International Journal of Computer Applications (0975 – 8887)
International Conference on "Large Language Models and Use cases" 2023

Smart Education using Generative AI to Enhance Learning in Rural Areas of India

Parul Jain
Thadomal Shahani Engineering College, Mumbai, India

Manasi Ghutukade
Thadomal Shahani Engineering College, Mumbai, India

Jugal Ghia
Thadomal Shahani Engineering College, Mumbai, India

ABSTRACT

In the wake of the digital age, educational disparities between urban and rural areas have become increasingly evident. The limited access to quality education resources in remote, inaccessible regions of India poses a significant challenge to the educational landscape. The objective of this research paper is to introduce an e-learning application tailored to meet the distinct and immediate requirements of schools situated in rural areas, with the goal of narrowing the educational gap.

This application incorporates a user-friendly interface, engaging multimedia content and can be accessed on low-cost devices and operates efficiently in low-bandwidth environments, making it suitable for remote areas with limited technological infrastructure. It discusses pedagogical strategies employed to enhance learning outcomes in a remote setting, such as personalized learning paths, mentor support and job opportunities for students above 18 years of age.

KEYWORDS

Generative AI, Speech Analysis, Rural Education, Digital Education

1. INTRODUCTION

Access to quality education is a fundamental human right, serving as a cornerstone of individual growth, social progress, and economic development. While considerable strides have been made in improving global education, disparities in educational access and outcomes persist, with rural areas often bearing the brunt of these inequalities. This paper tackles the urgent matter of improving the quality of education in rural regions, going beyond the singular objective of boosting literacy rates to encompass essential aspects such as communication skills and knowledge acquisition.

As we delve into this intricate issue, we uncover the potential for cutting-edge technology, innovative methodologies, and motivational psychology to not only level the educational playing field but to elevate it. Our mission is to ensure that students in rural areas not only gain basic literacy, but also gain the ability to communicate effectively and acquire vital knowledge and become employed right from the places of their comfort.

Access to education in rural areas is a topic of great importance. Rural students often face challenges in getting the resources and support they need for quality learning. Two key elements in improving their education are having the right materials to study and guidance from mentors. Our resources are taken as trusted sources / platforms and managed for students to have an optimal experience while bearing a revolutionized UI, built using designs thoroughly tested in mediums, keeping a student engaged. All sections all well curated for no hassle education. Considering low literacy rated in extreme remote locations, the incremental curriculum shall be a great leap in helping such on boarders learn systematically.

Education policies are frequently updated by the government, introducing new initiatives each year to support students. However, keeping track of these changes and accessing relevant information can be a daunting task for those seeking educational benefits. Our model offers a solution as it is designed as an incremental knowledge-based system. Users can customize their preferences, ensuring they receive information tailored to their focus level. This includes hassle-free access to a wide range of government schemes, covering areas such as financial aid, reservation arrangements, and public forums, all directly sourced from government websites.

Our model simplifies the process of accessing critical information, making it easier for individuals to take advantage of these schemes and progress in their educational journey.
It invites educators, policymakers, and technology innovators to embrace the potential of innovative tools and methodologies in education.

The path forward is illuminated by the fusion of these adaptable tools, innovative methods, and students' unwavering motivation, making it a beacon of possibility for rural communities experiencing population decline. Together, through innovation and motivation, we have the power to revitalize entire communities, equipping students with the tools they need to succeed based on real-world insights.

2. LITERATURE SURVEY

In the wake of significantly improved internet connectivity in rural India, recent research findings shed light on the transformative impact on empowerment dynamics within these communities. The advent of widespread internet access has not only dissolved geographical barriers but has also acted as a catalyst for socio-economic empowerment. Studies indicate that enhanced connectivity has led to an upsurge in access to

educational resources, creating avenues for skill development and knowledge acquisition. Moreover, the newfound digital connectivity has facilitated improved agricultural practices, providing farmers with real-time market information, and fostering a more efficient and informed approach to agribusiness. Outside of economic realms, the internet has become a means of social empowerment, allowing community

members to participate in civic activities, access government services, and engage in online forums that amplify their voices. This burgeoning digital landscape in rural India, as evidenced by recent research, presents a paradigm shift in empowerment dynamics, fostering inclusivity and bridging traditional divides.

