Didactica :
Jurnal Kajian Pendidikan dan Pembelajaran
2026, 6(1), 1-11
https://doi.org/10.56393/didactica.v6i1.3820

Real-Time ASR Transcription as Cognitive Scaffolding: Enhancing Intelligibility of Indonesian-Accented English in ELF Communication

Andy [1*], Lasim Muzammil [1], Mallaury Milliard [2]
[1] Universitas PGRI Kanjuruhan Malang, Indonesia
[2] Université Catholique de Lille, Indonesia
* Author Correspondence

Article History
Received : 1 December 2025;
Revised : 9 January 2026;
Accepted : 24 Januari 2026.

Keywords
Automatic Speech Recognition;
Intelligibility;
Indonesian-accented English;
English as a Lingua Franca;
Scaffolding.

Abstract
English as a Lingua Franca (ELF) communication prioritizes intelligibility over native-like accuracy among speakers with diverse linguistic backgrounds. This mixed-methods study examines whether real-time automatic speech recognition (ASR) transcription enhances the intelligibility of Indonesian-accented English (IAE) in ELF contexts. Data were collected from Universitas PGRI Kanjuruhan Malang students through pre- and post-intelligibility transcription tasks, completed with and without Google Live Transcribe, as well as questionnaires and semi-structured interviews. Quantitative results revealed a statistically significant improvement in listener intelligibility when ASR support was available, particularly for low-frequency vocabulary, technical terms, and sentence-final elements, alongside reduced performance variability. Qualitative findings indicated positive user perceptions of real-time transcription as accessible, user-friendly, and supportive of comprehension and communicative confidence, despite occasional transcription errors. Overall, the findings suggest that real-time ASR transcription functions as cognitive scaffolding that mitigates accent-related processing challenges in ELF communication. This study contributes to ELF and CALL literature by providing empirical evidence that ASR-mediated interaction functions as cognitive scaffolding, supporting listener intelligibility in multilingual English use, particularly in the processing of low-frequency vocabulary, technical terms, and sentence-final elements.

Contact : Corresponding author e-mail: andy@unikama.ac.id
How to Cite : Andy, A., Muzammil, L., & Milliard, M. Real-Time ASR Transcription as Cognitive Scaffolding: Enhancing Intelligibility of Indonesian-Accented English in ELF Communication. *Didactica : Jurnal Kajian Pendidikan Dan Pembelajaran*, *6*(1), 1–11. https://doi.org/10.56393/didactica.v6i1.3820

Introduction

In a progressively more global world, not merely function as a native language but more broadly the role of English is as a lingua franca (ELF), in which English is a means of communication among non-native speakers (NNS) with distinct linguistic milieu. Applied linguistics has established ELF to develop into a significant notion, in the context that NNS in the expanding circle of English speakers during their English performance often pass on typical lexical, phonological and syntactic attributes. At present there is in progress trend to acknowledge ELF perception along with attached intelligibility for worldwide contact, with the association of each NNSs localized nature as like sociolinguistic versions and mother tongue phonology. Is said by Leong et al (2023) and Kim (2021) that this unique linguistics features of ELF may bring about critical consequences to high-stakes academic and professional fields, regarding the upshot issue of miscommunication and unintelligibility caused accordingly. This concern is true to all L1 languages of NNS that to some extent interfere intelligibility of English for international communication, as like the one named Indonesian-accented English (IAE).

Empirical studies have revealed low intelligibility stage of IAE speakers, the justification is that they experience anxiety that can cause low confidence even it gets worsen with restricted vocabulary and grammar proficiency. These all further set hurdles to mutual sound spoken exchange of ideas (Purwati et al., 2023; Octaberlina et al., 2022; Wulandari et al., 2021). Not only halted with linguistic concern, pedagogical one particularly education conduct in Indonesia is pointed out by Sari et al (2021) that the benchmark for institutional outlook and evaluation practices still focus on the excell of native-speaker norms. Less attention is specified to address typical pronunciation substitutions that could obstruct understanding such as rendering "she" as [si:] (Abdi Rahmat Syam et al., 2024).

