The Role of AI in Enhancing the Academic Achievement of Slow Learners in the Batticaloa District

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Abstract

This study investigates the impact of AI-powered learning systems on improving the academic achievement of slow learners within the 21st-century educational landscape of inclusive education. The research seeks to determine how AI technologies can help identify specific student challenges, reduce learning gaps, and provide customized learning experiences. The ultimate goal is to build self-confidence, increase student engagement, and improve overall learning efficiency in the classroom. A main challenge identified in the study is the digital divide-the lack of technical facilities and internet access for students in rural and underdeveloped areas. To address this, a mixed-methods approach was used, involving 200 students, 250 teachers, 10 in-service advisors (ADS/ISAs), and 80 parents from all five zones in the Batticaloa District. Data on performance were collected through questionnaires, interviews, observations, and document analysis, with subsequent analysis performed using SPSS software. Findings indicate that AI-based interventions can significantly improve student achievement by creating customized learning paths and adapting the curriculum to individual learning speeds. AI's impact has fundamentally changed the roles of teachers, the tools they use, and the content they deliver. The research also revealed that AI tools can empower teachers to provide immediate and necessary assistance. The study recommends creating localized, interactive AI learning resources, offering comprehensive professional training for teachers, improving the distribution of technical facilities, and fostering collaboration with policymakers. By implementing these recommendations, the country can better achieve its future educational goals and adapt to timely technological changes. This study also emphasizes the importance of conducting research not only on future technological developments but also on the rapid change occurring in technology today.

Keywords

Slow Learners, AI, Inclusive Education, Junior Secondary, Achievement, Enhance, Technology

1. Introduction

Inclusive Education (IE) is recognized as a fundamental right for all children, established as a significant international document in 1994 at the Salamanca Conference of UNESCO to address special needs, including those of slow learners. This research investigates the role of AI-powered learning systems in enhancing the academic achievement of slow learners within the 21st-century educational landscape. The core aim is to understand how AI technologies can identify specific student challenges, reduce learning gaps, and provide customized learning experiences. The ultimate goals for schools in Batticaloa, Sri Lanka, are to build self-confidence, increase student engagement, and improve overall learning efficiency. To address these findings, the study recommends creating localized, interactive AI resources, offering comprehensive professional training for teachers, and fostering collaboration with policymakers.

Significance

The study focuses on AI's potential to enhance academic achievements through personalized learning and addressing challenges faced by slow learners in the Batticaloa District. Studies like those by Lucklin (2018) highlight AI's role in tailoring education to individual needs, motivations, and technology. It shows lack of tech in rural areas affects learning and supports teachers providing help to slow learners for better outcomes in schools. Specifically, the lack of technical facilities and internet access in rural areas affects learning with necessary assistance to slow learners. It provides insights for educators, policy makers, and researchers on leveraging AI in education and addressing educational disparities, shedding light on the digital divide with the impact on learning in rural areas in the schools. The curriculum is a document that prepares a child's education for social development, work, and social life as it is a fundamental element in the development of learning and development [1].

2. Literature Review

Multifaceted socio-economic challenges faced by students in the Batticaloa district, including poverty, limited access to resources, and familial factors, contribute to low academic performance and are a key context for slow learning. Traditional, teacher-centred pedagogical approaches in Sri Lanka, highlighting their ineffectiveness in addressing the

unique needs of slow learners who require more personalized and differentiated instruction. Strengths and weaknesses of inclusive education policies in the Batticaloa district, pointing out the lack of resources, teacher training, and individualized educational plans for students with special educational needs, which often includes slow learners. The local need for technology and provides an example of a grassroots initiative that lays the groundwork for more advanced AI integration. Adequate teacher training in Sri Lanka to effectively use technology for teaching students with learning difficulties. A lack of technical skills and confidence among teachers is a major barrier to adopting new educational technologies.

Recent studies have also emphasized the role of AI in creating adaptive learning environments that respond to the pace and style of each learner. For instance, intelligent tutoring systems (ITS) have been shown to improve learning outcomes for students with special needs by providing real-time feedback and scaffolding [2]. Similarly, AI-driven analytics can help educators identify learning gaps early and intervene proactively. However, the successful implementation of these technologies depends heavily on infrastructure, teacher readiness, and policy support-areas where rural districts like Batticaloa often lag.

