Cloud-Based AI Tutor for Rural School Children

M. Manoj, V. Balu, M. Jahnavi, K. Siva Shankar, P. Bhavana
Department of ECE, Sasi Institute of Technology and Engineering
Tadepalligudem, Andhra pradesh, India

***Abstract*—According to this paper one of such developed is a cloud-based AI tutoring system that is supposed to enhance the learning process in the schoolchildren, particularly in the rural schools. It will be more interesting to combine gamification and interactive artificial intelligence catboat's with students. Each subject is further broken down into smaller topics and levels. This structure helps students manage their studies effectively and provides the right materials and multiple-choice questions to assess their knowledge level. Students benefit from quick feedback and become aware of their weaknesses since they earn points for improvements. Admins can effectively monitor performance and address issues. The personalized support from the conversational AI chatbot lets students ask questions and receive help when needed, making the learning process easier and more productive. This approach ensures that students in rural areas receive high-quality education, encouraging them to continue their studies. The system also promotes collaborative learning among students, which boosts overall educational achievement. Additionally, the platform's scalable design allows it to extend its services to more students in other regions, making decentralization a viable long-term solution. Cloud technology ensures the system is reliable and accessible anytime, anywhere, supporting a continuous learning process.**

***Keywords*—Cloud Computing, artificial intelligence tutor, gamification, rural learning, interactive learning, customized feedback.**

I. INTRODUCTION

Good education also poses a significant concern to children in rural schools as they have access resources, facilities, and no customization support. To address these issues, this project proposes a service of tutoring on the cloud where AI performs its tasks, and it is specifically oriented toward the needs of rural students to learn. The platform also integrates new and emerging technologies such as the cloud computing, artificial intelligence and gamification to generate interactive and engaging learning experience. Based on multiple choice questions-based assessments and real-time feedback, the students receive access to established content and an opportunity to track their progress using a gamified database. It is also possible to build an artificial intelligence chatbot with the assistance of the Gemini API that will assist a student with a personalized help to simplify the process of doubts clarification and learning more. ReactJS is used for the front end, Spring Boot for backend services, and MySQL for data storage, making the system robust and reliable. The platform aims to close the digital divide and provide rural students with access to effective learning tools. The main goal of this project is to create an AI tutoring system in the cloud that meets the educational needs of school children in rural areas. Cloud technology ensures that the site is always available and scalable, allowing students in remote locations to access learning materials anytime, anywhere. Another important goal is to make engagement and motivation more active through gamification. The platform will include features to track progress, points, and scores, encouraging students to take part in learning and monitor their growth. The project also aims to offer personalized support through an AI-based chatbot. This will help students address misconceptions in real-time and tailor their learning to different needs. Additionally, the platform will give administrators a powerful management tool for organizing subjects, posting materials, arranging assessments, and tracking student progress and feedback. This promotes smooth operation and ongoing improvement of the educational process. The proposed system will be a web-based tutoring tool accessible on most internet-enabled devices, making it widely available in rural areas. It allows administrators to create educational topics quickly, upload learning materials, design tests, and monitor student performance in real-time. Students will enjoy a structured and interactive learning experience, making it easy for them to enroll, receive customized study materials, and take quizzes that align with their curriculum while providing immediate feedback on their academic performance. The scalability, availability, and reliability provided

by cloud computing mean that the platform can serve more users without impacting performance. This flexibility allows the system to meet the needs of small rural schools as well as non-governmental organizations and educational institutions dedicated to providing equal access to education for many people. The platform will democratize education by fostering inclusive growth through its geographical and infrastructural reach, enabling rural learners to access ready-made, customized, and interactive educational tools anywhere and anytime, regardless of their location..