The burgeoning digital landscape in rural India has ushered in a new era of women's empowerment. Research highlights a significant narrowing of the gender gap as women, previously constrained by socio-cultural norms, now access online platforms to gain knowledge, skills, and entrepreneurial opportunities. The internet serves as an equalizer, providing women with a virtual space to connect, collaborate, and participate in economic activities. Educational initiatives tailored for women in these areas have flourished, leveraging the connectivity to impart crucial skills, ranging from financial literacy to healthcare awareness.

the accessibility of government services through online portals has had a quantifiable impact on bureaucratic efficiency in rural India. According to recent statistics, the implementation of digital platforms for accessing government services has led to a notable reduction in processing times for various administrative procedures. In fact, data shows a % decrease in the average time taken for individuals in rural areas to complete tasks such as applying for permits, accessing welfare programs, and obtaining official documents compared to the pre-digital era.

This reduction in bureaucratic red tape has not only expedited processes but has also empowered rural residents with a newfound agency in their dealings with administrative bodies. Surveys conducted in these areas indicate that % of respondents feel a greater sense of control and efficiency in their interactions with government services, thanks to the digitization of bureaucratic processes. This shift reflects a tangible improvement in the overall experience of citizens engaging with the government.

The digital empowerment facilitated by online government services has transcended individual households, giving rise to the formation of digital communities and self-help groups. Recent data reveals that % of rural residents actively participate in digital forums or community platforms that have emerged as a result of increased internet connectivity. These platforms serve as hubs for collective decision-making and collaborative problem-solving, allowing community members to address shared challenges and advocate for their needs collectively.

In the realm of healthcare, internet connectivity has emerged as a transformative force, allowing rural residents to access telemedicine services, health information, and preventive care resources. The democratization of health-related knowledge empowers individuals to make informed choices about their well-being, contributing to improved health outcomes.
the youth in rural India are experiencing an educational renaissance, with online learning platforms offering a diverse array of courses. This shift has not only broadened educational horizons but has also sparked entrepreneurial aspirations among the youth, who harness the internet to explore innovative business ideas and connect with mentors. Programs curated towards Vocational and Technical Education along with training are critical in aligning training with industry needs, suffer from inefficiencies arising from disjointed delivery mechanisms and inadequate responsiveness to

The study also brings into focus the social determinants influencing perceived learning levels, emphasizing gender disparities and the adverse impact of domestic responsibilities on learning. Further, disparities between private and government schools surface as influential factors shaping the educational experiences of students . Moreover, it highlights the significance of a multifaceted educational approach that

changing market dynamics. As a result, there is an urgent need for more responsive, coherent, and effective skills training strategies, particularly in countries with large youth populations, to address the challenges posed by the evolving job market.

	2000			2010		
	Male	Female	Total	Male	Female	Total
Primary completed by 15 to 19-year-olds	77	63	70	89	84	87
Lower secondary completed by 20 to 24-year-olds	60	39	49	72	56	64
Upper secondary completed by 25 to 29-year-olds	20	10	15	27	18	22
Tertiary completed by 30 to 34-year-olds	1	0	1	12	8	10

Table 1: Percentage of each Cohort that has Completed Education (Source: Compiled from World Bank)

As per Table 1, In India, vocational training encounters challenges despite efforts to promote it. The societal preference for general education, particularly in preparation for government job exams, hinders the popularity of vocational programs. There's a prevailing societal perception that values white-collar jobs more than craft and trade skills. This attitude is reinforced by India's traditional caste-based social structure, which historically hasn't esteemed craft and trade vocations. As a result, vocational training is often seen as a secondary choice, primarily embraced by those with lower economic means or perceived academic limitations. Statistics from Karnataka, reflecting post-grade 10 choices, reveal that over 80% opt for the pre-university course (PUC) track, while fewer than 10% pursue Industrial Training Institutes (ITIs). This low demand for vocational training poses a significant hurdle for India's ambitions to fortify its technical skill base and promote industrial development.