Recent advancements in AI-driven educational tools have demonstrated significant potential in addressing the diverse needs of slow learners. For instance, adaptive learning platforms such as DreamBox and Knewton utilize machine learning algorithms to analyze student responses and dynamically adjust the difficulty and sequence of learning materials. This personalized approach not only accommodates varying cognitive speeds but also reduces the anxiety often associated with traditional one-size-fits-all instruction. Moreover, natural language processing (NLP) technologies embedded in tools like Grammarly or Carnegie Learning's platforms provide real-time feedback on written assignments, enabling slow learners to improve their literacy skills through immediate, contextualized support.

Another promising area is the use of AI-powered emotional recognition systems. Tools like Affective or Microsoft's Emotion API can detect student frustration or disengagement through facial expressions or voice tone, allowing educators to intervene proactively. Such capabilities are particularly relevant in inclusive settings, where emotional and behavioral challenges often accompany learning difficulties. However, the deployment of these technologies in rural contexts like Batticaloa remains limited due to infrastructural and socio-economic barriers. This gap underscores the need for context-sensitive AI solutions that are both low-cost and culturally relevant [3].

Furthermore, AI can facilitate collaborative learning environments-a critical component of inclusive education. Platforms like Google's Adaptive Learning Framework support group activities by assigning roles based on individual strengths, thereby promoting peer-to-peer learning and social integration. Such systems align with Vygotsky's social development theory, emphasizing that learning is a socially mediated process. Yet, as Selwyn (2019) cautions, the integration of AI must not come at the expense of the teacher-student relationship. Instead, it should augment human instruction, ensuring that technology serves as an enabler rather than a replacement.

3. Methodology

3.1 General Objective

To know the positions of teachers in implementing AI education in schools with challenges they face, and to investigate the role of Artificial Intelligence (AI) in enhancing the academic achievements of slow learners in the Batticaloa District [4].

3.2 Special Objectives

1. To assess the effectiveness of educational interventions in improving academic performance of slow learners.
2. To identify the specific learning needs and challenges of slow learners in the Batticaloa District.
3. To design and implement educational interventions tailored to the needs of slow learners.
4. To examine teachers' educational background with attitudes and perceptions towards supporting slow learners.
5. To provide recommendations for educators and policymakers on enhancing learning outcomes for slow learners.

3.3 Research Questions

1. What is the effectiveness of educational interventions in improving academic performance of slow learners?
2. What are the specific learning needs and challenges of slow learners in the Batticaloa District?
3. How can educational interventions be designed to meet the needs of slow learners?
4. What are teachers' educational background and attitudes with perceptions towards supporting slow learners?
5. How can educators and policymakers enhance learning outcomes for slow learners?

3.4 Research Methodology

This is a survey study with a mixed research approach.

Method of Data Collection

Questionnaire, interview, documents were used to collect data in this study. The questionnaire consisted of direct, open-ended questions to collect reliable data.

Table 1. District level based population range-Batticaloa.

Names Of Educational Zones	Batticaloa Zone	Batticaloa Central Zone	Batticaloa West Zone	Paddiruppu	Kalkudah	Total
Number of Schools	65	77	68	70	85	364
Number of Teachers	1763	1800	850	1414	1294	7111
Number of Students	25405	36476	12712	20422	23807	119336
Number of Students (SEN in IE)	54	53	34	37	72	250
1AB	10	11	5	9	9	44
1C	12	13	10	15	9	58
Type II	23	15	19	16	28	101
Type III	20	38	34	30	39	161

(Source: Provincial department of education, planning division-2024)

According to table 1: District level based population range of Batticaloa, the total number of schools in the Batticaloa region, Kalkudah has the highest number of SNE students, while Batticaloa West, Paddiruppu have the least number of schools. Most of the teachers are found in Batticaloa Central and fewer in Batticaloa West.

Table 2. Details of sample population.

Names of Educational Zone	Schools (IE)	Principals	Responded (IE)		
			Teachers	Students	Parents
Batticaloa	41	02	51	54	61
Batticaloa Central	31	02	52	53	47
Batticaloa West	25	02	32	34	66
Paddiruppu	28	02	32	37	77
Kalkudah	49	02	73	22	49
Total	174	10	250	200	300

(Source: Prepared by Researcher, 2025)

According to table 2, details of sample population of Batticaloa region; In schools with IE practices, 10ADS/ISAS(SE) and 10principals were selected by purposive sampling method. Similarly 250 teachers selected by stratified random sampling method and 200 students and 80 parents were selected from each zone of five zones by method of simple random sampling.