II. RELATED WORK

The present paper is aimed at incorporating cloud computing and AI to provide rural students with low educational resources to participate in personalized tutoring[1]. The system will differentiate the learning contents based on the performance of the students and will also make the access to be affordable through low-priced devices[2]. The paper is an AI-based cloud system hypothesis that can enable learners to rural schoolchildren because it can provide them with real-time opportunities[3]. Even within the low-connective spaces of the system, the failure to absorb learning is permitted through optimization of the data handling[4]. It is a smart tutoring system that the paper states are based on AI and cloud storage, which is utilized to deliver an individualized lesson to students in a remote location[5]. It offers improved way of learning because it tracks the student progress and dynamically changes the content[6]. This project is an AI tutor on the cloud allowing the narrowing of the educational divide in rural areas[7]. The system offers interactive learning models and feedback mechanism to improve the knowledge of the students[8]. The research focuses on how AI-based cloud computing can be used to provide scalable and flexible education or learning to the rural learners[9]. It guarantees content delivery depending on the speed and level of knowledge of the individual. The paper will produce an intelligent tuition tool founded upon cloud computing to be implemented to benefit students in rural schools. The system is also able to have access to quality educational materials and personal recommendations. The paper is devoted to the improvement of rural schooling by using an AI-based tutoring system which is situated on the cloud[10]. It offers dynamic learning guidance and follows performance of students in real time. The proposed work presupposes the use of an AI tutor as a cloud platform that is able to offer multilingual and personalized education to school children in rural schools[11]. The system compliments interaction through being interacted and having user friendly learning interfaces. The article presents a scaled cloud-based tutoring platform that is an AI based tool in learning gaps detection amongst rural students[12]. It is applied to provide certain educational content in order to improve the learning process at school. The proposal involves a proposal of a tutoring system over the cloud that will be fueled by AI to upgrade access and quality of education in rural areas[13]. The system assists in empowering real time feedbacks and proper contents management to improve learning processes.

The present paper proposes a cloud-deployable interactive course through an AI-based tutoring system that will be used to support the rural students[14]. It increases education opportunities through individualization of learning, depending on the needs and performance of the students. Opportunity of cloud-based intelligent tutors in the rural schools is addressed in the study, and how they can provide delivery of affordable and scalable learning solutions. In the effort to do that, the system is relying on AI algorithms to create dynamic lesson plans and monitor the interactions with students during the lesson[15]. This paper brings out the importance of cloud computing and AI in availing cheaper educational services to rural children. The system allows controlled access to personalized learning content and supports students at their level. The paper proposes a cloud-based AI tutor for rural students that uses machine learning to tailor the learning experience. It can help individuals address problems associated with remote learning by offering live analysis and assessment. The article discusses the potential for interactive learning for children in rural schools through AI and cloud technologies. It also assumes flexible learning, where the material is adjusted to match each student’s learning style. The paper focuses on how AI-driven cloud platforms can transform education in rural areas by providing opportunities for one-on-one tutoring. The system responds to students' achievements and delivers a personalized educational experience while tracking progress. The paper aims to create a cloud-based AI tutor system that will improve literacy and numeracy among rural

children. The platform is user-friendly and offers various learning paths to meet different needs.

III. PROPOSED SYSTEM

The proposed system is a web-based tutoring system, which can be accessed using any internet-connected device across all the rural countries due to its accessibility to a large number of people. It allows its administrators to study and develop learning topics in their educational environment in an efficient manner, publishing different learning materials, creating exams and seeing the performance of students in real time. Pupils have a more active and relaxed learning culture which allows the pupils to easily enrol, receive personalized study texts, complete quizzes and studies according to their academic program and learn their performance real-time. The performance, in the form of scalability, accessibility and reliability, is guaranteed by implementing cloud computing and hence, the number of users of the platform can be increased without compromising on performance. This flexibility makes the system not only perfect in schools within the rural regions but also in NGOs and organizations that strive to establish an equal opportunity to schooling. The platform is to break geographical and infrastructural barriers to democratize education, thus allowing the rural population to have access to education and providing them with access to inclusive development and providing them with access to the learning materials, personal and interactive at any time, and anywhere.

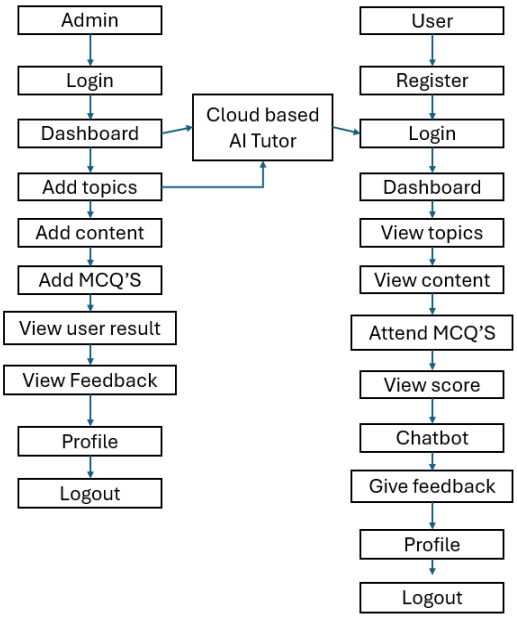

Fig. 1. Workflow of the system

The Fig.1 shows how a cloud-based AI tutoring system operates. It separates the paths for administrators and users. The system focus on managing content, interactive learning, and feedback to provide an efficient, personal educational experience.

