Enhancing English Speaking in ESL Classrooms Through ICT-Integrated CLT: A Mixed Methods Approach

Pradip Kumar Mahata[1] and Pragyan Paramita Pattnaik[2]

ABSTRACT

In the evolving landscape of English as a Second Language (ESL) education, speaking remains one of the most challenging skills to master, particularly in Bengali-medium secondary schools in Jhargram District, West Bengal. This study explores the impact of integrating Information and Communication Technology (ICT) within the framework of Communicative Language Teaching (CLT) to enhance students' speaking proficiency.[1–3] Employing a mixed-methods, quasi-experimental design, and the research contrasts traditional teaching methods with ICT-enhanced CLT approaches across control and experimental groups.[4,5] Quantitative results from pre- and post-tests reveal significant improvements in speaking performance among students in the experimental group. Qualitative feedback from students, teachers, and parents supports these findings, highlighting increased engagement, reduced speaking anxiety, and improved fluency and communicative competence.[6–9] The study underscores the pedagogical potential of ICT tools in fostering more dynamic, interactive, and learner-centered ESL classrooms while also identifying infrastructural and training barriers that must be addressed for broader implementation.

Keywords: ICT-integrated communicative language teaching, Bengali-medium secondary ESL, Speaking proficiency enhancement, Quasi-experimental mixed-methods research, Rural West Bengal edtech implementation

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Introduction

In today's fast-paced, hyper-connected world, English proficiency is more than a skill it's a passport to global citizenship. For students navigating the evolving demands of the 21st-century classroom, especially in non-native English-speaking regions, mastering spoken English has become a critical milestone. Yet, speaking remains one of the most underdeveloped and anxiety-inducing skills in ESL (English as a Second Language) classrooms.

Enter the era of digital learning, where Information and Communication Technology (ICT) is not just a supplement but a transformative force in education. From AI-powered pronunciation apps to interactive video platforms, ICT tools are reshaping how language is taught, practiced, and perfected. At the heart of this transformation lies Communicative Language Teaching (CLT) a student-centered approach that prioritizes real-life communication over rote memorization. When ICT merges with CLT, it creates a vibrant ecosystem for learners to engage, express, and evolve.

Imagine students collaborating on virtual role plays, recording and critiquing their own speaking performances, or participating in global discussion forums all while receiving instant, personalized feedback. These scenarios are no longer futuristic dreams; they are the new normal in progressive ESL classrooms. And yet, not all classrooms are equipped equally. Many secondary schools, especially in resource-constrained areas, struggle with inadequate infrastructure, rigid exam-centric curricula, and limited teacher training in both ICT and CLT methodologies.

This study springs from these realities. It aims to explore how integrating ICT within the CLT framework impacts students' speaking skills in ESL classrooms. Using a mixed-methods approach combining observation, pre- and post-intervention assessments, and interviews it investigates not just performance metrics, but also the lived experiences and perceptions of both students and teachers. In doing so, it offers insights into how we can bridge the gap between potential and practice, and truly empower learners to find their voice in English. This study hypotheses that Integrating Information and Communication Technology (ICT) within the Communicative Language Teaching (CLT) framework significantly enhances the speaking skills of Bengali-medium ESL students compared to traditional teaching methods.

Literature Review

Communicative Language Teaching (CLT) remains central in language education for shifting focus from rote grammar learning to the holistic development of communicative competence, including grammatical, discourse, sociolinguistic, and strategic elements.[7,8,10] Recent research upholds this approach, affirming that meaningful interaction, collaboration, and task-based speaking activities drive students to use language authentically and effectively.

The integration of Information and Communication Technology (ICT), especially mobile-assisted language learning (MALL), has transformed traditional classrooms.[1,11,12] Studies between 2019 and 2023 widely report that MALL tools such as speech-recognition apps, digital role play, and mobile audio-video resources encourage student engagement, improve oral proficiency, and foster learner autonomy.[3,13,14] For instance, a 2023 quasi-experimental study found that learners using mobile tools for regular speaking practice demonstrated measurable gains in pronunciation, fluency, and self-confidence compared to those receiving only textbook-based instruction. These tools also enable instant feedback and personalized pathways, supporting even large or resource-limited classrooms.

ICT initiatives specifically tailored for rural Indian contexts have expanded rapidly since 2019, including government projects aimed at providing smart classrooms, mobile learning labs, and regionally contextual

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materials (Learning Routes India, 2025). These efforts have begun bridging the digital divide, offering rural students regular exposure to English through digital content, despite ongoing infrastructure issues such as device shortages and erratic connectivity (IJRASET, 2023). Context-sensitive interventions, like the use of mobile platforms adapted to local languages and cultural content, have proved especially impactful for increasing motivation and accessibility.[15,16]

Alongside technological innovation, researchers have foregrounded the critical role of anxiety reduction in promoting oral English use, particularly among rural and multilingual learners.[4,5] Recent studies report significant speaking anxiety stemming from fear of mistakes, low self-confidence, and limited opportunities for real communication.[15,17] Evidence indicates that supportive classroom environments, structured peer feedback, gradual introduction of speaking tasks, and use of mobile or digital rehearsal tools all contribute to reduced anxiety and improved performance (ENJOYMENT AND ANXIETY, 2024; A Snapshot on the Speaking Anxiety, 2023). Mindfulness routines and positive error correction have also shown positive effects for student willingness to speak (Effective Strategies, 2024).

In the West Bengal context, studies continue to highlight hurdles linked to socio-economic status, limited English exposure outside the classroom, and inconsistent implementation of ICT.[16,18] Making communicative and mobile-enhanced pedagogy both accessible and anxiety-sensitive is thus essential for real progress.

In summary, current research (2019–2023) demonstrates that integrating CLT with ICT especially mobile devices, delivers notable gains in speaking competence and motivation, provided that strategies also consciously address learners' affective needs and local realities. Systemic support for infrastructure, teacher training, and context-adaptive approaches will determine the long-term success of these innovations in Indian ESL classrooms.

Research Gaps

- Limited empirical research exists on the combined impact of ICT and CLT methodologies, specifically on speaking skills in ESL classrooms of Jhargram District, West Bengal's secondary education system.
- Regional challenges such as socio-economic disparities, multilingual student populations, and infrastructure limitations are under-explored in relation to ICT-supported CLT approaches.
- Most studies focus on reading and writing skills; spoken English proficiency and its development through CLT-ICT integration receive insufficient attention.
- Teachers' and students' perceptions of ICT tools in CLT-based activities remain largely undocumented in rural and semi-urban areas of Jhargram District, West Bengal.
- There is a lack of studies evaluating the effectiveness of ICT-based CLT intervention over time using both qualitative and quantitative methodologies.