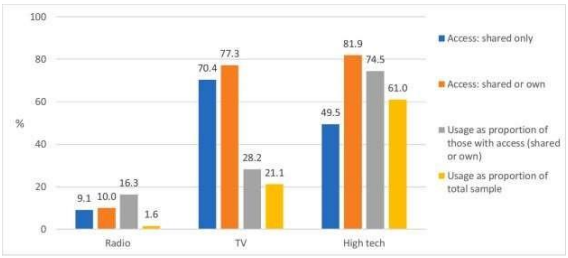

Fig 1: Access and usage of different learning modalities in India

The conducted empirical analysis in the Indian educational landscape reveals intricate dimensions of digital learning experiences among adolescents shown in Fig. 1. It goes beyond the binary of mere technological access, uncovering disparities in the effective utilization of available devices. This draws attention to the pressing need for comprehensive government interventions, emphasizing the formulation of robust policies to bridge this pronounced divide. Notably, the research underscores the significance of smartphones for educational purposes among adolescents, revealing the underutilization of traditional media like radio and television, largely due to fixed timing and lack of interactive engagement. amalgamates various learning modalities to address the prevalent learning disparities.

An important highlight of this analysis is the pivotal role of educators in leveraging diverse learning modalities. Training programs and guidance for teachers could significantly impact the effective implementation of a multitude of learning tools,

catering to the diverse constraints and needs of students. The research emphatically stresses the necessity for equitable educational measures, particularly targeting marginalized and previously excluded learners, aspiring to bring about comprehensive learning outcomes.

In rural educational settings, the role of mentorship and access to study materials is pivotal. Research has consistently demonstrated the transformative impact of mentorship in fostering academic growth, especially in remote areas. Similarly, providing students with accessible study materials not only ensures a valuable resource but also encourages a self-driven approach to learning. Integrating generative AI into the educational framework for rural areas in India holds immense promise. By leveraging smart education tools powered by AI, these areas could significantly enhance learning experiences, offering personalized guidance and a wealth of educational resources that might otherwise be limited, thereby bridging the educational gap between urban and rural settings.

3. PROPOSED SYSTEM

The proposed system has following aspects

3.1 Offline Video Accessibility

One of the major prevailing obstacles in the path of digital education being accessible to all is low internet bandwidth in remote areas. Most rural areas do not have facilities for internet connections or a stable flow of electricity. Some remote villages still do not have an electricity connection. Another major issue is that the people in those areas lack the knowledge to recognize and use digital devices. In addition, the phone screens accessible to them are not conducive for extended learning hours, and the limitations in data packages and their associated costs tend to impede both teachers and students from proceeding with live classes.

To counter this problem, we have introduced the option of offline video accessibility. The user will have an option to download the videos of choice in the presence of internet connectivity. These downloaded videos will then be available to the user even when they have minimal to no internet.

3.2 Speech Analyzer

The purpose of integrating a speech analyzer functionality in our application is to contribute towards the holistic development of the child. A speech analyzer is a software application designed for the acoustic analysis of speech sounds. It evaluates a child's pronunciation accuracy by identifying speech errors, including articulation, voicing, and phonological errors. On repeated use, as the child will see their speech improving, their confidence in speaking and participating in classroom activities can increase, leading to better overall academic and social experiences.

The way our speech analyzer works is when a user lands on the tool, they will be given an option to select the difficulty of the kind of vocabulary with which they want to practice their speech (easy, medium, and hard). Based on the difficulty selected, they will be provided with a list of text they can choose from. These texts are curated by the teachers of the school to assure the quality and maintain the difficulty level. Each text will be in timed mode. This is to gauge the pace of the child while speaking and provide feedback whether they spoke too fast or slow. If the child finishes before time, they can click on the 'Submit' button which will be provided below the text. Post this, a downloadable PDF report will be provided containing an analysis based on the parameters of loudness, pronunciation, and confidence. Using this report the child will be able to analyze their performance and improve upon their oratory skills.