IV. METHODOLOGY

The system starts with user registration, allowing both Admins and Users to create their profiles. Admins can log in to manage the platform, add topics, content, and multiple-choice questions (MCQs). After logging in, users can view their progress and track their performance. Once authenticated, user roles move to their respective dashboards for further integration. The system will initiate with user registration, giving Admins and Users the ability to create their profiles. Admins will also be able to log in to oversee the platform and add topics, content, and MCQs.Learners are able to log in and get access to the learning modules to monitor their progress and track performance. When the user is successfully logged in, the two roles are redirected to their respective dashboards to continue other interactions between them. Admin is the one who is permitted to add the topics and deliver content to all levels of education. They also have MCQs per topic so as to gauge the user knowledge. The admins could get a chance to analyze user outcome and reviews to improve on the content quality. This is what the users can have access to and according to their various levels and they can work on it through the dashboard interface. The account-holders are able to access their account and manage personal information in their profiles. After they are completed, the two can walk out of the system which helps in securing it. It will also be a platform where there is easy transfer between the tasks, yet transferable access control between the different roles. This renders the system effective, personal and accessible to everyone.

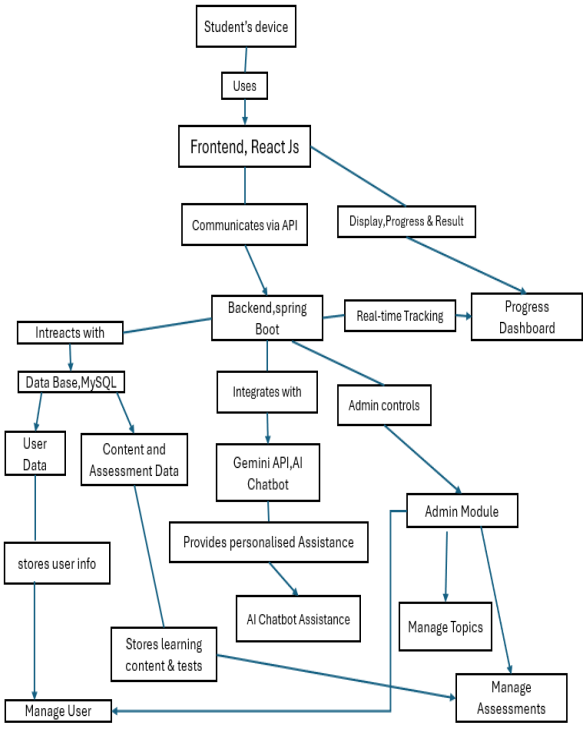

Fig. 2. System Architecture

The fig.2 shows the structure of a cloud-enabled intelligent tutoring system. It shows how the frontend, backend, database, and AI components interact. It explain smooth data flow, real-time performance tracking, and administrative control to provide personal learning experiences.

A. Cloud Computing

Cloud computing helps one save, access information, applications and services over the net rather than their personal devices or local computers. It provides an effortless and handy way of consuming computing resources such as storage and software without necessarily possessing some costly hardware or software. This technology works with the aim that the users are able to rent out services on demand and will pay only what they use. It is attractive to the user in that it takes the pressure of managing away and keeps the systems in the hands of the user and puts the systems under the hands of a provider. In our project, we are using the concept of cloud computing by ensuring that the system is easily accessible to everyone irrespective of their geographical locations. All is stored on the cloud and therefore the user can access learning materials and make progresses in any internet-enabled means. This makes it easy as students may be in the rural settings or congested urban centers. The cloud also facilitates in management and sharing of data in fast speed with all the student performance and course content being accessible in real-time and easy to manage.

B. AES Algorithm

The algorithm is a trendy method of protecting confidential data. It is meant to store the information by keeping entry forms of the information encrypted in a way that only the official system/people can understand the original information. Typically online banking data, communication tools, and government websites are the data encrypted with the assistance of the AES. It is also strong because it ensures that it cannot be accessed by an unauthorized user through a complex mathematical formula and it is very difficult to access the information without the key. The algorithm is the one which also operates on the subdivision of data into small blocks and playing with each block on a series of rounds of tasks. The encryption algorithm consists of key operations (such as substitution, i.e. the replacement of the bytes) and the mixing (i.e. the mixing of data in some complicated manners), and the permutation (i.e. the translations of bits). AES algorithm simply refers to processing all the blocks of data and carrying out a series of transforms by means of the secret key ensuring that data is incoherent. Only the correct secret key can reverse all the transforms and restore the original data.

