

Artificial Intelligence Applications in Enhancing English as Second Language Listening Skills among Undergraduate Learners in Andhra Pradesh: A Theoretical and Observational Research Framework in the Age of NEP 2020

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Abstract

Background: Andhra Pradesh presents a compelling site for examining AI-assisted ESL instruction within one of the world's most linguistically complex educational environments. At the undergraduate level, listening comprehension remains poorly scaffolded in most institutions across the state.

Purpose: This article proposes a theoretically grounded and observationally oriented research framework for examining how AI-powered applications can enhance ESL listening proficiency among undergraduate learners in Andhra Pradesh, with particular attention to NEP 2020 and the state's urban-rural digital divide.

Approach: Drawing on second language acquisition theory and an interpretive synthesis of observational and document-based evidence from comparable multilingual settings, this article provides four research propositions, outlines an observational research design, and also examines the framework's principal limitations.

Significance: The framework offers a principled, replicable basis for naturalistic inquiry in Andhra Pradesh's colleges and contributes to international scholarship on AI-mediated language learning in postcolonial, multilingual, and resource-uneven educational contexts.

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1. Introduction

India occupies a singular position in the global landscape of English language education, with over 250 million English users and a higher education system enrolling more than 43 million students across approximately 43,000 colleges (AISHE, 2022). Within this national context, Andhra Pradesh stands out as a particularly instructive site of inquiry: the state hosts over 3,000 degree colleges spread across the coastal, Rayalaseema, and north Andhra regions that differ sharply in urbanisation, infrastructure, and English exposure. Yet, the quality of English language instruction is deeply uneven, and nowhere is this more consequential than in listening comprehension—the skill undergraduate learners most frequently need and least reliably possess.

Andhra Pradesh undergraduate classrooms have long been shaped by grammar-translation pedagogies calibrated to the AP State Board and Intermediate examination formats that

privilege reading and writing. Listening, where it features at all, is rarely treated as a teachable skill. Graduates who read English competently often struggle with lectures, interviews, and professional conversations that deviate from the narrow phonological register of their college teacher's voice (Graddol, 2010). The structural causes of this gap—large class sizes, limited authentic input, and the extraordinary diversity of learners' L1 phonological backgrounds—are not amenable to purely teacher-driven solutions.

The National Education Policy 2020 (NEP 2020) places the technology integration at the heart of its reform agenda, explicitly positioning AI-driven personalisation as a means of extending quality learning to institutions historically underserved by both human and infrastructural resources (Ministry of Education, 2020). This creates both an opportunity to explore AI tools as genuine pedagogical supplements for ESL listening development and an obligation

to examine them honestly within the structural realities of AP higher education. This article is a theoretical and observational synthesis-not a report of experimental data. Drawing on SLA theory, classroom observation literature, and document-based evidence, it proposes four research propositions, a suitable observational research design, and an account of the limitations any investigation in this space must confront. The framework is addressed to researchers, educators, and policymakers who share an interest in what AI can realistically offer AP's undergraduate ESL learners.

2. Theoretical Framework and Contextual Literature

2.1 Listening in AP Undergraduate ESL: A Structural Challenge

The listening difficulties of AP undergraduate ESL learners are structurally produced rather than individually determined. Most students enter degree programmes having been assessed almost exclusively through reading and writing tasks. Sustained exposure to varied spoken English-the condition most conducive to listening development-has simply not been part of their educational experience. By the time these students reach college, the phonological representations of English that accurate listening requires are, for many, underdeveloped (Agnihotri & Khanna, 1997).

Andhra Pradesh's sociolinguistic landscape compounds this challenge distinctively. While Telugu is the dominant L1 across the state, phonological and dialectal variation within Telugu itself-across coastal Andhra, Rayalaseema, and north Andhra districts-means even a single-state study encounters meaningful L1 interference diversity. Telugu-medium schooled students who transition to English-medium undergraduate programmes carry Telugu's syllable-timed rhythm, retroflex consonants, and open vowel system into listening tasks designed around stress-timed, consonant-cluster-heavy speech. Many learners from border districts additionally bring Urdu, Kannada, or Odia competence, further diversifying the phonological landscape. The resulting interference patterns-vowel misassignment, consonant cluster reduction, prosodic mismapping-are specific, diverse, and resistant to the one-size-fits-all listening curricula that most institutions offer. Vandergrift's (2004) metacognitive model notes that listeners lacking fluent bottom-up phonological processing compensate through heavy reliance on L1 translation and inference-strategies cognitively taxing and prone to breakdown under natural speech conditions. This is precisely the profile that characterises many AP undergraduate listeners.