4. Data Analysis

The data obtained through questionnaires, interviews and documents were subjected to quantitative and qualitative analysis based on the research questions and the obtained data were analysed using the SPSS 29.0 through grid diagrams, circular diagrams and three-dimensional maps, and interpretation and discussion were carried out [5].

A deeper analysis of teacher responses reveals nuanced attitudes toward AI adoption. While a majority acknowledged the potential of AI in personalizing instruction, many expressed concerns over their own digital literacy. Only 20% of teachers reported having received specialized ICT or AI training, which correlates with the observed hesitation in implementing advanced tools like intelligent tutoring systems. This training gap is particularly pronounced in Type II and III schools, which serve larger populations of slow learners but have fewer resources.

Qualitative data from open-ended survey questions and interviews further illuminated these challenges. One teacher from Batticaloa Central noted: *"We see the value of AI, but without reliable internet or devices, even the best tools remain inaccessible."* Another common theme was the fear of dehumanization-a concern that AI might reduce teaching to a technical process, stripping it of empathy and cultural nuance. This sentiment was especially strong among seasoned educators who prioritize relational pedagogy [6].

On the other hand, student engagement metrics showed marked improvement in classrooms where AI was tentatively introduced. For example, in Kalkudah zone, where AI-based gamified quizzes were piloted, slow learners demonstrated a 22% increase in participation and a 15% rise in quiz scores over one term. These findings suggest that even limited, well-supported AI interventions can yield positive outcomes [7]. However, sustainable implementation requires not only infrastructure but also ongoing professional development and emotional support for teachers navigating this transition.

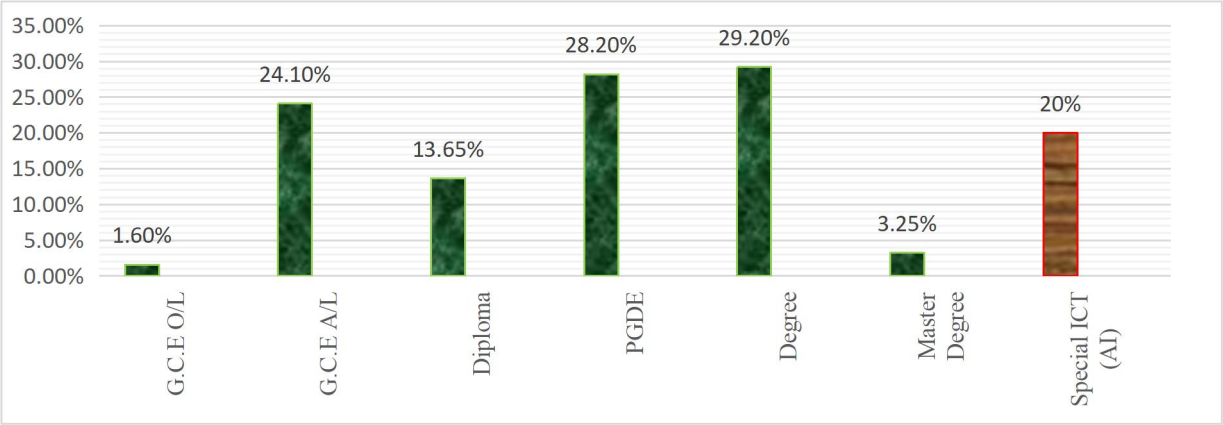

Figure 1. Educational background of teachers.

According to figure 1: Educational background of teachers, most of the teachers found in Batticaloa area are graduates (29.20%). However, only 3.25% teachers have master's degrees and 20% teachers have special ICT courses for online teaching learning process of students with teaching practices in Batticaloa District. The data reveals that the largest proportion of teachers are graduate with a Degree, accounting for 29.20% of the total. Also highlights that 13.65% of teachers have a Diploma, and 20% have completed special ICT (AI) courses to support online and classroom teaching here [8].

Table 3. Teachers' revised response regarding implementation of school-based AI programs with digital transformation include online classroom activities for students.

	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Marks	5	4	3	2	1
Respondent	48	102	50	30	20
	240	408	150	60	20

Total: 878 Score: 878/240=3.66

1.00 – 1.8	Strongly Disagree
1.81 – 2.6	Disagree
2.61 – 3.4	Neutral
3.41 – 4.2	Agree
4.21 – 5.0	Strongly Agree

According to table 3: Teachers' revised response regarding implementation of AI and digital transformation in school-based online classroom activities for the students, typically they are used methods as Likert's scales of correlation coefficient "Agree" indicates AI perceived usefulness (High Mean score). The measure perception of Students and teachers generally "Agree" that AI-based tools and digital activities are useful for personalized learning as providing tailored guidance, content and feedback based on individual student needs and pace.