Research Questions

- What is the impact of ICT-integrated CLT activities on the development of speaking skills among secondary school ESL learners in Jhargram District, West Bengal?
- How do students and teachers perceive the use of ICT tools in CLT-based English speaking activities?
- What challenges and limitations do ESL teachers and learners face when implementing ICT in a CLT framework?
- To what extent do ICT-based CLT interventions help overcome the speaking anxiety and low self-confidence among ESL students in rural and semi-urban classrooms?
- Are there any notable differences in students' speaking performance before and after the ICT-CLT intervention?

Research Objectives

- To evaluate the effectiveness of ICT-supported CLT methodologies in enhancing speaking skills among ESL students in secondary schools of Jhargram District West Bengal.
- To analyze teachers' and students' perceptions of the integration of ICT tools in communicative language teaching.
- To identify the challenges faced by ESL educators and learners in implementing ICT in CLT-based speaking activities, particularly in under-resourced contexts.
- To examine the role of ICT tools in reducing speaking-related anxiety and enhancing student engagement and autonomy.
- To compare students' speaking performance through pre- and post-intervention assessments in ICT-CLT integrated ESL classrooms.

Research Method

This study employs a **mixed-methods approach**, integrating both **quantitative and qualitative methods**. A **quasi-experimental design** will be used, involving two groups: an **experimental group** that receives ICT-integrated CLT instruction, and a **control group** taught through traditional methods.[3,11,12] Quantitative data (from pre- and post-tests) will measure improvements in speaking skills, while qualitative data (from classroom observations and interviews) will explore participants' experiences, perceptions, and contextual challenges. This design ensures a comprehensive understanding of the **effectiveness and impact** of ICT-enhanced CLT practices. As shown in Table 1, the distribution and frequency of ICT-integrated CLT implementation highlight varying exposure levels among students.

Research Design

Schools in studies examining ICT and Communicative Language Teaching (CLT) in India are generally selected using well-established educational research sampling methods. The most common approaches include cluster random sampling, stratified random sampling, and purposive sampling, chosen to ensure representativeness and logistical feasibility.

Random Sampling techniques has used for the selection of sample from 2 secondary schools with four teachers 2 from each school in Jhargram District, West Bengal. 2 teachers per group (selected for their familiarity with CLT and willingness to adopt ICT methods)

- The **experimental group** (30 students) will receive instruction using ICT-supported CLT techniques.
- The **control group** (30 students) will be taught using traditional teacher-led methods without ICT tools or CLT emphasis.

Consent from minors in Indian educational research is typically obtained through a two-step process: parental (or legal guardian) consent and student assent. First, informed consent forms describing the study's purpose, procedures, risks, and confidentiality measures are provided to parents or guardians, who must sign before a child can participate.

Data Collection

The process of data collection for this study will unfold in three key stages: before, during, and after the intervention. Each stage has been designed to align with the mixed-methods and quasi-experimental nature of the research, ensuring that both quantitative improvements in speaking skills and qualitative classroom experiences are captured and analyzed effectively.

ICT-CLT Lesson Plan

Warm-up (5 minutes)

The teacher begins the session with warm greetings and encourages students to share brief personal updates or respond to simple questions about their daily routines, hobbies, or what they had for breakfast. Instead of relying on first language, the teacher introduces a set of essential vocabulary words (e.g., "wake up," "commute," "study," "friends") on a digital whiteboard. These words are paired with visuals, short audio pronunciations, and sometimes emojis or GIFs to make the vocabulary lively and memorable. This initial step serves two purposes: it triggers students' prior knowledge and gently shifts their mindset from L1 to L2, while also lowering anxiety levels by connecting learning to personal experiences.

Role Play (10 minutes)

Students are divided into pairs and assigned real-life communicative tasks like buying a train ticket, ordering food in a restaurant, or explaining symptoms at a clinic. Each pair records their dialogue on a smartphone or tablet app (e.g., voice recorder, Flipgrid, or WhatsApp voice notes). After completing the role-play, they replay their recordings to reflect on their pronunciation, fluency, and grammar use. Teachers provide a digital rubric that emphasizes *communication and clarity* rather than grammatical perfection. Students receive feedback focused on strengths (e.g., "You used polite expressions well") and areas for improvement (e.g., "Work on linking words when asking questions"). This activity fosters autonomy and helps students hear themselves as English speakers.

Picture Narration (10 minutes)

The teacher projects or shares engaging pictures (local festivals, markets, family events, or school celebrations) using a projector or digital screen. Each student is asked to describe what they see in English, using online vocabulary aids and pronunciation tools when necessary. For instance, if a student struggles with a word, they can quickly look it up on a classroom tablet or dictionary app. This activity sparks spontaneous speaking and encourages descriptive language. Peers ask follow-up questions like, "Who are they?" or "What are they doing?" which promotes interaction and clarification. This not only develops visual literacy and observation skills but also enhances the learner's ability to produce extended discourse.

Speaking (10 minutes) – Peer Reviewed

Each student selects a familiar topic from a provided list (e.g., "My favorite festival," "A memorable trip," "My best friend") and gives a short 2–3 minute speech. Instead of submitting to the teacher alone, students record their speech and share it with a peer. Using a digital checklist, peers evaluate the speaker's fluency, vocabulary, and grammar, while also writing one positive remark (e.g., "You spoke with confidence") and one suggestion (e.g., "Try to use linking words like 'because' and 'so'"). Teachers review the peer feedback to ensure it is constructive and not discouraging. This activity builds confidence, accountability, and critical listening skills.

Group Discussion (10 minutes)

Students are placed in small groups (4–5 members) and shown a short online video clip or asked to read a brief digital article on a relevant topic such as "The Importance of Clean Water" or "The Role of Social Media in Daily Life." Each student is assigned a specific task: summarizing one section, sharing a new vocabulary word, or giving a short opinion. The teacher monitors groups, ensuring equal participation and encouraging quieter students to contribute. The emphasis is on authentic opinion-sharing, not rote memorization. Students learn to negotiate meaning, listen actively, and build arguments, while also practicing real-world academic and conversational English.