The inclusion of enhanced technology as like ASR applications namely Google Live Transcribe is an assuring movement to provide ground-breaking resolution, to cut down such remaining articulation challenges, complementing conventional pronunciation instruction. Henceforth, Automatic Speech Recognition (ASR) apps are worth considering to be utilized into the pedagogy and English language communication, these tools are of great advantage as model of pronunciation, aid in processing verbal communication and suggesting advice (Sun, 2023; Tsai, 2022; Lai & Chen, 2022). In terms of this mitigation of contact impediment ASR tools also have verified to be valuable in boosting pronunciation, confidence, and pragmatic aptitude of English learners (Lee et al., 2025; Sun, 2023). Other worldwide communication success aid is also reported by the available support of literacy in digital and cultural intersect competence (Farida et al., 2024).

Automatic speech recognition (ASR) systems, particularly Google Live Transcribe, provide real-time visual subtitles that function as textual reinforcement to enhance the intelligibility of non-native speech in ELF communication. Increasing ASR accuracy supports improved comprehensibility, learner autonomy, and intercultural interaction. ASR tools also facilitate pronunciation development, vocabulary acquisition, and feedback on segmental and suprasegmental features while reducing cognitive processing demands (Ngo et al., 2023; Jiang et al., 2022; Johnson & Cardoso, 2024; Xiao & Park, 2021). Moreover, ASR systems can adapt to

and recognize diverse accents, including Indonesian-accented English (Radzikowski et al., 2021; Kim et al., 2024).

Several studies on English users in Indonesian environment has embarked on tackling their sociolinguistic identity, in appealing on the blending nature of the way English is used as well as how to compromise in the middle of multilingualism (Foster & Welsh, 2021; Kusumaningputri, 2023). Regarding the dominant accent in IAE that is Javanese-accented English, record has been made documenting its intonation as pronunciation exclusive characteristics (Ardini, 2024).

Notwithstanding these ASR tools acceleration, on hand studies take a broad view repeatedly across second language users populations findings. Merely limited approach has in particular investigate intelligibility scale advance by ASR tools application in Indonesian-Accented English, and its unique phonological and sociolinguistic characteristics in ELF global contact. The fact is that it remains underexplored to analyse the ASR tools support in real-time interpersonal contact, particularly in enhancing intelligibility of accents of wide-ranging second language speakers accents during spontaneous conversation. This gap brings to light the call for targeted study that links speech technology, applied linguistics, and intercultural communication.

The goal of this study is to explore the aid of Google Live Transcribe to develop the degree of intelligibility of Indonesian-accented English in ELF contact, the stimulus it provides to listeners' intelligibility, and users' perception in the course of real-time communication events. IAE as a localized English nature and to what extent Google Live Transcribe is feasible to impact for improvement of its intelligibility attainment in vigorous interactional state of affairs, turns out to be the novelty of this research.

Method

This study employed a mixed-methods approach that used quantitative intelligibility testing with qualitative user evaluation to explore the impact of Google Live Transcribe on the intelligibility of Indonesian-accented English in ELF communications. Twenty students of Universitas PGRI Kanjuruhan Malang majoring in English-speaking studies, from four L1 background groups (Javanese, Nusa Tenggara Timur, Papuan, and Ambonese), were interviewed. This was done to prevent familiarity effects with a very limited level of previous exposure to Javanese-accented English. The Intelligibility tests were pre- and post-tests in which listeners wrote both a recorded audio-only version and a recording with real-time ASR captions. Intelligibility scores were calculated based on the number of words correctly transcribed. A descriptive statistics test and paired sample t-test were used to assess quantitative data. Qualitative information was collected using a 20-item Likert scale questionnaire, five open-ended questions, and semi-structured interviews with ten randomly selected individuals. A live interactive task using Google Live Transcribe also allowed for a peek into real-time communication strategies such as repair sequences and captions. Qualitative data were then thematically examined to identify common understandings, affordances, and constraints on ASR-based communication. Ethics such as informed consent, anonymization, and secure data processing were strictly enforced.