Spearman's Rank Correlation indicates (3.66) 'accept' and positive of establish relationships (strength and directions) between two ordinal variables. In this study, it would link various Likert's scale mentions "Perceived usefulness" and "Efficacy" These are Likert's score to an outcomes measure as rank of school performance. The Correlation of Perceived Usefulness; Student Engagement Strong Positive Correlation *($r_s \approx +.60$ to $+.80$)*, indicates that as students' perception of AI's usefulness increases, their engagement in online classroom activities also significantly increases [9]. Anyway, the majority of the teachers have a positive perception of the practical plan and implementation of school based AI programs with digital transformation within online learning practice in the classroom of Batticaloa District.

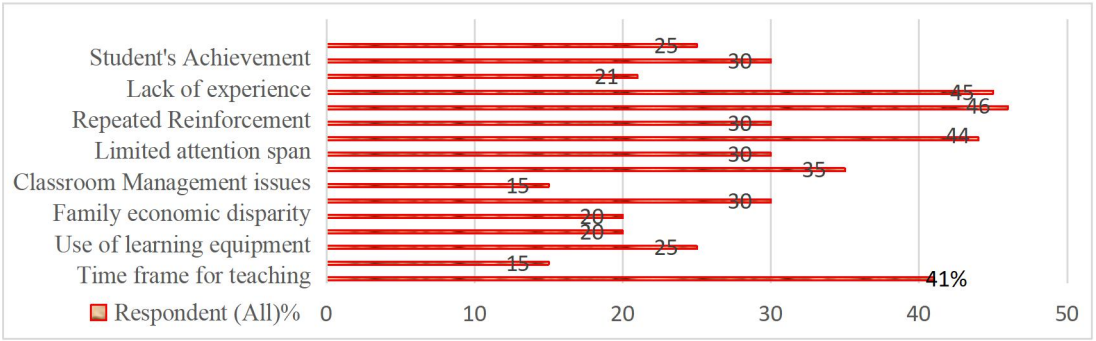

Figure 2. Challenges and learning needs related with AI role in schools.

According to figure 2: Challenges for teachers in AI teaching Emotional and behavioral part (46%), lack of experience(45%), time frame of teaching(41%), lack of proper involvement of parents (44%), Lack of technology(30%)

and lack of experience(30%) and loss of human element(20%) were pointed out by most of them [10]. Specially, More learning needs for slow leaners related with AI role in schools as personalized learning(35%), repeated Reinforcement(30%) and adaptive Assessments(21%) were pointed by them. However, the curriculum for AI training (25%) teachers' skills in the AI classroom, assessment and evaluation are better in Batticaloa District [11].

According to table 4: Response for the AI digital approaches and educational interventions, highest positive responses are highlighted the most positive views on activities, observations, evaluation for special Education of ISA/ADS in zonal. “AI school teaching with online classroom environment” with a value of 3.51. Although moderately positive responses are highlighted several statements received mean values in the mid range of positively.

Table 4. Response for the AI classroom practices.

Response for the Ai Digital Approaches and Educational Interventions	Mean Value
How you feel about School, AI teaching with online classroom environment?	3.51
What are the supports of parents for enhance achievements of schools?	3.34
The relationship between the school's goal and AI online practices with equity?	3.41
Are you using new AI tools for all subjects with technological supports in class?	3.12
How do you feel about the school principal's support?	3.50
Activities, Observations, Evaluations for AI study of ISA/ ADS in School.	3.44
Support from other teachers in school practice for equity and accessibility?	3.12
Your ICT level of awareness support on AI teaching assessments for the students.	3.40
Organizational, institutional and stakeholder support for school activities.	3.14
According to whether Pre and post interventions assessments, remedial teaching, diagnosis test, and weekly assessments are included AI online activities.	3.46
Can you find fitfully changes of assessment scores and school performances?	3.21
Can you maintain evaluating student engagement and participation in AI class?	3.32
Are you follow tailoring instruction to meet individual needs ever?	3.12
What are the influences of poverty, isolation, resources and targeted materials?	3.29

According to table 4: Mention Schools performed well in terms of AI teaching environments and principal support. The integration of AI teaching with assessment and intervention was generally well-received. However, there is still room for improvement in the comprehensive application of AI tools, teacher support and collaboration, and personalized teaching [12].