Student Feedback/Teacher Reflection (5 minutes)

The teacher uses a tablet observation checklist to record levels of student engagement, difficulties, and progress during the lesson. At the end, students vote anonymously via mobile devices or school computers on the activity they found most useful (e.g., role play, group discussion). This instant feedback helps the teacher adapt and refine lessons. The teacher also facilitates a short reflective discussion, asking students: "How did technology make speaking easier for you today?" This reflection nurtures a sense of ownership in learning and emphasizes the role of technology in making language practice more accessible, interactive, and motivating.

Control Group (Traditional Lesson Plan)

Warm-up (5 minutes)

The teacher greets students and immediately asks them to read aloud passages from the prescribed textbook. The emphasis is on accuracy in grammar, intonation, and pronunciation. Mistakes are corrected on the spot, often interrupting the natural flow of reading. The classroom atmosphere remains formal and teacher-centered, with students focused on being "correct" rather than communicative.

Grammar Drill (10 minutes)

Students receive printed grammar worksheets with fill-in-the-blank activities (e.g., verb forms, tense changes, sentence structure). They complete these individually, followed by a group correction session where the teacher provides the "right" answers. The teacher dominates the talk, explaining rules extensively, while students remain mostly passive. This fosters a sense of accuracy over fluency, reinforcing rule-based learning but offering little room for creative language use.

Textbook Exercise (10 minutes)

Short reading passages are assigned from the textbook, followed by written comprehension questions. Students read silently or aloud, then write down answers in their notebooks. The activity checks literal understanding and recall but seldom extends into open-ended discussion. Speaking opportunities are limited, and students are mainly evaluated on their ability to produce correct written responses rather than on oral communication.

Speaking Task (Structured) (10 minutes)

Students are placed in pairs or small groups to practice scripted dialogues directly from the textbook. The dialogues are predictable (e.g., "Hello, how are you? I am fine, thank you") and repetitive. Students rehearse these lines under teacher supervision, with emphasis on memorization and accuracy. While this activity ensures exposure to correct forms, it limits creativity, spontaneity, and real-world communication skills.

Pronunciation (10 minutes)

The teacher introduces new vocabulary words, demonstrates their pronunciation, and asks the whole class to repeat in chorus. Corrections are made when the group falters, but individual practice is minimal. This approach trains students in sound recognition and repetition but offers no meaningful interaction, leaving little chance for students to apply pronunciation skills in natural contexts.

Student Feedback / Teacher Reflection (5 minutes)

At the end of the class, the teacher provides general comments on discipline, completion of tasks, and overall performance. Students may share what they liked or disliked verbally, but since feedback is neither anonymous nor structured, it often remains superficial. Reflection is teacher-driven, focusing on control and correctness rather than student engagement or learning needs.

Chart Interpretation

As presented in Table 3, the comparative results demonstrate distinct performance gaps between the control and experimental groups.

- Across all ten indicators, the **Experimental Group (ICT-CLT)** consistently outperformed the **Control Group (traditional)**.
- **Confidence & Participation:** Experimental students reported much higher confidence in speaking (M = 3.97 vs. 2.83) and active participation (4.03 vs. 2.77).

Table 1 | Distribution and frequency on ICT integrated CLT

SL No.	Statements	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean	Standard Deviation
1	Access to ICT tools makes me more confident speaking English in class.	68	27	5	0	0	4.63	0.59
2	Digital classroom activities increase my willingness to participate.	60	35	5	0	0	4.55	0.53
3	Using mobile apps helps me improve my pronunciation skills.	48	45	7	0	0	4.41	0.57
4	Online group discussions motivate me to express my opinions in English.	57	38	4	1	0	4.51	0.62
5	Peer feedback from recorded speech helps me learn faster.	52	42	5	1	0	4.45	0.61
6	Technical challenges (e.g. internet, devices) rarely affect my learning.	15	40	23	20	2	3.46	0.88
7	ICT makes collaborative learning with classmates more enjoyable.	50	47	2	1	0	4.46	0.54
8	ICT integration helps me use richer vocabulary while speaking.	44	50	5	1	0	4.37	0.56
9	Recorded role plays make me aware of my strengths and weaknesses.	46	45	6	3	0	4.34	0.65
10	Learning with ICT prepares me for real-world communication challenges.	53	41	6	0	0	4.47	0.57

This table that students showed a highly positive attitude toward ICT integration in English learning, with most mean scores above 4.3 (Agree–Strongly Agree range). ICT integration significantly enhances confidence, participation, collaboration, and communication skills, though technical barriers remain a minor but notable challenge.

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Table 2 | Distribution and frequency of challenges of ICT in CLT

SL No.	Statements	Strongly Agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly Disagree (%)	Mean	Standard Deviation
1	I have received sufficient training to effectively use ICT in my ESL teaching.	18	33	20	26	3	3.30	1.12
2	The current ESL curriculum adequately supports the integration of ICT tools and methods.	22	40	14	18	6	3.60	1.15
3	I am familiar with the available digital resources suitable for my ESL lessons.	29	50	13	6	2	4.00	0.85
4	Time constraints in the school schedule limit my ability to implement ICT-based activities.	25	51	9	14	1	3.85	0.92
5	Students often get distracted when ICT tools are used, affecting classroom discipline.	10	28	15	40	7	2.75	1.19
6	Many teachers, including myself, lack the ICT skills necessary for effective CLT implementation.	37	42	11	6	4	4.05	1.05
7	Technical support services for ICT equipment in the school are insufficient or delayed.	28	55	10	4	3	4.00	0.88
8	There is a need for more comprehensive training on how to integrate ICT with ESL teaching.	42	44	6	6	2	4.20	1.08
9	The available ICT infrastructure (computers, projectors, internet) is insufficient for teaching.	34	40	12	11	3	3.85	1.15
10	Slow or unreliable internet connection often disrupts ICT-based lessons.	36	47	5	9	3	3.95	1.05
11	Technical issues and equipment breakdowns frequently interrupt classroom flow.	27	50	8	10	5	3.80	1.08

Teachers generally see ICT as valuable but face **training gaps, weak infrastructure, and unreliable technical support** as their biggest hurdles. Student distraction is a **secondary concern**, while curriculum and time limitations remain moderate obstacles.

