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Enhancing Academic Achievements of Slow Learners through AI: A study based on Junior Secondary schools in the Kalkudah Zone

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Abstract

This study examines the impact of AI-powered learning systems on enhancing the academic achievement of slow learners within the 21st century educational landscape of inclusive education. It seeks to determine how AI technologies can identify specific student challenges, reduce learning gaps and provide customized learning experiences. The ultimate goal is to build up self-confidence, increase student engagement, and improve overall learning efficiency in the classroom. A significant challenge is the digital divide, particularly the lack of technical facilities and internet access in rural and underdeveloped areas. To address this, a mixed-methods approach was used, involving 120 students, 90 teachers, 5 principals, 5 ADS/ISAs and 30 parents from all five schools in the Kalkudah zone. Data collection methods included questionnaires, interviews, observations, and document analysis, performed using SPSS version 29.0. The Findings indicate that AI-based interventions can significantly enhance student achievement by creating customized learning paths and adapting the curriculum to individual learning speeds. AI has transformed 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 important of conducting research not only on future technological developments but also on the rapid change occurring in technology today.

Keywords: Junior Secondary, AI, Achievement, Slow Learners, Technology, Enhance

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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. Artificial Intelligence (AI) tools provide a practical solution by diagnosing individual learning difficulties and adjusting the lessons automatically. However, using these digital tools in rural and underdeveloped areas brings major practical challenges, especially due to poor school infrastructure. This study focuses on how junior secondary schools in the Kalkudah Zone can use AI learning systems to help slow learners, while examining the real challenges of using technology in rural schools. To address these findings, the study recommends creating localized, interactive AI resources, offering comprehensive professional training for teachers, and fostering collaboration with policymakers.

The study focuses AI's potential to enhance academic achievements of personalized and improving learning with challenges faced by slow learners in the Kalkudah zone, Batticaloa. Studies like those by Lucklin (2018) highlight AI's role in tailoring education to individual needs, motivations and technology. It helps move away from the traditional method where one lesson speed is used for everyone. It shows how simple technology can practically assist students who are at risk of failing. By focusing directly on the Kalkudah Zone, this research highlights the "digital divide." It provides direct evidence of how poor internet and lack of computers affect rural classrooms, which helps in planning resource allocation. It gives useful data for teachers who need quick ways to find student weaknesses, for principals managing school resources, and for policymakers planning future technology upgrades. It provides insights for educators, policy makers and researches 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

Review of the Literature

Past research shows that slow learners need more repetitions and flexible learning methods, but the traditional school environment forces them to match the average speed of the class (Chen, 2024; Vorobyeva, 2025). When these learning gaps are not addressed for a long time, students lose their self-confidence and develop fear towards education (Main, 2026). Recent studies explain that Artificial Intelligence

in education helps by creating individual learning paths, allowing students to study at their own comfortable speed without stress (Adewale, 2026; Nantaburom, 2026). However, most existing research on educational AI has been conducted in wealthy, urban areas with advanced school facilities (Jallali, 2026). There is very little factual data about how these tools work in poor, rural communities where daily electricity and internet are unstable (Zulu, 2025). The local need for technology and provides an example of a grassroots initiative that lays the groundwork for more advanced AI integration (Vanni Hope, 2025).

Methodology

- **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 and evaluate how using AI learning systems impacts the academic achievements, classroom participation and confidence of junior secondary slow learners in the Kalkudah Zone, while identifying the practical issues of implementing it.

- **Special Objectives**
  - To identify the specific learning weaknesses and subject gaps of junior secondary slow learners using AI diagnostic features.
  - To measure the actual changes in exam scores and learning speed when slow learners use individual AI learning paths.
  - To examine how using AI tools changes the way teachers deliver lessons and support weaker students in the classroom.
  - To evaluate how infrastructure problems, like poor internet and lack of computers, affect the usage of AI tools in rural schools.
- **Research Questions**
  - How effectively do the diagnostic features of AI learning systems isolate the specific learning weaknesses and subject gaps among junior secondary?
  - What are the actual differences in terminal exam marks and individual learning speed when slow learners utilize personalized AI learning paths?
  - In what ways does the introduction of educational AI tools modify the traditional lesson delivery methods and the target support teachers provide to weaker students?

- How do common rural infrastructure problems, such as unstable internet connectivity and computer shortages, impact the daily implementation and usage of AI tools in schools?

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	66	78	68	74	85	371
Number of Teachers	1865	1454	818	1550	1330	7017
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	10	9	45
1C	13	14	10	18	9	64
Type II	23	15	19	16	28	101
Type III	20	38	34	30	39	161

(Source: Provincial department of education, planning division - 2025)

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

Schools	Types of school	Number of Teachers	Number of Students	Respondents			
				Senior Secondary Teachers	Principals	Students	Parents
A	National	72	1100	25	1	33	09
B	1C	33	700	17	1	22	06
C	1AB	56	1046	21	1	32	08
D	1AB	42	850	15	1	20	04
E	1C	39	376	12	1	13	03
Total		245	4082	90	05	120	30

(Source: Prepared by Researcher, 2026)

According to Table 2: Details of sample population of Kalkudah zone; In schools with IE practices, 05ADS/ISAS(SNE) and 05principals were selected by purposive sampling method. Similarly, 90 teachers selected by stratified random sampling method and 120 students and 30 parents were selected from each zone of five zones by method of simple random sampling.