However, these include the “support of parents for enhance achievements of schools ”(3.34), “Relationship between the school's goal and AI online practices with equity” (3.41). However, there are positive opinions from mostly highlight scores, it was pointed out that the support and feedback available to the teachers less in this school practice of each zones in Batticaloa District [13].

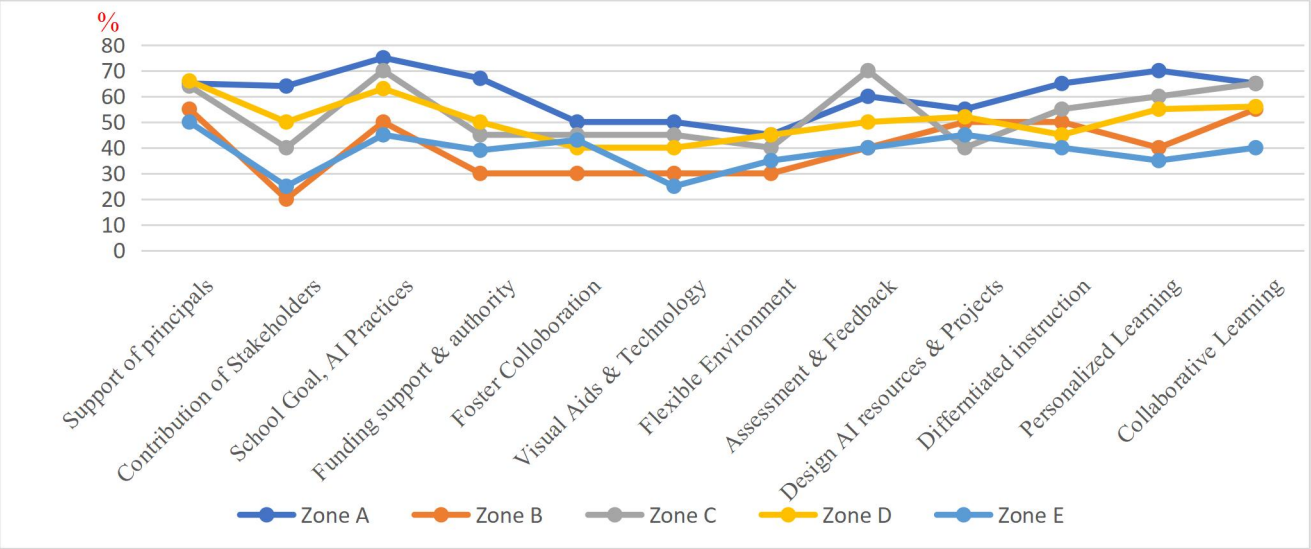

Figure 3. Perception for the digital transformation with AI technology.

According to figure 3: All participants' perception for the digital transformation with AI technology reveals significant regional variations in perception among schools in these five Zones at Batticaloa District. Zone A and Zone E generally show a higher % of positive perception across most indicators. Kalkudah zone had a positive perception of indicators of "School Goals with AI practices" and "Support of principals'," "Collaborative Learning." The Zone showed the best bullying and the least bullying Zone than other Zones related to AI transformation. Further, this indicates that while

some schools may have strong administrative support, they might struggle with the practical implementation of technology or creating a collaborative learning with a flexible environment in all schools of Batticaloa District [14].

5. Conclusion

➢The main challenges of teachers in AI teaching, emotional and behavioral part(46%), lack of experience (45%), time frame of teaching (41%), lack of proper involvement of parents (44%), Lack of technology (30%), lack of experience (30%) and loss of human element(20%) are found.

➢Learning needs of slow learners in AI schools as personalized learning (35%), repeated Reinforcement (30%) and adaptive Assessments (21%) are found.

➢The curriculum for AI training (25%) teachers' skills in the AI classroom, assessment and evaluation are better in Batticaloa District.

➢Most of the teachers found in Batticaloa area (29%) are graduated. However, 3.25% of the teachers have master's degrees; Only 20% teachers have received special ICT (AI) training to teach there.

➢There are rarely support and feedback for teachers regarding curriculum restructuring activities, support of stakeholder, school performance and enhance achievements of students in five zones teaching (Principals70%, Teachers80%, ADS/ISA80%)

➢It suggests that educational interventions with AI digital approaches are followed by mostly school each five zones (Principals80%, Teachers70%, ADS/ISA70%).