Results and Discussion

Results

Table 1 shows a quantitative summary of intelligibility scores before and after Google Live Transcribe. Listeners experienced substantial challenges in accurately transcribing IAE speech in the absence of ASR support. The mean intelligibility score without Live Transcribe across all listeners was 64.2% (SD = 11.7), indicating moderate comprehension depending on individual proficiency and complexity of the prompt. In line with earlier studies in IAE (Abdi Rahmat Syam et al., 2024; Wulandari et al., 2021), the most frequently misinterpreted segments was vowel substitutions and consonant clusters. For example, the central vowel /ʌ/ in words like "but" was frequently misheard as /a/ or /æ/, while final consonant clusters such as /-ld/ in "world" were repeatedly omitted in listener insight.

Table 1. The quantitative summary of intelligibility scores before and after Google Live Transcribe

Measure	Baseline (audio-only)	With Google Live Transcribe (audio + ASR)	Statistical test / notes
Mean intelligibility score (%)	64.2	87.6	Significant improvement, $p < .001$
Standard deviation (SD)	11.7	6.3	Reduced variability with ASR support
Common error types	Vowel substitutions; consonant-cluster deletion	Minimal errors; previously misheard words correctly identified	Greatest gains in technical terms and sentence-final words
High-misinterpretation items	Proper nouns, academic terms, low-frequency vocabulary	Markedly improved recognition	Visual captions facilitated lexical access
Segmental accuracy	Confusion of minimal pairs	Substantial improvement; fewer minimal-pair errors	ASR compensated for phonological interference
Listener difficulty pattern	Higher errors on content words	More accurate identification	Reduced cognitive load due to visual reinforcement
ASR error rate	—	12.4% transcription error rate	Errors with noise, idioms, uncommon names
Effect on prosodic ambiguity	Sentence-final words often misheard	Higher accuracy	ASR mitigated prosodic reduction effects
Overall interpretation	Moderate intelligibility with variation	High intelligibility with reduced variation	ASR mediated accent-related challenges

Phonological intervention as like patterns that do not exist in Bahasa Indonesia made the listeners often misidentified minimal pairs due to vowel length distinctions, such as confusing "bit" and "beet." Additionally, false impression rates were higher for content words conveying information (such as nouns and verbs) indicating distraction, due to accent features, in accessing lexical. This is consistent with prior evidence that accent-induced segmental deviations can hinder intelligibility in ELF interactions (Ngo et al., 2023, Kim, 2021). Intelligibility level declined in proper nouns-sentences and specific unfamiliar terms. Therefore it was justified that intelligibility is not exclusively related to speaker clarity but also processing strategies and listener expectation (Thir, 2023).

After the introduction of Google Live Transcribe, listener performance improved markedly across all measures. The mean intelligibility score increased to 87.6% (SD = 6.3), reflecting a statistically significant gain from the baseline score. Paired-sample t-tests confirmed this improvement was highly significant ($p < .001$), suggesting that the ASR tool effectively mediated accent-related challenges. The most pronounced gains were observed in technical terms, sentence-final words, and low-frequency vocabulary. These results align with previous studies indicating that ASR systems can improve L2 learners' pronunciation and speaking performance (Sun, 2023; Tsai, 2023).

The transcription display offered by Google Live Transcribe appeared to compensate for unfamiliar phonetic input by providing immediate visual confirmation, thereby facilitating top-down processing. Listeners reported that seeing the text helped them "fill in the gaps" when audio cues were unclear. This aligns with findings on multimodal input support in listening comprehension, where visual reinforcement can significantly enhance processing accuracy and reduce cognitive load (Xiao & Park, 2021; Jiang et al., 2022).

Segmental accuracy also improved, with words that had previously been misunderstood such as "achievement" and "contribution" now correctly identified in most listener transcripts. Particularly, sentence-final words, which tend to be more susceptible to reduction or intonational variation in IAE, were more accurately captured when transcriptions were available. This suggests that Google Live Transcribe mitigates the perceptual ambiguity caused by prosodic features of the Indonesian accent (Ardini & Sunarya, 2024).

However, the tool was not infallible. In 12.4% of the cases, transcription errors occurred, especially with background noise or when speakers deviated from standard phrasing. For example, idiomatic expressions such as "a piece of cake" were sometimes rendered literally, and uncommon names were inaccurately transcribed. These limitations are consistent with known constraints of ASR systems, which tend to perform best with standard accents and predictable syntax (Kim et al., 2024; Radzikowski et al., 2021). Nevertheless, such errors rarely caused complete comprehension failure, indicating that the overall communicative function of the interaction was preserved.