The theoretical rationale for AI-supported listening instruction draws on two foundational SLA constructs. Krashen's (1985) Input Hypothesis argues that acquisition proceeds when learners encounter input slightly beyond current competence-a condition that adaptive AI platforms operationalise automatically, calibrating task difficulty in response to ongoing performance. Long's (1996) Interaction Hypothesis adds that negotiation of meaning during interactive encounters accelerates comprehension gains, a principle enacted by conversational AI agents that require learners to listen, respond, and repair in real time. Both principles address AP undergraduates' core deficit: not the absence of English instruction, but the absence of sufficient, differentiated, and interactive listening exposure.

2.2 NEP 2020, Digital Infrastructure, and the Access Divide

NEP 2020 is unambiguous in its technology ambitions. It

mandates AI integration across higher education, establishes the National Educational Technology Forum (NETF) as a permanent advisory body, and explicitly identifies data-driven personalisation as a mechanism for expanding educational access and quality (Ministry of Education, 2020, p. 57). The policy's endorsement of multilingualism as a pedagogical resource rather than a deficit legitimises AI tools calibrated to Indian English norms, while its emphasis on continuous assessment aligns naturally with AI platforms' capacity to generate granular performance data across listening sub-skills. These aspirations sit in productive tension with ground reality. TRAI (2023) data confirm that broadband penetration and connection quality in rural India remain substantially below urban levels, and ASER (2023) research reveals that shared device usage, limited data affordability, and uneven digital literacy remain widespread outside metropolitan areas. Within Andhra Pradesh, this divide is acutely visible: an AI listening tool that functions smoothly in a well-connected college in Visakhapatnam or Vijayawada faces genuine structural barriers in a district college in Kurnool, Srikakulam, or interior Nellore. The state's AP Fiber Net (APSFL) broadband initiative has improved rural connectivity in some mandals, yet device access and digital literacy remain inconsistent in many government and aided colleges.

2.3 Observational Evidence from Comparable Contexts

Observational and descriptive research from analogous multilingual postcolonial contexts offers instructive insights. Classroom observation studies in Gulf, East Asian, and Southeast Asian undergraduate settings have documented patterns of learner engagement with AI listening platforms-including spontaneous self-correction, use of replay and subtitle functions, and greater willingness to attempt listening tasks independently-that align with the theoretical benefits predicted by Krashen's (1985) and Long's (1996) frameworks (Godwin-Jones, 2018; Huang *et al.*, 2023). These populations share with AP undergraduates a pattern of high-stakes English assessment and limited authentic listening exposure.

Particularly relevant are naturalistic observations of instrumentally motivated ESL learners who sustain engagement with AI platforms more consistently than with conventional listening tasks, drawn by gamification features, immediate feedback, and visible progress indicators (Godwin-Jones, 2018). Given that instrumental motivation-driven by examination and employment outcomes-is the dominant ESL orientation among AP undergraduates who aspire to IT, banking, or public-sector careers, these observational patterns transfer meaningfully to the present framework.

3. Research Propositions

The following propositions emerge from the theoretical framework and contextual literature above. They are framed as observationally grounded propositions rather than experimental hypotheses, reflecting the framework's commitment to naturalistic inquiry in AP undergraduate institutional settings.

3.1 Listening Behaviour and AI Tool Use

P1: AP undergraduate ESL learners who have naturalistic access to AI-powered listening tools will demonstrate observable shifts in listening behaviour-including greater use of replay, contextual inference, and self-monitoring strategies-compared to their prior behaviour in conventional instructional environments.

This proposition is grounded in Vandergrift’s (2004) metacognitive model and documented classroom observations from comparable multilingual settings. Rather than measuring pre-post score gains, observational inquiry focuses on the qualitative nature of how learners interact with AI-generated audio input and feedback-behaviours that are visible, documentable, and pedagogically meaningful.

3.2 Motivation and Autonomous Engagement

P₂: AP undergraduate ESL learners with access to AI listening platforms will demonstrate observable patterns of autonomous out-of-class engagement-including voluntary app use, increased listening to English-medium digital media, and peer discussion of AI-generated content-that are largely absent in conventional instructional conditions.

In the AP context, where voluntary listening practice outside the classroom is rare and English-medium media consumption remains limited in many semi-urban and rural households, this proposition speaks to one of AI’s most practically significant potential contributions. Smartphone ownership among AP students-even where laptop access is limited-makes app-based AI listening tools a particularly accessible mode of autonomous exposure (Canagarajah, 2013).