Table 3 | Group comparison

Group	I Feel Confident Speaking	Actively Participate	Use Wide Vocabulary	Speak Fluently	Pronounce Difficult Words	Initiate Conversations	Lessons Engaging	Tech Helps Speaking	Like Digital Tools	More Motivated by ICT
Control	2.83	2.77	2.60	2.97	2.70	2.50	2.60	2.63	2.83	2.43
Experimental	3.97	4.03	4.07	3.97	3.90	4.03	4.13	3.97	4.00	3.93

- **Language Skills:** They showed stronger outcomes in using wide vocabulary (4.07 vs. 2.60), speaking fluently (3.97 vs. 2.97), and pronouncing difficult words (3.90 vs. 2.70).
- **Initiative & Engagement:** ICT learners were more likely to **initiate conversations** (4.03 vs. 2.50) and found lessons more **engaging** (4.13 vs. 2.60).
- **Technology Impact:** The experimental group valued technology in improving speaking (3.97 vs. 2.63), expressed higher **liking for digital tools** (4.00 vs. 2.83), and felt **more motivated** by ICT (3.93 vs. 2.43).
- The **biggest gaps** appeared in *initiating conversations* and *motivation*, highlighting ICT's role in building **confidence and learner autonomy**

Finally, the data will be compiled and analyzed using both statistical and thematic techniques. Pre- and post-test scores will be compared using paired sample t-tests to determine the effectiveness of the ICT-CLT intervention quantitatively. Meanwhile, qualitative data from observations, interviews, and teacher reflections will be thematically analyzed to identify patterns, themes, and insights into the learners' and teachers' experiences. Triangulation of these diverse data sources will ensure the validity and reliability of the findings, ultimately offering a holistic understanding of how ICT-enhanced CLT impacts speaking skills in Bengali-medium ESL classrooms of Jhargram District West Bengal.

Data Analysis and Interpretation

The present study involved a total of 60 students, with 30 students each in the control and experimental groups.[3,11,12] The objective was to evaluate the effectiveness of the ICT-Integrated Communicative Language Teaching (CLT) method on improving students' speaking skills in ESL classrooms.[14,19,20] To this end Warschauer's,[13] various statistical tests namely frequency analysis, one-sample t-test, paired-sample t-test, and one-way ANOVA were employed using SPSS.[1,11]

This line chart (Figure 1) compares three data series across students in the **Control Group**, with all labels marked as "Control" along the X-axis. The Y-axis represents **test scores**, ranging from 0 to 20.

- **Blue Line (Series1):** This represents the **Control Group Post-Test scores**.
- **Red Line (Series 2):** This shows the **Control Group Pre-Test scores**.

Table 4 | Control group marks

Group	Post-Test	Pre-Test	Marks Improvement
Control	15.00	15.60	.60
Control	13.50	14.10	.60
Control	15.40	15.80	.40
Control	17.60	17.90	.30
Control	13.20	13.90	.70
Control	13.20	13.70	.50
Control	17.70	17.80	.10
Control	15.70	16.00	.30
Control	12.60	13.30	.70
Control	15.20	15.90	.70
Control	11.90	12.80	.90
Control	13.60	14.30	.70
Control	14.00	14.40	.40
Control	13.10	13.50	.40
Control	16.10	16.40	.30
Control	15.30	15.80	.50
Control	12.50	13.20	.70
Control	14.80	15.20	.40
Control	13.90	14.20	.30
Control	14.50	15.00	.50
Control	12.00	12.90	.90
Control	14.20	14.50	.30
Control	16.00	16.20	.20
Control	13.40	13.80	.40
Control	14.90	15.10	.20
Control	12.80	13.50	.70
Control	13.70	14.00	.30
Control	15.60	16.00	.40
Control	11.80	12.70	.90
Control	14.30	14.80	.50

- **Green Line (Series3):** This likely represents the **difference between Post-Test and Pre-Test scores** (i.e., the improvement margin).

The Main Observations

- Minimal Change Between Pre and Post-Test Scores:
  - The blue and red lines nearly **overlap throughout the graph**, indicating that **there was little to no improvement** in speaking skills among students in the control group.
  - Any slight increase or decrease is marginal, suggesting that the teaching method used (likely traditional/textbook-based) did not significantly impact learners' speaking performance.

- Green Line Analysis (Series3 - Improvement Scores):
  - The green line stays consistently **near the bottom of the chart**, hovering close to **zero**, which further emphasizes the **negligible improvement**.
  - The variations in this line are small and nearly flat, meaning **no student showed remarkable progress**.

- Overall Trend:
  - The chart visually affirms the **statistical findings** mentioned earlier: that the control group's performance remained relatively stagnant.
  - Any fluctuations in scores are **normal variations**, not indicative of instructional effectiveness.

As shown in Table 4, the control group displayed minimal improvement in post-test performance using traditional methods. It serves as a visual reinforcement that the **control group**, taught without ICT-CLT intervention, showed **no meaningful improvement** in speaking test scores. The overlap between pre- and post-test scores and the flat improvement line illustrate that traditional methods alone may not be sufficient to enhance communicative competence in ESL learners.

This line chart (Figure 2) illustrates the performance of students in the **Experimental Group** on speaking

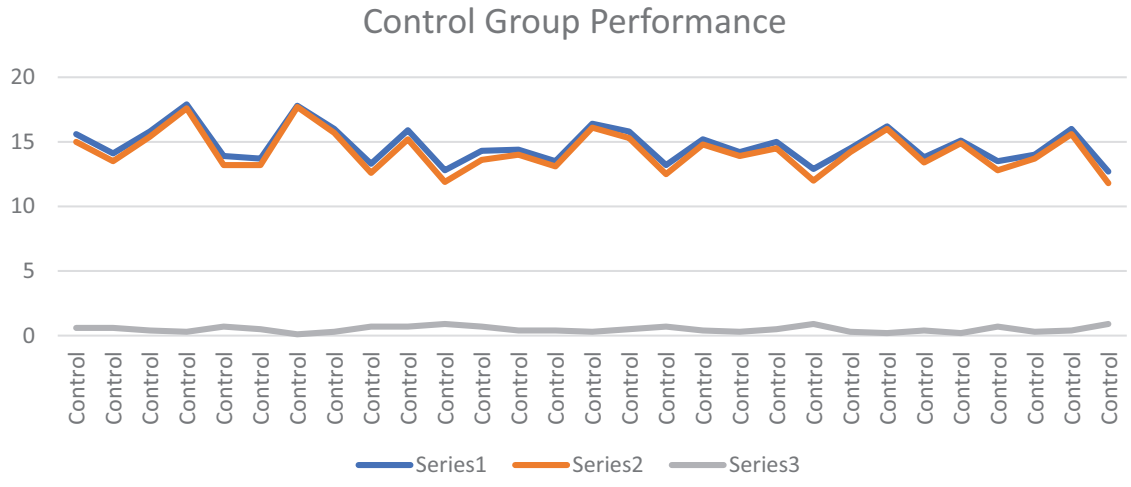

Fig 1 | Chart interpretation: performance of control group (pre-test vs post-test)

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skill tests, both **before and after the ICT-integrated CLT method** was applied.