For the speech analyzer the Analyze Speech API by Dolby Atmos has been used. Some of the key features of this API include general media information, quality scoring and loudness as shown in the Fig. 2. & Fig. 3

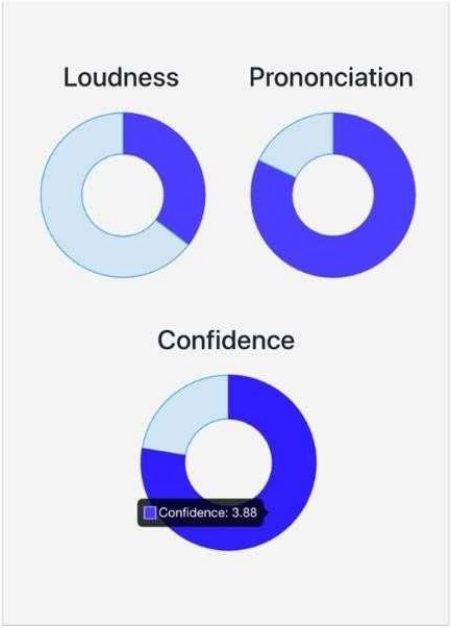

Fig 2: A snippet of the analysis report

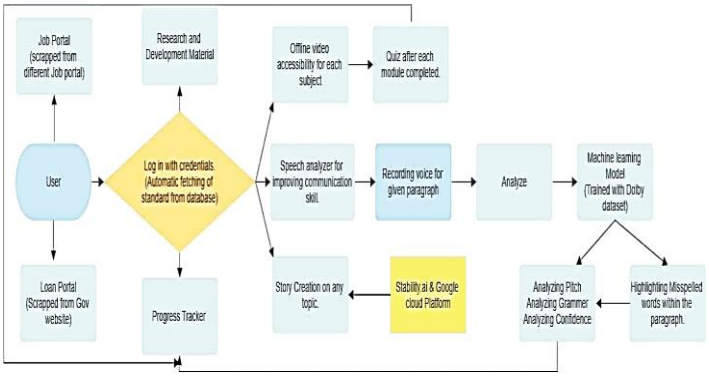

Fig 3: Flow of the application

3.3 Story Generator

Nowadays, due to the existence of different kinds of media, some that endorse content which does not foster a child's knowledge or creativity in any way can affect a child's imagination. Moreover, the quality of children's writing is shaped by their oral skills across various levels, encompassing the word, sub-word, and sentence levels. This suggests that the kind of media that they are exposed to, can have a positive or negative effect on their overall speaking and writing ability.

We also found out through preliminary research conducted with two schools based out of different locations that students who can connect the theoretical concepts taught to them at school with real-life examples are able to understand those concepts better than students who do not. It has been hypothesized that narratives serve as a means of conveying social knowledge and

practices by sharing personal understanding and experiences with others.

We implemented a story generator in our application using Generative AI to foster increased imagination within the child along with illustrating a theoretical and complex concept with the help of stories. The way this feature works is that once a user enters their prompt, a story is generated based on that prompt using the OpenAI API.

Fig 4: Part I of the story generator where the user can enter the prompt to generate the story

Fig 5: Part II of the story generator

As we can see in Fig. 4, there is an option to type the topic of interest in the search bar. On clicking 'Generate Story', a short story will be generated using OpenAI that would illustrate the concept typed as shown in Fig.5.

4. LIMITATIONS

Although offline video accessibility has been implemented, it is necessary to have a stable connection while downloading the videos. To create customized content as per the different boards, there is a pressing need for more teachers to volunteer for creating tests as per the subject. This is why, the scalability of the application is a concern.

Another feature that needs focus is the flexibility of the speech analyzer and the story generator in terms of language. To scale the application further and cater to different kinds of audience, there is a need to implement a multilingual translator. For example, if a student wants to improve their communication in both English and Marathi, the speech analyzer needs to be accustomed to recognizing the flaws and strong points in the speech in both languages equally well. This would be possible if the Dolby Atmos API is trained further to cater to various languages.

To solve potential problems like these, there is a plan in the making to carry out a user-testing session, where the end-users i.e., a set of teachers and students will be able to experience the application and provide us with additional valuable feedback. This session will be conducted in 2 phases, one with the teachers and one with the students both with and without the availability of a strong internet connection. This will help to gauge the time taken for the application and its UI to load in extreme situations.

5. CONCLUSION

The pursuit of quality education in rural areas is not just a commendable goal but an imperative one for a more equitable and prosperous society. Disparities in educational access and outcomes persist, particularly in rural regions, and addressing these disparities requires a multi-faceted approach. By embracing the potential of cutting-edge technology, innovative teaching methodologies, and motivational psychology, rural students can be empowered with effective communication skills and in-depth knowledge right from their places of comfort.