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 analyzed using the SPSS 29.0 through grid diagrams, circular diagrams and three-dimensional maps, and interpretation and discussion were carried out.

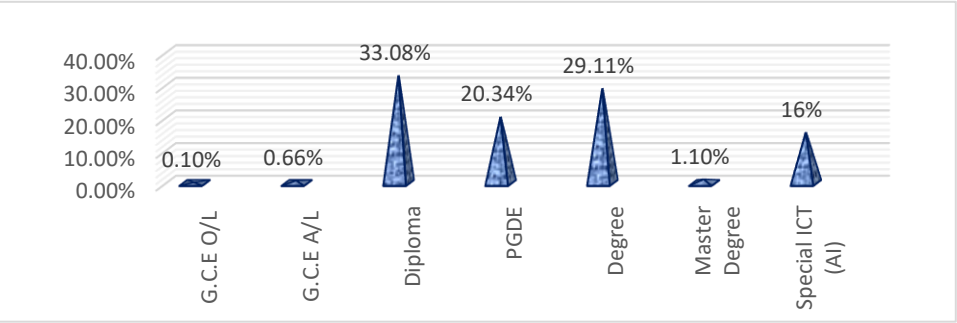

Figure-1: Educational background of Teachers

According to Figure-1: Educational background of teachers, most of the teachers found in Kalkudah area are graduates (29.11%). However, only 1.10% teachers have master's degrees and 16% 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 29.11% of the total. Also highlights that 13.65% of teachers have a Diploma, and 16% have completed special ICT (AI) courses to support online and classroom teaching here.

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	46	100	54	30	20
	230	400	162	60	20

Total: 872 Score: 878/230 =3.79

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 (3.79) '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 (rs ≈+.60 to +.80), indicates that as students' perception of AI's usefulness increases, their engagement in online classroom activities also significantly increases. 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 Kalkudah zone in the Batticaloa District.

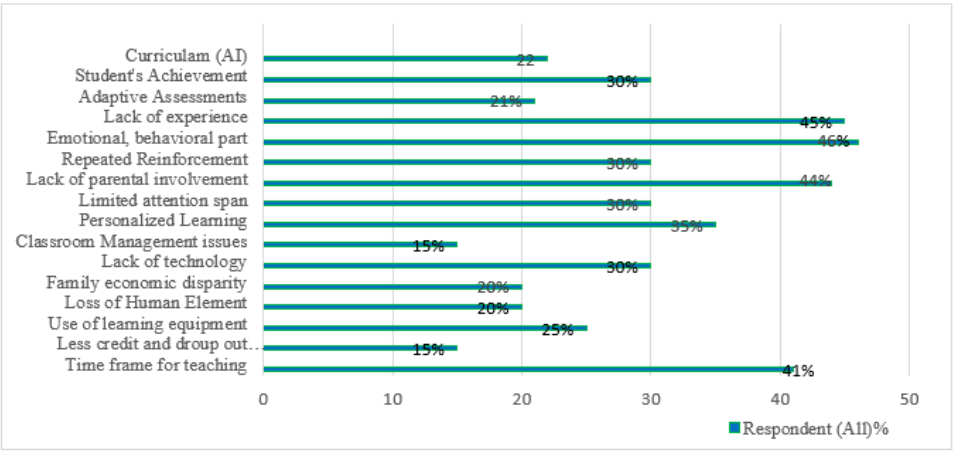

Figure-4: Challenges and learning needs related with AI role in schools

According to Figure-4: Challenges for teachers in AI teaching Emotional and behavioral part (42%), lack of experience (41%), time frame of teaching (40%), lack of proper involvement of parents (42%), Lack of technology (28%) and lack of experience (29%) and loss of human element (20%) were pointed out by most of them. Specially, more learning needs for slow learners related with AI role in schools as personalized learning (35%), repeated Reinforcement (31%) and adaptive Assessments (21%) were pointed by them. However, the curriculum for AI training (26%) teachers' skills in the AI classroom, assessment and evaluation are better in Kalkudah zone.

Paired-Samples t-Test Finding

A paired-samples t-test was completed to see if the exam marks of the 120 slow learners changed significantly after using the AI tool. The statistics show that before the AI intervention, the students' average test score was quite low (X^{-}=42.15, SD=6.42). However, after practicing with the individual AI paths, their average score rose to 58.58 (SD=8.11). The actual score increase was 16.43 points. The test gave a value of t(119)=−14.82 with a significance value of p=.001. Since this p-value is much lower than the standard 0.05, the improvement is genuine and not a matter of luck. This mathematically proves that personalized learning pacing helps slow learners perform better in their exams.