- **Blue Line (Series1):** Represents the **Post-Test scores** of the Experimental Group.
- **Red Line (Series2):** Represents the **Pre-Test scores** of the same group.

Table 5 | Experimental group marks

Group	Post-Test	Pre-Test	Marks Improvement
Experimental	13.70	16.50	2.80
Experimental	12.80	15.80	3.00
Experimental	14.60	17.00	2.40
Experimental	12.40	15.40	3.00
Experimental	13.90	16.20	2.30
Experimental	14.30	16.80	2.50
Experimental	15.20	17.50	2.30
Experimental	11.70	14.50	2.80
Experimental	13.50	16.10	2.60
Experimental	14.00	16.90	2.90
Experimental	12.60	15.20	2.60
Experimental	13.30	16.00	2.70
Experimental	13.60	16.30	2.70
Experimental	14.70	17.30	2.60
Experimental	11.90	14.40	2.50
Experimental	12.20	15.10	2.90
Experimental	13.80	16.40	2.60
Experimental	14.50	17.20	2.70
Experimental	12.00	15.30	3.30
Experimental	13.40	16.00	2.60
Experimental	14.10	16.70	2.60
Experimental	13.00	15.50	2.50
Experimental	12.90	15.70	2.80
Experimental	13.70	16.10	2.40
Experimental	14.20	17.00	2.80
Experimental	13.50	16.20	2.70
Experimental	12.60	15.30	2.70
Experimental	11.80	14.90	3.10
Experimental	13.10	16.00	2.90
Experimental	14.00	16.80	2.80

- **Green Line (Series3):** Represents the **difference between Post-Test and Pre-Test scores**, indicating individual student improvement.

Key Observations

- **Clear Improvement from Pre-Test to Post-Test:**
  - The **blue line (Post-Test)** consistently stays **above the red line (Pre-Test)** across all students.
  - This shows that **almost all students in the experimental group improved** after being taught using the **ICT-based CLT method.**

- **Significant Performance Gain:**
  - The **gap between the blue and red lines** is visibly more prominent compared to the control group chart.
  - The **green line (Series3)**, while relatively flat, maintains a **higher average level** than in the control group—hovering around **2.5 to 4 marks**, suggesting substantial individual improvements.

- **Consistency in Performance:**
  - There are **fewer dips and less fluctuation** in this chart compared to the control group, which means performance gains were more **uniform across the group**.
  - This uniformity implies that the ICT-integrated CLT method was **consistently effective**, regardless of initial performance levels.

As reflected in Table 5, the experimental group achieved higher post-test scores under the ICT-CLT intervention. It clearly reflects the **positive impact** of ICT-based CLT teaching strategies on students' speaking skills. The consistently higher post-test scores across all students, along with steady improvement

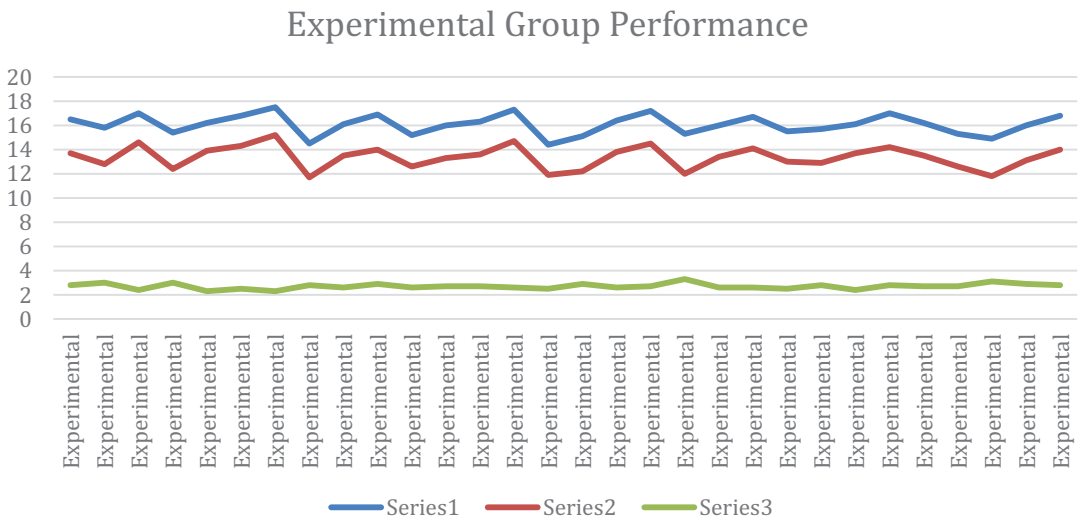

Fig 2 | Chart interpretation: performance of experimental group (pre-test vs post-test)

levels, validate that **the experimental approach significantly enhanced speaking proficiency**.

This stands in stark contrast to the control group, where traditional methods yielded little to no improvement. Hence, the chart not only complements the statistical analysis but also reinforces the pedagogical value of integrating technology and communication-focused methods in ESL classrooms.

Interpretation

As indicated in Table 6, the paired-sample statistics show substantial mean improvement between the pre-test and post-test.

- The **mean score increased from 13.81 (pre-test) to 15.41 (post-test)**, showing a noticeable improvement after implementing the ICT-based CLT method.
- The difference in means is **approximately 1.60**, which is substantial in the context of language skill development.

Interpretation

As presented in Table 7, the paired-sample correlations reveal a significant relationship between learners' initial and final performances.

- There is a **moderate positive correlation** between the pre-test and post-test scores.
- The **p-value < 0.001** indicates this correlation is **statistically significant**, meaning students' performance in the post-test is positively linked to their pre-test performance, albeit with an improvement.