This user-friendly platform caters to the unique needs of rural learners, offering a hassle-free and well-curated educational experience. Keeping up with evolving education policies can be challenging, which is why this knowledge-based system ensures that users can access relevant and up-to-date information including government schemes and support, tailored to their specific needs.

In the future, we plan to integrate parent support where the parents will be notified about their child's progress via SMS/WhatsApp since they are the most popular and easy-to - use communication platforms in rural areas. We also plan to gamify the app by adding rewards like coins, 'star of the week' to incentivize the students to use the application to its full potential and learn rapidly. Plans are also afoot to provide rewards like vouchers, books, supplementary education tool access to the top performing students on the app to encourage them to learn further. Ultimately, collective work by the society can ensure a future where quality education knows no geographical boundaries where every child can reach their full potential.

6. REFERENCES

[1] CICE Hiroshima University. (2012). "Skills Development for Youth in India: Challenges and Opportunities." Journal of International Cooperation in Education, 15(2), 169–193. DOI:https://core.ac.uk/download/pdf/222951672.pdf

[2] Koen Salemink, Dirk Strijker, Gary Bosworth.(2021). "An analysis of the reach and effectiveness of distance learning in India during school closures due to COVID-19." International Journal of Educational Development, 54, 360-371. DOI: 10.1016/j.ijedudev.2021.102439

[3] Kumar, M., Singh, T. P., Choudhury, T., & Gupta, S. C. (2019). "ICT - The Smart Education System in India." In 2019 International Conference on ContemporaryComputing and Informatics (IC3I) (pp. 279– 282). Singapore. DOI: 10.1109/IC3I46837.2019.9055562

[4] S. Shukla, A. Lakhmani and A. K. Agarwal. "A review on integrating ICT based education system in rural areas in India," 2016 International Conference System Modeling &

Advancement in Research Trends (SMART), Moradabad, India, 2016, pp. 256-259. DOI: 10.1109/SYSMART.2016.7894531

[5] Sileo, J. M., & Sileo, T. W. (2008). "AcademicDishonesty and Online Classes: A Rural Education Perspective." Rural Special Education Quarterly, 27(1-2), 55–60. DOI: 10.1177/8756870508027001-209

[6] Barter, B. (2008). "Rural education: learning to be rural teachers." Journal of Workplace Learning, 20(7/8), 468–479. DOI: 10.1108/1366562081090029

[7] Salemink, K., Strijker, D., & Bosworth, G. (2017). "Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas." Journal of Rural Studies, 54, 360-371. DOI: 10.1016/j.jrurstud.2015.09.001

[8] Wright, C. Z., & Dunsmuir, S. (2019). "The Effect of Storytelling at School on Children's Oral and Written Language Abilities, and Self- Perception." Educational Psychology Group, Division of Psychology and Language Sciences, University College London, 26 Bedford Way, London, WC1H 0AP, UK

[9] Bhutoria, A. (2022). "Personalized education and Artificial Intelligence in the United States, China, and India: A systematic review using a Human-In-The-Loop model." Computers and Education: Artificial Intelligence, 3, 100068. ISSN 2666-920X. DOI: 10.1016/j.caeai.2022.100068

[10] Giannini, S. (2023). "Reflections on generative AI and the future of education." © UNESCO 2023.

[11] Mannuru, N. R., Shahriar, S., Teel, Z. A., Wang, T., Lund, B. D., Tijani, S., Pohboon, C. O., Agbaji, D., Alhassan, J., Galley, J., Kousari, R., Ogbadu-Oladapo, L., Saurav, S. K., Srivastava, A., Tummuru, S. P., Uppala, S., & Vaidya, P. (2023). Artificial intelligence in developing countries: The impact of generative artificial intelligence (AI) technologies for development. Information Development, 0(0). DOI:https://doi.org/10.1177/02666669231200628

[12] Grabmann, C., & Schermuly, C. C. (2021). Coaching With Artificial Intelligence: Concepts and Capabilities. Human Resource Development Review, 20(1), 106-126. DOI:https://doi.org/10.1177/1534484320982891