3.3 Digital Access as a Structural Determinant

P₃: The observable benefits of AI-supplemented listening engagement will differ substantially between urban and rural AP institutional settings, with device availability, connectivity reliability, and digital literacy functioning as structural determinants of access rather than individual learner variables.

The state’s pronounced intra-regional disparities-between coastal urban centres and Rayalaseema’s interior districts-make AP an especially productive site for observational examination of how structural access conditions shape technology-mediated learning. Treating access as a research focus rather than a background variable is an equity commitment with direct relevance to AP’s digital education policy agenda.

3.4 Metacognitive Strategy Development

P₄: AP undergraduate ESL learners engaged with AI listening tools will show observable development of metacognitive listening strategies-particularly monitoring, problem-solving, and reduced reliance on L1 Telugu translation-in naturalistic classroom and out-of-class contexts over a sustained engagement period.

4.3 Recommended Observational Methods

Metacognitive strategy use is among the strongest predictors of long-term listening development (Vandergrift & Tafaghodtari, 2010). For AP undergraduates-many of whom completed Telugu-medium secondary schooling and habitually rely on L1 translation as their primary comprehension strategy-AI tools that demand real-time, non-translational engagement may catalyse a meaningful strategic shift. AI-generated corrective feedback, delivered without the social awkwardness of public classroom correction, may be especially effective in building the monitoring confidence that AP learners often lack.

4. Proposed Observational Research Design

4.1 Overall Approach

An interpretive, qualitative-dominant design is recommended, drawing on naturalistic classroom observation, document analysis, learner portfolio review, and open-ended interview inquiry. This approach prioritises understanding the conditions and processes of AI-assisted listening development in AP colleges rather than measuring outcomes through controlled comparison. The design is flexible and contextually responsive-qualities essential in a system as institutionally diverse as Andhra Pradesh’s higher education landscape.

A core design feature is the deliberate selection of contrasting AP institutional settings: at minimum one urban or semi-urban college (e.g., affiliated to Andhra University or Sri Venkateswara University in a district headquarters town) and one rural or semi-rural institution (e.g., a government-aided college in a mandal-level town in Kurnool or Vizianagaram district). This contrast enables naturalistic examination of how structural access conditions shape technology-mediated listening practice.

4.2 Participants and Access

Observational inquiry should engage 30–60 first- or second-year undergraduate students enrolled in English as a compulsory subject under Andhra Pradesh’s Common Core Curriculum, selected purposively to represent variation in Telugu dialect background, medium of prior schooling (Telugu-medium vs. English-medium), and institutional setting. Faculty members and college technology coordinators serve as co-participants, providing institutional and pedagogical perspectives on AI tool integration. Documentation of first-language background, device ownership, and internet access conditions is treated as substantive contextual data.

Table 1: Recommended observational instruments and methods for the proposed AP-contextualised framework.

Purpose	Instrument/Approach	AP-Specific Rationale
AI Tool Observation	Classroom observation of ELSA Speak/SpeakAI sessions; field notes	Documents naturalistic learner interaction with AI platforms without controlled groups
Discourse & Classroom Observation	Audio/video recordings; observation protocols	Captures spontaneous L1 Telugu coping strategies, self-correction, and listening behaviour in real AP classrooms
Institutional Document Analysis	AP State Board syllabi; college lesson plans; APSCHE policy documents	Reveals systemic listening neglect in curriculum design and the gap between NEP 2020 mandates and classroom reality
Digital Access Mapping	Infrastructure audit; college ICT records; APSFL connectivity data	Provides observational evidence of device availability and connectivity across contrasting AP college types
Learner Portfolio Analysis	Listening journals; written reflections; peer discussion records	Naturalistic window into metacognitive strategy development without reliance on self-report questionnaires
Semi-Structured Interviews	Open-ended interviews in English and Telugu	Essential for capturing learner and educator voices; Telugu option critical in rural AP settings
Focus Group Discussions	Educator and student focus groups	Surfaces community-level attitudes toward English, AI tools, and listening pedagogy in AP college contexts

4.4 Analytical Orientation

Analysis follows an interpretive thematic approach: reflexive thematic analysis of interview and observation data, systematic document analysis of institutional and curriculum materials, and naturalistic mapping of digital access conditions across participating institutions. Findings are integrated through narrative synthesis, foregrounding the experiential and structural dimensions—learner anxiety, access workarounds, platform trust, institutional readiness—that reveal how AI tools are actually taken up (or not) in AP college environments. No statistical inference or questionnaire-derived data is employed; the analytical goal is contextually rich understanding rather than numerical generalisation.