Table 6 | Paired samples statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Posttest	15.4067	60	1.31018	.16914
	Pretest	13.8083	60	1.33547	.17241

Table 7 | Paired samples correlations

		N	Correlation	Sig.
Pair 1	Posttest and Pretest	60	.631	.000

Correlation coefficient (r) = 0.631, with a *p*-value = 0.000.

Table 8 | Paired samples test for speaking performance

Paired Difference	M	SD	SE	95% CI Lower	95% CI Upper	*t*	df	p	Cohen's d
Post-test – Pre-test	1.60	1.14	0.15	1.30	1.89	10.90	59	< .001	1.30

Table 9 | One-way ANOVA comparing control and experimental groups

Source	SS	df	MS	F	p	Partial η^2
Post-test						
Between Groups	26.40	1	26.40	20.45	< .001	0.26
Within Groups	74.88	58	1.29			
Pre-test						
Between Groups	11.70	1	11.70	7.26	.009	0.11
Within Groups	93.52	58	1.61			

Interpretation

As shown in Table 8, the paired-sample test confirms statistically significant improvement in speaking proficiency for the experimental group. The paired-samples *t*-test compared students' speaking performance before and after the ICT-CLT intervention.

- Mean Difference (M = 1.60): On average, students scored 1.6 points higher in the post-test than in the pre-test, indicating measurable improvement in speaking proficiency.
- Standard Deviation (SD = 1.14): The variation around this mean difference was modest, showing that most students improved in a fairly consistent way.
- Confidence Interval (95% CI [1.30, 1.89]): We can be 95% confident that the true improvement lies between 1.3 and 1.9 points. Since the interval does not include zero, the gain is statistically reliable.
- t (59) = 10.90, p < .001: The improvement is highly significant, meaning the probability that this result occurred by chance is less than 0.1%.
- Cohen's d = 1.30: This represents a very large effect size, according to Cohen's (1988) benchmarks (0.2 = small, 0.5 = medium, 0.8 = large). It shows that the intervention had a strong practical impact on students' speaking skills.

The ICT-CLT intervention produced a **statistically significant and practically large improvement** in students' speaking performance. Not only did nearly all students improve, but the size of the gain (d = 1.30) indicates that the intervention had a powerful effect, well beyond what would be expected from normal classroom progression.

Interpretation

As indicated in Table 9, the one-way ANOVA results demonstrate clear variance between control and experimental group outcomes.

Post-Test Results

- **Between-Groups SS = 26.40, F(1, 58) = 20.45, p < .001, Partial η^2 = 0.26**
  - The difference in **post-test speaking scores** between the experimental and control groups is **statistically significant**.
  - The effect size (**partial η^2 = 0.26**) indicates that **26% of the variance** in post-test scores is explained by the type of instruction. This is considered a **large effect** in educational research.
  - Students taught with **ICT-integrated CLT** significantly outperformed those taught with traditional methods.

Pre-Test Results

- **Between-Groups SS = 11.70, F(1, 58) = 7.26, p = .009, Partial η^2 = 0.11**
  - There was a **small but significant difference** between groups even at the pre-test stage.

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Table 10 | Group comparison of speaking skill indicators

Indicator	Control M	Experimental M
Confidence	2.83	3.97
Participation	2.77	4.03
Vocabulary use	2.60	4.07
Fluency	2.97	3.97
Pronunciation	2.70	3.90
Initiate conversations	2.50	4.03
Lessons engaging	2.60	4.13
Tech helps speaking	2.63	3.97
Like digital tools	2.83	4.00
More motivated by ICT	2.43	3.93

- The effect size (**partial η^2 = 0.11**) shows that about **11% of the variance** in pre-test scores was attributable to group membership.
- This suggests that the two groups were **not perfectly matched** at baseline, though the gap was much smaller than at post-test.

The ANOVA results confirm that the **ICT-CLT intervention had a strong positive effect** on students' speaking performance. While there was some pre-existing difference between the groups, the **post-test gap widened substantially**, showing that the intervention—not just initial differences—was responsible for the large gains observed.

Interpretation

As shown in Table 10, all key speaking-skill indicators show stronger performance among students exposed to ICT-enhanced CLT activities. The table presents mean scores (on a 5-point Likert scale) across ten indicators of speaking performance and learner engagement. Across all indicators, the experimental group (ICT-CLT) reported substantially higher means than the control group (traditional instruction).

1. **Confidence and Participation**
   - Experimental students reported much higher confidence in speaking (M = 3.97 vs. 2.83) and willingness to participate (M = 4.03 vs. 2.77).
   - This suggests that ICT-CLT activities reduced anxiety and encouraged more active involvement.

2. **Language Skills**
   - Gains were evident in vocabulary use (4.07 vs. 2.60), fluency (3.97 vs. 2.97), and pronunciation (3.90 vs. 2.70).
   - The largest gap appeared in vocabulary use, showing that ICT-based tasks expanded students' lexical repertoire.

3. **Initiative and Engagement**
   - Experimental students were more likely to initiate conversations (4.03 vs. 2.50) and described lessons as more engaging (4.13 vs. 2.60).
   - This indicates that technology-supported communicative tasks promoted learner autonomy and classroom interaction.

4. **Perceptions of Technology**
   - Experimental students strongly agreed that technology helped their speaking (3.97 vs. 2.63), that they liked digital tools (4.00 vs. 2.83), and that they were more motivated by ICT (3.93 vs. 2.43).
   - These findings confirm that ICT integration not only improved skills but also enhanced motivation and positive attitudes toward English learning.

The comparison highlights that ICT-CLT integration had a broad and consistent impact: improving language skills (vocabulary, fluency, and pronunciation), boosting confidence and participation, and fostering positive learner attitudes. The sharpest differences were in initiative (conversation starting) and motivation, suggesting that technology particularly empowers learners to take an active role in communication.

Qualitative Data Analysis

Integrating ICT in Bengali-medium ESL classrooms significantly improves language learning outcomes compared to traditional methods. Students find multimedia presentations, educational videos, and interactive apps make lessons more engaging and accessible, catering to diverse learning styles and increasing motivation and participation. Teachers report that ICT enables dynamic, student-centered instruction with differentiated support for varied proficiency levels. Parents observe their children show greater enthusiasm for English learning and improved pronunciation and vocabulary skills. Overall, qualitative feedback from students, teachers, and parents aligns with quantitative data, confirming that ICT integration fosters better language acquisition, engagement, and educational experiences.