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?	3.60
What are the supports of parents for enhance achievements of schools?	3.33
The relationship between the school's goal and AI online practices with equity?	3.31
Are you using new AI tools for all subjects with technological supports in class?	3.01
How do you feel about the school principal's support?	3.54

Activities, Observations, Evaluations for AI study of ISA/ ADS in School.	3.49
Support from other teachers in school practice for equity and accessibility?	3.00
Your ICT level of awareness support on AI teaching assessments for the students.	3.30
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.	3.49
Can you find fitfully changes of assessment scores and school performances?	3.08
Can you maintain evaluating student engagement and participation in AI class?	3.41
Are you follow tailoring instruction to meet individual needs ever?	3.42
What are the influences of poverty, isolation, resources and targeted materials?	3.32

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 3.6 Although moderately positive responses are highlighted several statements received mean values in the mid-range of positively.

However, these include the "support of parents for enhance achievements of schools" (3.33), "Relationship between the school's goal and AI online practices with equity" (3.31). 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 the Kalkudah zone.

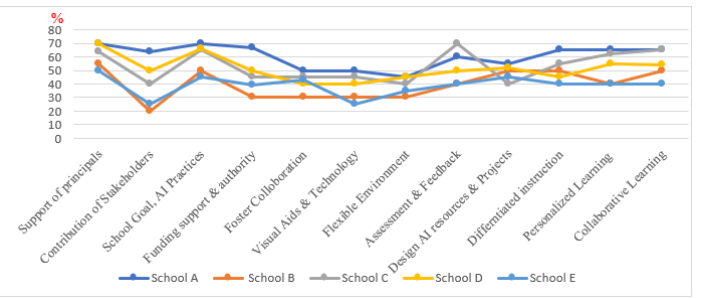

Figure-2: Perception for the digital transformation with AI technology

According to Figure-2: All participants' perception for the digital transformation with AI technology, reveals significant regional variations in perception among schools in this five schools at Kalkudah zone. Schools A and E generally show 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 schools showed the best bullying and the least bullying schools than other schools related with AI transformation. Further that 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 flexible environment in all schools of Kalkudh zone in the Batticaloa District.

Conclusions

- The main challenges of teachers in AI teaching, emotional and behavioral part (42%), lack of experience (41%), time frame of teaching (40%), lack of proper involvement of parents (42%), Lack of technology (28%), lack of experience (29%) and loss of human element (20%) are found.
- Learning needs of slow learners in AI schools as personalized learning (35%), repeated Reinforcement (31%) and adaptive Assessments (21%) are found.
- The curriculum for AI training (22%) teachers' skills in the AI classroom, assessment and evaluation are better in Kalkudah zone in the Batticaloa District.
- Most of the teachers found in Batticaloa area (29%) are graduated. However, 1.10% of the teachers have master's degrees; Only 16% teachers have received special ICT (AI) training to teach there.
- AI-powered learning systems are highly beneficial for supporting slow learners in an inclusive classroom. By allowing students to study at their own speed, the technology successfully reduces learning gaps, increases class participation, and improves exam marks, as verified by the t-test
- There are rarely support and feedback for teachers regarding curriculum restructuring activities, support of stakeholder, school performance and enhance achievements of students in five schools teaching (Principals80%, Teachers80%, ADS/ISA80%)
- It suggests that educational interventions with AI digital approaches are followed by mostly school each school in Kalkudah zone (Principals80%, Teachers75%, ADS/ISA80%).

- In schools, remedial and active teaching, Pre and post interventions assessments and practical projects are followed somewhat better in classroom approaches. (Principals60%, Teacher 80%, ADS/ISA80%).
- 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 Kalkudah zone (Principals80%, Teachers75%, ADS/ISA80%).
- 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/ISA80%).

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.

Develop offline software modules as since internet signals are highly unstable in rural villages, software developers should focus on making AI learning activities that can run without internet (offline cached) using local school servers. We want provide practical teacher training in schools of zonal. The local education zone and In-Service Advisors (ISAs) should arrange continuous practical training for teachers. This should focus on how to read AI data dashboards and how to mix technology with daily classroom teaching.

Ministry must have distributed computers equitably in all schools. Educational authorities should prioritize deep rural schools when distributing hardware like tablets and laptops, and introduce solar power backups to save learning hours during electricity cuts. Build a local collaboration team as educational directors, principals, and parent committees need to establish a joint monitoring team to

handle machine repairs, software updates, and adjust school timetables to modern digital changes.

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 wellbeing. 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 for the examples: seminars, workshops, software competitions, java application and rent online programs. Creating curriculum volumes for students to teach students about AI policies, applications and ethical risks.

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LIST OF ABBREVIATION: ADS-Assistant Director in Service, ISA-In -Service Advisors, AI- Artificial intelligence, SNE- Special Needs Education

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