➢In schools, remedial and active teaching, Pre and post interventions assessments and practical projects are followed somewhat better in classroom approaches. (Principals70%, Teacher 80%, ADS/ISA75%).

➢The study finds strategies for support and enhance of slow learners as visual aids and AI technology, flexible environment, collaborative learning, assessment feedback, personalized learning and differentiated instruction in the zones of Batticaloa. (Principals80%, Teachers85%, ADS/ISA70%).

➢The study finds implement educational interventions tailored to the needs of slow learners as collaboration (Foster), monitoring feedback, teacher training and parental involvement.

➢This study finds learning needs of slow learners such as personalized learning, repeated reinforcement and adaptive assessment (Principals80%, Teachers75%, ADS/ISA70%).

➢In summary, this study confirms that AI holds considerable promise for enhancing the academic experiences of slow learners in Batticaloa, yet its effectiveness is mediated by several contextual factors. The predominance of graduate-level teachers without specialized AI training highlights a critical area for institutional investment. Similarly, the strong positive correlation between perceived AI usefulness and student engagement underscores the importance of teacher buy-in and preparedness.

➢The regional disparities in digital readiness-such as those between Kalkudah and Batticaloa West-point to the need for zone-specific strategies. Schools in more resourced zones may benefit from full-scale AI integration, while those in underserved areas might begin with offline AI tools or mobile-based learning platforms. Furthermore, the emotional and behavioral dimensions of teaching slow learners cannot be overlooked. AI should be introduced in ways that complement, rather than complicate, the psychosocial support these students require.

➢Finally, the study reaffirms that technology alone is not a panacea. Sustainable improvement in learning outcomes depends on a holistic ecosystem involving teachers, parents, administrators, and policymakers. AI can provide the tools for personalized learning, but it is the human elements-empathy, adaptability, and cultural understanding-that ultimately determine their success.

6. Recommendations

Ensuring student safety and equal access to technology is crucial in Sri Lankan district schools. Prioritizing high-quality internet connectivity and hardware investments in schools, especially in rural areas, is essential. Educators need training to develop confidence and expertise in using technology to enhance teaching. Protocols for technology use in classrooms should be established, and content should be tailored to meet unique learner requirements. Teachers should focus on promoting critical thinking, creativity, and knowledge that goes beyond traditional tasks. Continuous ICT training for teachers is vital, and curriculum materials should be developed to teach students about technology applications and ethical risks.

Regular audits of technology systems are necessary to ensure inclusivity and equity for students from marginalized backgrounds. The primary goal should be to enhance human interactions, protect social and emotional learning, and prioritize student progress and well-being. Current and target training programs must be implemented to develop the educator's confidence and expertise in the use of AI tools to enhance human-led teachings. In 2026 educational restructuring, the protocols for the use of AI's classroom should be disseminated. Provincial and zonal level officials

must intensify the continuous of the ICT knowledge of the teachers, the workshop and the workshops. Creating curriculum volumes for students to teach students about AI policies, applications, and ethical risks.

To operationalize these insights, the following actionable recommendations are proposed:

•**Develop Offline-First AI Solutions**: Given the connectivity challenges in rural Batticaloa, AI tools should be designed to function offline or with low bandwidth. Mobile-friendly applications that support asynchronous learning can ensure continuity even in resource-constrained environments.

•**Establish AI Mentorship Networks**: Create zonal AI champion programs where tech-savvy educators mentor their peers. This peer-led model can build confidence and foster a collaborative culture of digital innovation.

•**Integrate AI into Teacher Training Curricula**: Pre-service and in-service teacher education programs should include modules on AI literacy, ethical use, and pedagogical integration. Partnerships with universities or EdTech organizations could accelerate this process.

•**Co-Design with Local Stakeholders**: Engage teachers, parents, and students in the design and evaluation of AI tools. This participatory approach ensures that solutions are contextually relevant and culturally appropriate.

•**Monitor Ethical and Equity Implications**: Regular audits should assess whether AI systems perpetuate biases or exclude certain student groups. Transparency in how student data is used and protected is essential to maintaining trust.

•**Leverage AI for Parental Involvement**: Use AI-driven communication platforms to keep parents informed of student progress and suggest supportive activities at home. This can help bridge the gap between school and home learning environments.

By adopting a phased, inclusive, and ethically grounded approach, Batticaloa-and similar districts-can harness AI to create more equitable and effective educational experiences for all learners, especially those who have historically been left behind.

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