Result Analysis and Research Findings

Based on the comprehensive statistical and qualitative analyses, the integration of Information and Communication Technology (ICT) into Bengali-medium English as a Second Language (ESL) classrooms has demonstrated significant advantages over traditional teaching methods.

While ICT–CLT hybrids have been explored in many EFL/ESL contexts, this study contributes a valuable, context-specific dataset by focusing on rural Bengali-medium secondary schools. Although it may not radically advance theoretical frameworks, its strength lies in offering empirically grounded insights that highlight the practical applicability, challenges, and pedagogical implications of ICT integration in under-researched regional settings.

Statistical Findings

The quantitative data reveal that students exposed to ICT-enhanced instruction exhibited marked improvements in their English language proficiency. The experimental group, which received ICT-integrated teaching, showed a substantial increase in post-test scores compared to the control group. This improvement is statistically significant, indicating that the use of ICT tools

contributes positively to students' language learning outcomes.

Qualitative Insights

As indicated in Table 2, both teachers and students initially reported several constraints related to ICT accessibility and technical support in the Bengali-medium schools. Following the implementation of ICT in ESL in this study, feedback from students, teachers, and parents further supports the efficacy of ICT in ESL education. Students reported increased engagement and motivation when learning through multimedia resources and interactive platforms. Teachers observed that ICT tools facilitated more dynamic and student-centered classrooms, allowing for differentiated instruction and immediate feedback. Parents noted their children's heightened enthusiasm for English learning and improved communication skills at home.

Research Findings

Observation of Speaking Components

Teachers noted that ICT tools, especially voice recording and speech apps, helped students become more self-aware of pronunciation and fluency gaps.

This study aimed to evaluate the impact of ICT-integrated Communicative Language Teaching (CLT) methodologies on the development of speaking skills among secondary school ESL learners in Bengali-medium institutions of West Bengal. Grounded in both quantitative and qualitative data, the following key findings emerged in response to the research questions and objectives:

- **Significant Improvement in Speaking Proficiency**
  A statistically significant improvement was observed in the speaking performance of students in the experimental group who were exposed to ICT-CLT interventions. Pre- and post-test analyses revealed a mean score increase of 1.60 ($p < 0.001$), indicating that digital tools such as voice recording apps, YouTube videos, and interactive speaking quizzes substantially enhanced students' grammatical accuracy, fluency, and pragmatic competence.

- **Positive Perception of ICT Tools by Students and Teachers**
  Both students and teachers in the experimental group expressed favorable attitudes towards the integration of ICT in CLT-based speaking activities. Students reported increased motivation, engagement, and enjoyment during ICT-mediated tasks. Teachers acknowledged that these tools provided new avenues for differentiated instruction and helped create a more interactive, student-centered classroom environment.

- **Reduction in Speaking Anxiety and Increased Confidence**
  One of the core findings was the notable reduction in speaking-related anxiety. ICT tools like voice recording and playback allowed students to reflect on and refine their speech in a low-pressure environment. This, combined with peer feedback and interactive speaking tasks, resulted in increased confidence and greater willingness to communicate in English.

- **Context-Specific Challenges and Constraints**
  Despite the positive outcomes, several practical limitations were identified. Infrastructure gaps, such as unreliable internet connectivity and limited access to devices, posed significant barriers in rural and semi-urban schools. Furthermore, some teachers lacked sufficient training or confidence in using ICT tools effectively, highlighting a clear need for professional development and systemic support.

- **Alignment with Regional Needs and Pedagogical Gaps**
  Addressing the documented research gap, this study provides empirical evidence specific to West Bengal's secondary ESL classrooms, where prior studies predominantly focused on reading and writing skills. By spotlighting speaking proficiency through the lens of ICT and CLT integration, the research offers context-sensitive strategies that can inform curriculum development and pedagogical reforms in similar socio-educational environments.

- **Sustained Learning Outcomes and Pedagogical Implications**
  The consistent improvement across diverse learner profiles in the experimental group suggests that ICT-CLT integration is not only effective but scalable. The approach supports autonomy, learner engagement, and real-life communicative competence and confidence as observed in Table 11—key elements for 21st-century language education. These findings strongly advocate for the structured inclusion of ICT-enhanced CLT modules in ESL instruction, especially in under-resourced schools.

Table 11 | Competence observation findings after ICT-CLT integration

Competence	Observation Findings After ICT-CLT Integration
Grammar	Improved accuracy; some still struggled with complex structures
Vocabulary	Broader lexical range; better use of topic-related vocabulary
Pragmatic Competence	Better use of functional language in simulated real-life scenarios
Fluency	Increased confidence, reduced hesitation in ICT-aided tasks

Discussion

This study contributes to existing ICT–CLT research[11,12] by proposing a **Contextualized ICT–CLT Model (C-ICT-CLT)** for under-resourced ESL settings. Unlike prior studies that emphasized technology integration in well-equipped or urban contexts, this research demonstrates how ICT-enhanced communicative tasks operate under infrastructural limitations, linguistic

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constraints, and sociocultural challenges unique to rural West Bengal.

The findings advance theory in three ways:

- **Contextual Mediation of ICT–CLT** – The effectiveness of ICT is mediated by infrastructural readiness, teacher training, and learners' socio-cultural background. This suggests that ICT–CLT should be theorized not as a universal model but as a **context-dependent framework**.

- **Anxiety-Confidence Shift Theory** – Evidence shows that voice-recording, playback, and gamified ICT tasks systematically reduce speaking anxiety and build communicative confidence. This supports an emerging theoretical pathway: **technology-enabled self-regulation lowers affective barriers** to language acquisition.

- **Sustainability Dimension** – The study proposes that ICT–CLT integration fosters **sustained autonomy** in learners, as digital tools enable continued practice outside the classroom. This extends CLT theory by embedding technology as a means of continuity and independent learning beyond formal instruction.[20,21]

Thus, the research not only provides a dataset for rural ESL contexts but also advances a **localized theoretical framework**: ICT–CLT is most effective when reconceptualized as a dynamic, context-sensitive model that accounts for infrastructure, culture, and learner psychology.[4,6]

Recommendations

Based on the findings and observed challenges, the following recommendations are proposed:

- **Professional Development for Teachers:** Continuous training programs should be instituted to equip ESL teachers with the technical skills and pedagogical strategies required for effective ICT-CLT integration.

- **Infrastructure Enhancement:** Government and educational institutions must prioritize the development of digital infrastructure in rural and semi-urban schools to ensure equitable access to ICT tools.