1. Initial Key Expansion: The first step in AES encryption or decryption involves dividing the secret key into manyround keys through multiplication.All the encryption or decryption steps use all round keys.2. State Matrix: Data on which AES algorithms operate is block data and its block size is 128 bits.A block of data is an arrangement of four-by-four bytes known as state matrixS = S00 S01 S02 S03 S10 S11 S12 S13 S20 S21 S22 S23 S30 S31 S32 S33 (1) Where: • Each Sij represents each byte.Each round in AES carries out the transform that modifiesdata block that entails substitution, rotation,mixing, and the round-key.It makes sure that any ciphered text bears no resemblance with the original data and thus can hardlybe decoded without the key..

V. RESULTS

A. Home Page

Fig.3 says that the landing page makes the initial explanation of the platform and helps the user to decide on the next action to take and in shortest time

possible. It enables one to open learning, tests and personal progress at a single location.

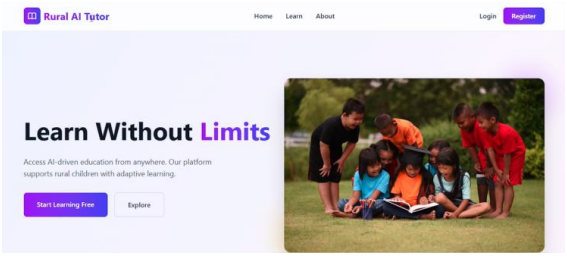

Fig. 3. Depiction of Landing Page

B. Admin dashboard

Fig.4 says that the rest of the events within the system like user activity, topics, and learning progress are also displayed in a simple and easy to understand overview in the managing dashboard. It will be able to help the admin manage the content easily, track the outcomes, and confirm with the comments within one site.

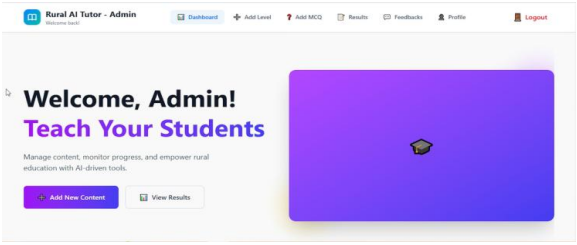

Fig. 4. Depiction of Admin dashboard

C. Add New Level

Fig.5 says the add new level page gives the administrator an opportunity to add a new learning level by giving the level a title and description as well as a difficulty level. It helps in organization of the lessons such that lessons are solved in a logical order by the learners.

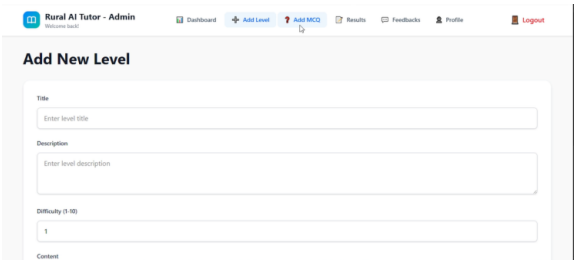

Fig. 5. Depiction of Add New Level

D. Add MCQ

Fig.6 says that the add MCQ page enables the administrator to insert multiple choice questions at all the levels. It assists in creating examinations in order that students can train and test their knowledge with minimal effort.

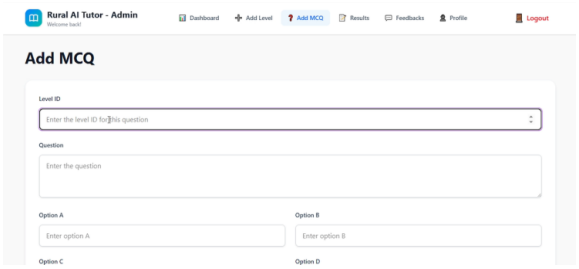

Fig. 6. Depiction of add MCQ

E. View Feedback

Fig.7 says that admin Dashboard is a clean and proper presentation of the user feedback, it allows the admins to get a quick preview of the most recent comments, ratings, and suggestions given by the students. The admins can also respond to the feedback or delete it and this makes the communication burden free and improves the system.