The qualitative summary can be elucidated as follows. Feedback collected through questionnaires and interviews revealed generally positive attitudes toward the use of Google Live Transcribe in ELF communication settings. Among the 24 listeners, 83% agreed that the tool significantly improved their ability to understand IAE speech. Respondents highlighted the convenience, clarity, and immediacy of the transcription as key benefits. Speakers, on the other

hand, appreciated that the tool helped reduce their anxiety during interaction, as it provided reassurance that their message was being received accurately.

These findings resonate with prior research emphasizing the affective and pragmatic benefits of ASR integration in language use (Ngo et al., 2023; Cogo et al., 2021). Several listeners reported feeling more confident when engaging with unfamiliar accents, while speakers noted increased comfort in managing real-time misunderstandings. Such outcomes suggest that ASR tools may serve not only as technical aids but also as social facilitators in multilingual communication.

The semi-structured interviews revealed a nuanced view of the technology's strengths and limitations. Listeners described the tool as "extremely helpful" for catching unfamiliar terms but noted occasional distractions caused by minor transcription inaccuracies. Some expressed concern about over-reliance on text, fearing it might reduce their listening effort over time. This echoes the broader debate in CALL (Computer-Assisted Language Learning) literature about the balance between technological support and learner autonomy (Johnson & Cardoso, 2024; Zhao, 2022).

Speakers were generally enthusiastic but also raised pedagogical concerns. Several participants suggested that ASR tools should be integrated into classroom settings to help students become aware of pronunciation issues early. One participant remarked that seeing the mis-transcriptions helped them notice recurring pronunciation errors, a claim supported by research on ASR feedback and pronunciation development (Sun, 2023; Xiao & Park, 2021).

Interestingly, users also discussed sociolinguistic implications. Some speakers saw the tool as validating their identity as English users despite their non-native accent. One participant stated, "It feels good that the app understands me—even when people sometimes don't." This sentiment highlights the inclusive potential of ASR technology to challenge native-speaker ideologies and support ELF principles, particularly in Southeast Asian contexts where accent diversity is the norm rather than the exception (Sari et al., 2021; Kim, 2021).

Taken together, the results indicate that Google Live Transcribe significantly enhances the intelligibility of IAE in ELF communication. It supports both listener comprehension and speaker confidence, while also raising important questions about the role of technology in shaping language attitudes and classroom practices. The following discussion section will explore the theoretical, pedagogical, and technological implications of these findings in greater depth.

Discussion

The findings of this study contribute to a growing body of literature that explores the intelligibility of English as a lingua franca (ELF) and the role of automatic speech recognition (ASR) tools in facilitating cross-accent communication. The baseline intelligibility scores of Indonesian-accented English (IAE), which revealed challenges in vowel contrasts and consonant clusters, align with previous research suggesting that segmental features often account for intelligibility breakdowns in ELF interactions (Lim, 2022; O'Neal, 2021). The post-intervention improvements observed with the use of Google Live Transcribe reflect ASR's growing reliability in supporting comprehension across diverse L2 accents, echoing Xiao and

Park (2021), who noted that ASR systems can recognize L2 speech with segmental accuracy comparable to human listeners.

This study also reinforces Inceoglu et al. (2022) and Sun (2023), who found that ASR-supported instruction and feedback can enhance pronunciation and intelligibility. Notably, the improvement in listener comprehension of technical terms and sentence-final words suggests that ASR transcription not only reinforces word recognition but may also scaffold listener attention to linguistically dense or prosodically weak segments. This resonates with Thir (2023), who emphasized the role of context, co-text, and listening proficiency in processing unfamiliar L2 speech.

The effectiveness of Google Live Transcribe in this study highlights the transformative role of technology in ELF communication. By mediating between speakers with accented English and listeners from diverse linguistic backgrounds, the tool acts as a real-time accommodation device, compensating for phonetic divergence. This finding supports Giles et al. (2023), who proposed an expanded view of Communication Accommodation Theory to encompass human-machine interactions.

While intelligibility remains a central goal in ELF, the integration of ASR tools introduces new possibilities for reducing listener effort and facilitating mutual understanding without requiring speakers to conform to native-speaker norms. This aligns with the ELF paradigm shift away from nativeness toward intelligibility and communicative effectiveness (Fiedler, 2022; Kim, 2021).

