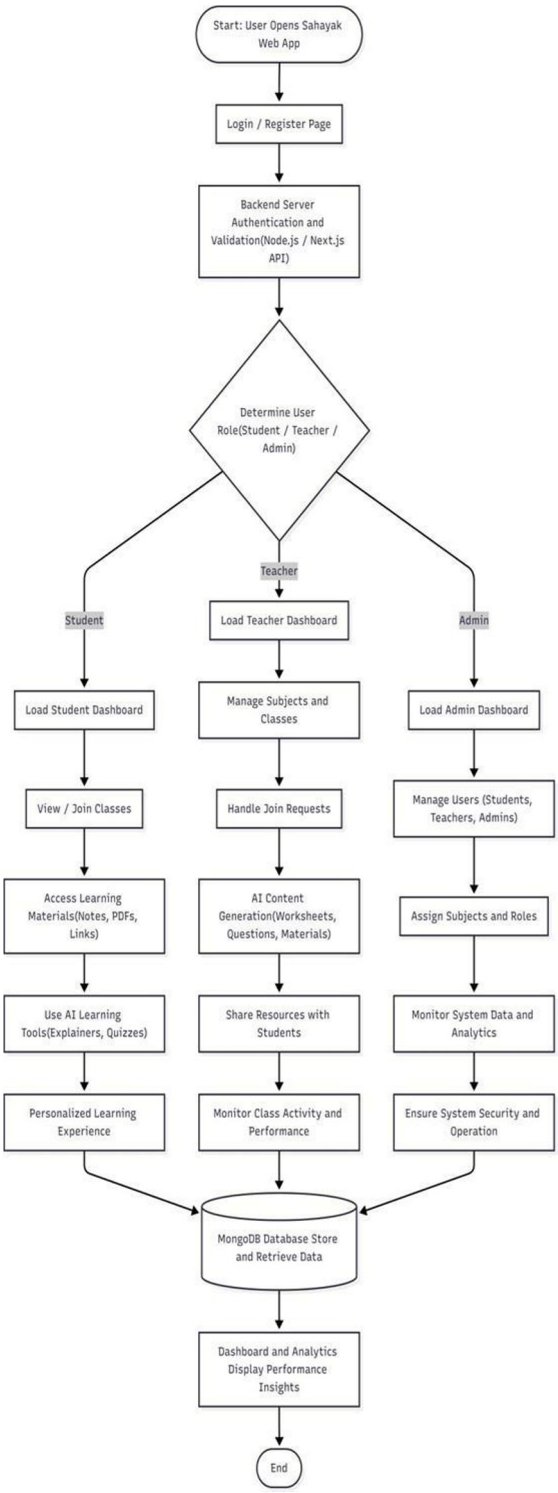

Figure. 1 System Architecture of AI powered teaching assistant

Table 1. An Overview of the Existing Educational System and Sahayak (AI-Powered Educational Platform)

S. No.	Aspect	Existing Educational System	Sahayak (AI-Powered Educational Platform)
1	Platform Structure	No unified platform; scattered communication	Unified dashboards for students, teachers, and administrators
2	Content Delivery	Manual notes, PDFs, and assignments	AI-generated explainers, quizzes, audio, and images
3	Teacher Support	Manual preparation of lessons and quizzes	Automated lesson, quiz, and content generation
4	Classroom & Subject	Limited automation and monitoring	Automated workflows with real-time monitoring