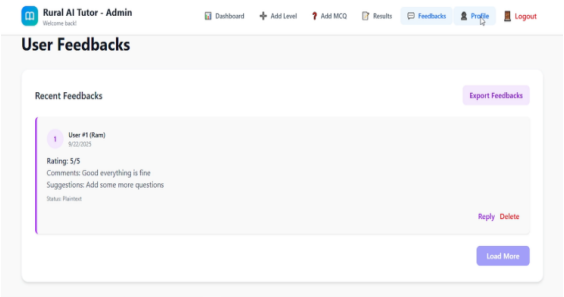

Fig. 7. Depiction of Student Feedback

F. Student Dashboard

Fig.8 says that student dashboard is a user-friendly interactive interface with a welcoming and student friendly interface that displays student names and can also access learning activities and quizzes readily. It tracks the developments of a student and suggests them to pass through the course of education with convenient buttons to navigate their materials and pass through quiz tests.

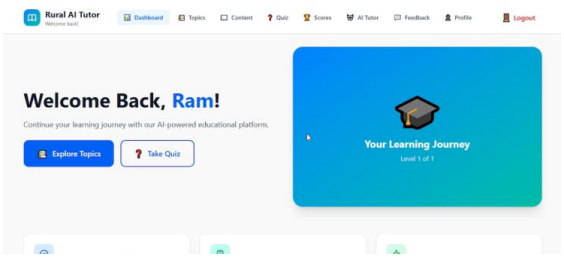

Fig. 8. Depiction of User Register

G. Learning Topics

Fig.9 says that this page will show the stage the student is at in learning process. It provides an easy way of beginning to learn and students can easily move around the topics and resume their learning.

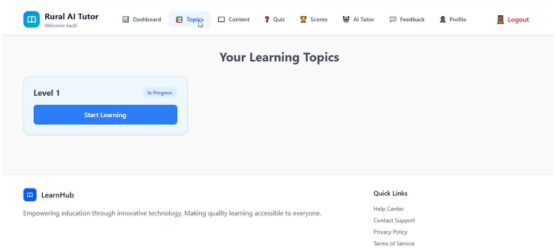

Fig. 9. Depiction of Learning Topics

H. Content Page

Fig.10 says that the Content Page illustrates the learning material concerning the level selected and allows studying subjects in the manner desired by the learner. It also offers a question area where the questions concerning the subject can be seen and students can have themselves tested by a questionnaire (at that level).

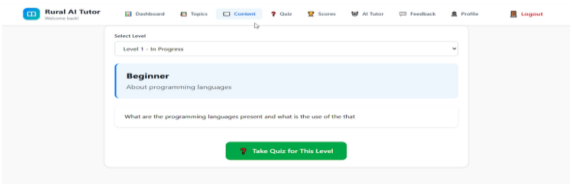

Fig. 10. Depiction of Content

I. Quiz

Fig.11 says that the Quiz Page enables a student to respond to a number of multiple-choice questions depending on what they have studied. After the quiz is completed, the students can conveniently give out their answers to know the level of their learning and as well as to keep track of their advancement.

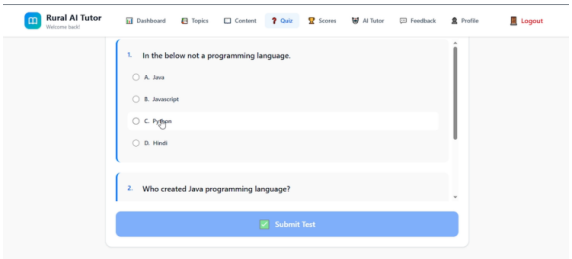

Fig. 11. Depiction of Quiz

J. Results

Fig.12 says that results Page displays the performance of the student upon passing a quiz with the score, percentage and points that have been acquired. In order to earn additional grades, the students will be given a time to view the progress and retake the quiz.

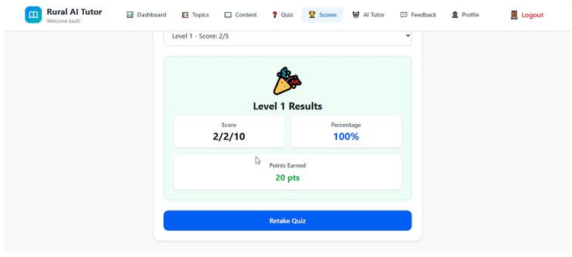

Fig. 12. Depiction of My Exams

K. AI Learning Assistant

Fig.13 sasy that the page enables students to converse with an artificial tutor in order to seek assistance regarding their studies. Learners are able to pose queries on their lessons, seek clarification on complex concepts as well as seek help on challenges in real time.