5. Contextual Limitations

5.1 Institutional Diversity and Scope of Claims

Andhra Pradesh's higher education system spans autonomous universities (Andhra University, Sri Venkateswara University, JNTU Kakinada), state-affiliated government degree colleges, private aided and unaided colleges, and open university centres—a range so varied in resourcing, faculty capacity, and learner profile that observations from any single study are necessarily bounded. Even within the state, the contrast between a well-resourced autonomous college in Visakhapatnam and a government degree college in a Kurnool mandal is stark enough to make cross-institutional generalisation hazardous. Research employing this framework must be explicit about the institutional scope of its claims and resist the tendency to speak of AP undergraduate learners as a single, uniform population.

5.2 AI Platform Calibration and Telugu-English Phonology

Most commercially available speech recognition platforms have been trained on American or British English corpora. When deployed with Telugu-dominant English speakers from Andhra Pradesh—whose phonological patterns include retroflex consonants, syllable-timed rhythm, distinctive vowel lengthening, and prosodic contours shaped by Telugu phonology—such platforms risk penalising legitimate Telugu-English features rather than genuine intelligibility errors. This calibration gap has direct implications for observational data: if learners are repeatedly flagged for features of their Telugu accent rather than comprehension failures, the AI feedback they receive is misleading. Researchers should document platform responses to AP speaker samples and interpret AI-generated feedback with appropriate critical scrutiny.

5.3 The Sociolinguistic Complexity of English in AP

English in Andhra Pradesh carries particularly layered and contradictory social meanings. For many first-generation college learners from rural or semi-urban backgrounds, and especially those from BC, SC, and ST communities—English is simultaneously aspirational and alienating: a gateway to government employment, private-sector careers, and social mobility, yet also a marker of urban privilege they were denied. The Telugu pride movement and ongoing medium-of-instruction debates in AP schools add further tension. These layered attitudes shape how learners engage with AI feedback systems in ways that frameworks designed for other sociolinguistic contexts may not anticipate. Observational researchers must remain alert to these dynamics when interpreting patterns of engagement and avoidance.

5.4 Longitudinal Constraints

The sustained naturalistic observation is necessary to distinguish meaningful patterns of AI-assisted listening development from transient novelty effects across a full academic year ideally. This is particularly pressing in the AP context, where semester structures constrain continuous engagement, and where connectivity gaps in the rural mandals and shared device access in the joint-family households may create irregular tool-use patterns that short observation windows cannot adequately capture. The future research should plan for extended fieldwork and document access disruptions as substantive data rather than methodological inconveniences.

Conclusion

The case for AI-supported ESL listening instruction in Andhra Pradesh's undergraduate colleges rests on a convergence of theoretical reasoning, observational evidence from comparable multilingual contexts, and explicit policy mandate. Adaptively calibrated input, immediate personalised feedback, and exposure to varied speaker profiles directly address the conditions-limited authentic listening, underdeveloped phonological processing rooted in Telugu L1 transfer, and insufficient individual practice—that produce the listening gap so widely observable among AP undergraduates. NEP 2020's technology ambitions, combined with AP's own digital infrastructure investments, provide the institutional legitimacy and policy architecture for pursuing this integration at scale.

What this framework adds is specificity and honesty. The access proposition (P_3) is the most important and most neglected dimension of this space: not whether AI tools can enhance ESL listening in principle, but whether they do so equitably across Andhra Pradesh's pronounced intra-state urban–rural divide. Addressing that question through sustained naturalistic observation—rather than controlled experiments or questionnaire-based measurement—is the approach best suited to the diversity, complexity, and sociolinguistic richness of AP higher education.

Three directions should define the field's next phase in the AP context. First, longitudinal observational studies tracking whether AI-assisted listening behaviours are sustained and transferred into authentic communicative contexts, including the professional and higher-education settings AP graduates aspire to enter. Second, equity-centred comparative fieldwork documenting differential access and engagement across AP's coastal, Rayalaseema, and north Andhra sub-regions, generating insights with genuine policy granularity for APHERMC. Third, critical platform analyses interrogating the normative assumptions, Telugu-English phonological calibration, and data practices of commercial AI tools before deployment at scale in AP's linguistically diverse colleges. The potential is real. Realising it responsibly demands contextually grounded scholarship rooted in the specific realities of Andhra Pradesh.

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