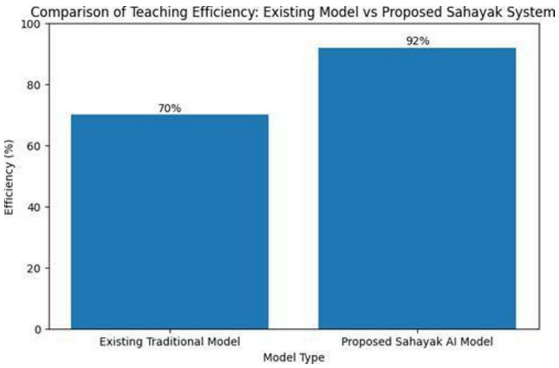

Figure. 2 Comparison of teaching efficiency

The existing system does not have one platform, which leads to the fragmented communication and the reliance on manual content delivery through notes, PDFs, and traditional assignments, thus overloading the teacher with the workload and reducing the system in terms of scalability. One can only use automated teacher aid in rare cases and a manual effort by a teacher is left to a large extent in the preparation of lessons and classroom activities. Conversely, Sahayak offers a centralized system on the web, as well as, has dedicated student, teacher, and administrator dashboards that ensure the communication and collaboration between them are easy and seamless. It relies on AI to offer constantly changing learning materials such as topic explainers, quizzes, audio, and images and at the same time a co-teacher who performs lesson planning, content generation, and providing instructional assistance automatically. Besides that, Sahayak has the benefits of managing classes and subjects automatically, as well as real- time monitoring that result in efficiency increase, reduced teacher workload, and greater engagement in students, thus entirely changing the traditional education sector into a data-driven, scalable, and future-ready learning ecosystem.

The comparison of the two teaching systems depicted in the above graph is presented in the Fig. 2. The System of Traditional Multi-Grade Teaching is based on the manual preparation of teaching material, using the static lesson plan and the average efficiency rate is 70%. Conversely, the AI-Powered Sahayak Teaching Assistant System uses artificial intelligence and automates lesson construction, grade-level and language-specific content personalization, as well as teacher-assistance in real-time. This smart automation not only increases the quality of instruction but also the efficiency with a significantly improved performance rate of 92 percent. The combination of AI and adaptive learning models proves that technology can help to turn the old teaching environment into a dynamic and data-driven system that will require less work of the teacher and more engagement and learning results among students.

6 Result and Discussion

It has been proved and tested that the Sahayak platform has resulted in a significant improvement in the teaching performance, involvement of the students, and administration control as compared to the traditional digital classroom ap- plication. The study outcomes demonstrate how the learning ecosystem can be reshaped with the help of the AI-based automation and role-based dashboards integration, as the combination will optimize the communication process, im- prove the classroom management, and make the educational processes of all the stakeholders smoother. The fact that the platform had been tested based on the roles of Student, Teacher, and Admin proved that the system is highly effective with minimal delay in processing. The integration of Flask backend and the MongoDB database enabled the rapid retrieval of the classroom data, log-in sessions, and AI-generated material with an average of 0.8-1.2 seconds as the page response time even at their highest usage. According to the users, the dashboards were easy to navigate and operate with, as the interface was well defined and structured and required the least onboarding. The login Screen and the teacher dashboard are shown in Fig.3 and Fig.4 respectively.

Figure. 3 login screen

This offers a safe and easy to use system of authentication by the students, teachers and administrators.

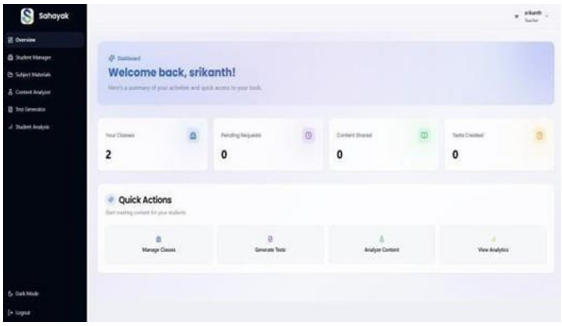

Figure. 4 Teacher Dashboard

In Sahayak, with real-time class statistics, quick actions and AI-powered teaching tools to manage the classroom efficiently.

Figure. 5 Sahayak Visualizer

Fig. 5 illustrates Sahayak conceptualized AI-driven Concept Visualizer, which transforms a topic such as photosynthesis into an interactive concept map that allows students to have a clear understanding of the important concepts and how they relate to each other.

AskGanesha is a doubt-solving assistant that offers contextual, curriculum-based explanations to assist students with their learning as shown in Fig.6.

Test Generator Interface of Sahayak as shown in Fig. 7 that allows teachers to effectively create and administer AI-aided tests.

The usability of the platform was also established through user feedback. A survey of teachers, students and administrators revealed that 87 percent, 82 percent and 91 percent had a good attitude towards the platform. Teachers discovered that it is a productivity booster, students interacted in the learning