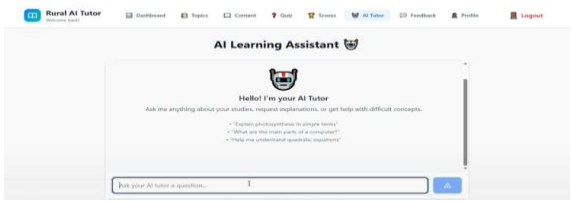

Fig. 13. Depiction of AI Assistant

L. Post Feedback

Fig.14 says that post Feedback Page allows the user to give comments and feedback or make suggestions about the site. It provides the students with a convenient mode of feedbacking and helping to improve the learning system.

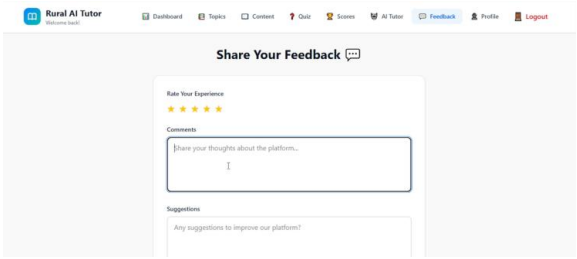

Fig. 14. Depiction of Feedback Post

VI. DISCUSSION

The article discusses the issue of AI and cloud computing implementation as the tool to create a solid and scalable tutor to provide rural schoolchildren. The education gap that would be encountered as a result of access to the quality

education is presumed to be minimized by the service by availing the personalized tutoring to the remote sites via the cloud technology. Through AI, the platform is capable of adapting to the learning pace of each student with the delivery of a customized lesson and instant feedback. Scalability that is observed with cloud computing also assures that many people can use the system without affecting its performance. It is concerned with privacy and security and, therefore, information about the students is not compromised. Introduction of the incentive processes which includes rewards, will encourage the students to participate and learn regularly. Finally, the paper provides a focus upon the feasibility of integrating AI and cloud technologies to reshape education to the underserved communities and make sure that every child is not disenfranchised to learn and develop.

VII. CONCLUSION

The portal is a breakthrough in bridging this education disparity in the rural and urban setting. Through cloud and AI, the system is easily accessible, scalable, and interactive to a learning experience and allows students to learn at their own pace, and is enhanced by an AI-driven chatbot which guides and provides real-time feedback to students. One of the aspects applied in the platform that makes students engage actively in the learning material and thus become learners and develop as academics is gamification. In addition, the administrative solutions assist in controlling the progress of students, determining the content, and creating assessments, thereby, allowing educators to regulate the best learning process. Scalability of the system implies that it can be modified to fit the needs of the rural schools to offer a future-viable solution to the demands of an evolving education environment. It all boils down to the fact that this platform has a potential to be a powerful tool of making education more easily accessible, of better quality and more inclusive among the underserved students.

VIII. FUTURE SCOPE

In order to ensure the AI Tutor has the greatest accessibility, engagement, and learning effects among rural school children, one can refine it in several ways. One of the possible solutions might be represented by the principle of multilingual help, according to which the students representing different regions should be capable of accessing the platform using their mother tongue, so the problem associated with language barriers may be successfully overcome. Furthermore, adapted learning algorithms could be employed to ensure a highly individualized and efficient learning experience for each user, since such a solution can focus primarily on student performance enhancement. Use of badges and leader boards (gamification) represents yet another area that could be explored in the future, since this method will be instrumental in motivating students and making them more involved. Performance analytics could be provided in real time to both teachers and students to give additional information concerning their progress, strengths, and weaknesses. Last but not least, voice-assisted learning or the development of a voice activated AI could serve as an advantageous innovation, particularly in case of learners having experienced a rather rural life and need help with mastering the material..