- **Curriculum Revision:** ESL curricula should be restructured to include ICT-integrated CLT modules, with a focus on speaking skills, communicative tasks, and student-centered learning.

- **Localized Digital Resources:** Development of bilingual or regionally adapted ICT materials can help mitigate language barriers and make content more accessible to students in Bengali-medium schools.

- **Administrative Support and Monitoring:** School leadership should encourage and monitor ICT use in classrooms, providing necessary support for troubleshooting and evaluation.

Limitations of the Study

- **Sample Size and Location:** The study was limited to two Bengali-medium schools in specific rural and semi-urban regions of West Bengal. Results may not be generalizable to all ESL contexts.

- **Duration of the Intervention:** The intervention period of four weeks may not fully capture the long-term effects of ICT-CLT integration on language retention and development.

- **Access and Equity Issues:** Variations in students' access to personal digital devices and internet connectivity outside the classroom may have influenced outcomes.

- **Teacher Variability:** While efforts were made to ensure parity, differences in teacher delivery styles and technological competence may have impacted the experimental conditions.

Scope for Further Research

- **Longitudinal Studies:** Future research could examine the long-term retention of speaking skills following ICT-CLT intervention and the sustainability of its impact.

- **Comparative Studies Across Boards and Languages:** A comparative analysis between Bengali-medium and English-medium schools, or between different state boards, can provide broader insights.

- **Impact on Other Language Skills:** Studies exploring the integration of ICT-CLT methods in enhancing listening, reading, and writing skills will provide a more holistic view of language development.

- **Gender, Socio-Economic, and Cultural Analysis:** Further research can examine how socio-economic background, gender, and cultural attitudes toward English influence ICT-based ESL learning outcomes.

While ICT–CLT hybrids have been examined in other EFL/ESL contexts, the present study offers a valuable context-specific dataset from rural Bengali-medium secondary schools. The contribution is moderate in theoretical advancement but significant in highlighting regional challenges and practical strategies for pedagogy.

Conclusion

This study demonstrates that the integration of ICT tools within a CLT framework significantly enhances the speaking proficiency of ESL learners in Bengali-medium secondary schools of Jhargram

District, West Bengal.[2,3,9] Students showed measurable improvements in grammatical competence, fluency, and confidence, while teachers acknowledged increased classroom participation and student motivation. While ICT–CLT hybrids have been reported in many EFL/ESL settings, this study adds a valuable context-specific dataset by focusing on rural Bengali-medium secondary schools. Although the contribution may be considered moderate in terms of theoretical advancement, its empirical strength lies in addressing a regional gap and offering practical strategies that can inform pedagogy in similar under-resourced environments. The findings affirm that ICT-CLT synergy offers a powerful pedagogical approach, particularly in regions where traditional methods have failed to foster communicative competence.[10,15] However, to fully harness this potential, systemic efforts must be made to address infrastructural gaps, equip teachers with digital competencies, and revise curricula to support communication-focused, technology-enhanced instruction. As education systems evolve to meet 21st-century demands, embracing ICT in language teaching is not a luxury it is a necessity.

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Appendix

STUDENT QUESTIONNAIRE (Post-Intervention – Semi-Structured)

Section A: General Perception of English-Speaking Skills

1. How confident do you feel while speaking English now, compared to before the intervention?
2. Which classroom activities helped you most in improving your speaking skills?
3. Did you face any difficulty using English during the activities? If yes, what were they?
4. How often did you speak English in class during the past four weeks?
5. Did you get enough opportunities to speak and interact with your classmates in English?

Section B: Perception of ICT Tools

6. Did the use of videos, apps, or digital tools make learning more interesting for you? Why or why not?
7. Which digital tool or activity did you enjoy the most (e.g., YouTube, voice recording, virtual role play)?
8. Did technology help you improve your pronunciation or fluency? Explain how.
9. Were there any challenges you faced while using digital tools in class?

Section C: Suggestions and Reflection

10. What would you suggest to make English speaking classes even better?
11. How do you feel about learning English through group tasks or digital activities now?

TEACHER QUESTIONNAIRE (Post-Intervention – Semi-Structured)

1. How effective was the ICT-based CLT method in developing your students' speaking skills?
2. Did students show more engagement during ICT-integrated sessions compared to traditional methods?
3. Which digital tools or activities were most successful in encouraging student participation?
4. What challenges did you face while implementing ICT in your ESL lessons?
5. How would you compare the progress of the experimental group vs. the control group?
6. Did the students show improvement in fluency, grammar, and vocabulary use? Please elaborate.
7. Do you think this method can be adopted in other classrooms across rural West Bengal?
8. What support or training would have helped you more during the intervention?

TEACHING PLAN FOR ICT-CLT INSTRUCTION (4 Weeks | Class IX | Experimental Group)

Week 1: Building Fluency and Vocabulary through Descriptive Speaking

Objectives: Develop fluency and vocabulary related to everyday topics

Activities

- Warm-up: Picture description using voice recording apps (individual task)
- Group activity: "Describe your school" – recorded and peer-reviewed
- ICT Integration: YouTube video models (short clips with subtitles); pronunciation shadowing

Week 2: Role Play and Real-Life Situations

Objectives: Enhance interactional speaking skills

Activities

- Role play: At a restaurant / doctor's clinic (pairs)
- ICT Tools: Use of AI voice-based platforms (or role-play simulation apps)
- Group reflection: What expressions did you learn today?

Week 3: Narration and Storytelling

Objectives: Develop narrative competence, sequencing, and pragmatic fluency

Activities

- Watch a short animated story (YouTube) and retell in own words
- Pair task: Narrate a past event from personal life using a digital slideshow
- Record and playback for self-evaluation and peer feedback

Week 4: Debates and Group Discussions

Objectives: Enhance argumentative speaking and collaboration

Activities

- Small group debates: "Is technology good or bad for students?"
- ICT Tools: Google Slides or Canva for presentation visuals
- Peer feedback: Use a simple rubric for scoring participation and vocabulary use

ASSESSMENT TOOLS

- **Pre/Post Speaking Rubric:** Grammatical Accuracy | Vocabulary | Fluency | Pronunciation | Coherence (scale of 1–5)
- **Observation Checklist:** Participation | English use | Peer interaction | Engagement level
- **Teacher Reflection Journal Prompts:** What worked today? What didn't? What surprised you?