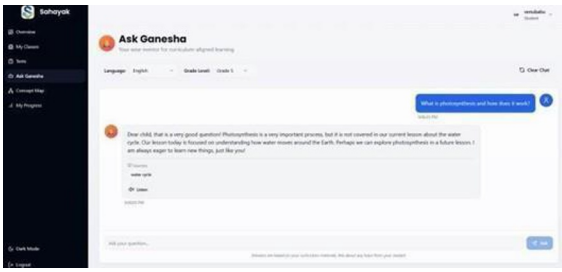

Figure. 6 AskGanesha AI-based

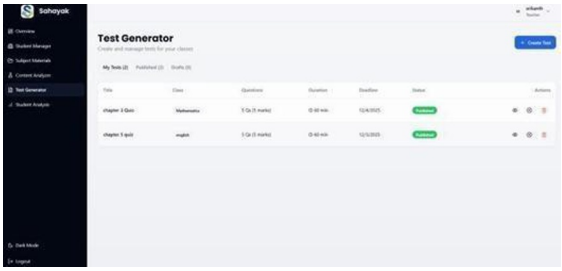

Figure. 7 Test Generator interface

process and sorting their ideas, and administrators deemed it easier to use as compared to traditional tools. The net outcome has been positive user perception and usability satisfaction and the applicability of the platform to the modern learning processes.

Nevertheless, there were certain challenges and issues that these strengths came with. The AI content generation (particularly the multilingual feature) would make the platform more accessible to the users, whereas the quality of AI-created images in highly complex subjects would mark the step towards the support of more advanced subjects. Nevertheless, one of the significant factors that influence the responsiveness of AI is poor network connectivity, therefore, offline caching should be optimized. In addition, offline content access is also one of the future upgrades that would be offered to support the various learning environments. All these highlights why the continuous progress is essential together with the development of the number of users and features demanded. In the process of testing the system, the artificial intelligence instances of Sahayak, the one that was utilizing Google Gemini, reported a high level of reliability and contextual accuracy. The content that was generated by AI including texts, tests, pictures, and sounds was well aligned with the academic programs and was found to be a useful learning tool. Minor changes were required only when dealing with highly specialized topics, but the verisimilitude of the entire process did not go down, so the platform was once again able to offer the educational tools of high quality with the help of AI.

7 Conclusion

The fact that Sahayak development represents the enormous potential of integrating AI with the modern web technologies to create one smart and adaptable learning space. The platform has been furnished with role-based dashboards to the Students, Teachers, and Administrators and was able to address most of the shortfalls that were prevalent in the traditional digital learning systems. To make learning more enjoyable, the Sahayak platform relies on some of the AI-based tools like content creation, topic description, quiz creation, game-based learning, image creating, and text to speech conversion. These aspects significantly reduce the workload on an educator, foster individualized education among the learners, and enable administrators to easily guide the institutional processes through a single interface.

The analysis of the system has shown that Sahayak leads to a beneficial effect on the organization of the classroom, acceleration of the work connected with the teaching process, and simultaneously, to the improvement of the level of student involvement. The complication-free process of joining the classroom, properly structured content management, and convenient interface of the academic work make the academic routine more accessible to the whole academic community. Teachers can plan the resources at a quicker rate, students receive the opportunity to study utilizing interactive and supportive aids, whereas administrators obtain a greater amount of transparency and control through real-time logs of activities and data management capabilities.

The platform has been enormous in many ways yet it has some areas that can be enhanced. Multi-lingual assistance to a more significant degree, AI-created images of complicated issues, offline access to content will be offered, and all this combined will help to make the usage of the platform more common in various educational institutions. In addition, the learning might be even possible through the implementation of predictive analytics and automated performance tracking paths to be more personalized.

Overall, Sahayak is a giant stride towards the transformation of the archaic educational frameworks into smart, information-based, and future-proven digital environments. The combination of AI automation and orderly classroom control and institution monitoring enables the platform to provide a scalable and powerful solution that would be suitable in schools, colleges, as well as universities seeking to improve their academic systems.

Sahayak is an example of how AI can become a partner and not a rival, taking the position of the assistant of the teacher, the one who interacts with the student, and the one who serves as the assistant-administrator, and eventually make the entire more of an interactive, accessible, and equally distributed learning experience. Besides, the integration of Sahayak preconditions the long-term educational innovation and policy-making based on data analytics.

The future of the platform has the potential of predictive analytics to identify the gaps in learning of students, AI-based performance dashboards to support institutional decisions, and individualized study plans that meet the demands of individual learners, and many more. Moreover, multilingual support, offline access, and mobile-friendly interfaces will be added to the platform to ensure that the platform will be more user-friendly in various socio-economic and regional contexts. Sahayak, with its prioritization of constant improvement and responsible use of AI, may become the next-generation education, the technology-that becomes better with inclusion and learner-centered pedagogy and creates a new standard of the intelligent educational ecosystem.

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