REFERENCES

[1] Amirbek, A., Torebek, Y., Abdualiyeva, M., Altynbekov, S., Tursynbayev, A., Abdraimov, R., &Omashova, G. (2026). Cloud-based learning and cognitive development among lower-secondary students (Grades 8–9): evidence from schools in Kazakhstan. Frontiers in Education, 11, 1749929. https://doi.org/10.3389/feduc.2026.1749929

[2] Bali, B. (2026). A novel context-aware intelligent learning framework for personalized education in developing countries. Next Research, 8, 101570. https://doi.org/10.1016/j.nexres.2026.101570

[3] Bennett, V. (2026). Transforming Teacher Education at HBCUs with Artificial Intelligence and Extended Reality: Integrating Cloud Computing and IoT for Ethical and Culturally Responsive Pedagogies. Signals and Communication Technology, Part F1411, 71–93. https://doi.org/10.1007/978-3-032-03554-7_4

[4] Dhaka, R. (2026). Comparative Study of AI Accessibility and Impact in Rural and Urban Schools. Jagannath University Journal of Research and Review, (01).

[5] Hamrick, J., Favela, A., Prueitt, N., Niland, H., Prince, A., & Marzban, F. (2026). Leveraging

Artificial Intelligence Tools for Educators in Rural Schools: Practical Resources and Considerations. Rural Special Education Quarterly. https://doi.org/10.1177/87568705251387039

[6] Just a moment... (n.d.). Retrieved April 7, 2026, from https://www.emerald.com/jet/article/doi/10.1108/JET-03-2025-0018/1349077?__cf_chl_tk=Lcpel9XrLOTivhwMMlUAzIWMgYg1QXMgZjZkqiEscss-1775564589-1.0.1.1-AGaUTNntYHdJLvgT_mBPgxT4_7Gg50kkhpAuMdo5iOw

[7] Kamaghe, J. (2026). Generative AI as a partner for teachers in building personalized learning paths for students with ease in Tanzania. Research in Learning Technology, 34, 1–14. https://doi.org/10.25304/rlt.v34.3594

[8] Karmakar, S., Vij, R., Chowdhury, S. K., & Sarkar, H. (2026). Innovative Approaches to Cloud-Based Standardization and Advanced Techniques for Next-Gen Online Evaluation. Transforming Education with Singularity Technologies, 175–189. https://doi.org/10.1201/9781003584339-15

[9] Khan, M. S. (2026). Smart classrooms, smarter futures: how AI is revolutionizing education for people with disabilities. Journal of Enabling Technologies, 1–7. https://doi.org/10.1108/JET-03-2025-0018

[10] Nanda, I. (2026). Implementing Internet of Things solutions in rural health care education. Connected Diagnoses, 71–95. https://doi.org/10.1016/B978-0-443-38299-4.00011-4

[11] OMAGWU, A., NUHU, I. L., BABALOLA, V. T., & OBEDA, G. (2026). Assessment of Teachers Preparedness and Challenges on Integration of Artificial-Intelligence Tools for Basic-Science Teaching among Universal-Basic-Education Schools in Kaduna State, Nigeria. Federal University Gusau Faculty of Education Journal, 3(1), 126–136. https://doi.org/10.64348/zije.2026352

[12] Pant, H. V., & Pande, J. (2026). Transforming Education in Uttarakhand through Cloud Computing Model: An Explorative Study. DMPedia Lecture Notes in Multidisciplinary Research, 1218–1230. https://digitalmanuscriptpedia.com/conferences/index.php/DMP-LNMR/article/view/121

[13] Rural STEMM Education Research: Bridging between Uniqueness and Universality - Google Books. (n.d.). Retrieved April 7, 2026, from https://books.google.co.in/books?hl=en&lr=&id=2oG2EQAAQBAJ&oi=fnd&pg=PA60&dq=Cloud-Based+AI+Tutor+for+Rural+School+Children&ots=u6oqDsfAhV&sig=8-06DqHIF2Z5HKacjvq9DW4_StI&redir_esc=y#v=onepage&q=Cloud-Based%20AI%20Tutor%20for%20Rural%20School%20Children&f=false

[14] Sanjay, S., Rajlaxmi, D., Valia, N., &Laljibhai, C. (2026). Empowering Tribal Students through AI-Driven Personality Development Programs. The Voice of Creative Research ,8(1), 223–233. https://doi.org/10.53032/tvcr/2026.v8n1.30

[15] Venugopal, L., & Juliet, A. H. (2026). GRFAT-MH: A privacy-preserving AI Tutor for mental health support in rural classrooms. Smart Technologies and Intelligent Computing, 228–233. https://doi.org/10.1201/9781003666929-34