Moreover, the tool's accessibility and real-time functionality make it a pragmatic solution for contexts where synchronous comprehension is essential, such as classroom discussions, professional meetings, or service encounters. Previous studies have shown that live captioning benefits L2 learners by enhancing participation and confidence (Wang & Chen, 2023). This study extends those findings by demonstrating that transcription support can also benefit ELF users in spontaneous, unscripted speech contexts.

The observed intelligibility gains and positive user perceptions suggest several pedagogical applications for ASR tools like Google Live Transcribe. First, the tool can be used to raise learners' awareness of intelligibility-related pronunciation issues. Since ASR recognition errors often mirror listener misunderstandings (Xiao & Park, 2021), learners can use transcription outputs to identify problematic segments and monitor their progress.

Second, integrating ASR into speaking and pronunciation courses can offer learners immediate feedback and encourage autonomous learning. This echoes Bashori et al. (2024) and Ngo et al. (2023), who advocate for ASR-based training combined with peer interaction and explicit correction. In this study, the feedback component extended beyond the classroom, allowing users to reflect on real-world communicative breakdowns and repair strategies.

Third, for language educators, this study underscores the importance of intelligibility-focused instruction over accent reduction. Teachers can leverage ASR data to support a more inclusive approach to pronunciation, emphasizing mutual intelligibility and listener accommodation rather than native-like articulation (Lim, 2022). ASR's potential in flipped classrooms and digital learning platforms (Jiang et al., 2021; Gottardi et al., 2022) also presents opportunities for scalable, differentiated instruction.

Beyond pedagogy, the findings have broader implications for professional communication and intercultural training. As English continues to serve as a global working language, professionals with non-native accents require tools that can mitigate miscommunication. ASR-based technologies offer real-time scaffolding that may reduce anxiety, increase task efficiency, and support more equitable participation in multilingual environments.

Despite its promising results, this study faces several limitations. First, the variability in ASR accuracy depending on device specifications, operating systems, and ambient noise conditions mirrors findings from Kim et al. (2024) and Goudarzi and Moya-Galé (2021). While Google Live Transcribe performed reliably in controlled environments, real-world noise and inconsistent microphone quality may affect transcription accuracy and, by extension, listener comprehension.

Second, while the study targeted IAE speakers, the generalizability of results is limited by the relatively small and homogeneous participant sample. Listener responses, though diverse, may not capture the full range of ELF listener profiles. Future research should replicate this study across different L1 backgrounds, proficiency levels, and interaction contexts to better understand how ASR supports or hinders intelligibility in varied ELF scenarios (Hannah et al., 2022).

Third, ASR tools are not free from interpretive bias. Misrecognition patterns can reinforce incorrect pronunciation habits or stigmatize non-standard accents if not carefully mediated by educators. Therefore, while ASR can be a diagnostic and remedial aid, it should complement, not replace, human feedback and interactive instruction (Barrot, 2023; Dizon, 2023).

Further research is also needed to explore the longitudinal impact of ASR-supported interventions. For example, does repeated exposure to live transcription improve L2 learners' segmental accuracy or prosodic control? Can ASR data be effectively integrated into individualized pronunciation coaching? How do users' metacognitive strategies evolve through ASR-mediated learning?

Finally, this study contributes to the broader discourse on AI in education. As tools like Google Live Transcribe become more prevalent, stakeholders must consider ethical, pedagogical, and sociolinguistic implications. Balancing technological innovation with cultural sensitivity and learner diversity remains a critical challenge for language educators and technology developers alike (Alhalangy & Abdalgane, 2023; Liu & Wang, 2024).

In sum, this research provides a compelling case for the pedagogical and communicative value of ASR technology in ELF contexts. By highlighting both its affordances and limitations, the study encourages a nuanced adoption of digital tools that prioritize intelligibility, equity, and learner agency.

Conclusion

This study shows how Google Live Transcribe has played an important role in enabling the intelligibility of an Indonesian-accented English (IAE) in ELF settings. Unlike earlier findings that have predominantly been devoted to controlled pronunciation practice or scripted speaking tasks, this study highlights the novelty of testing ASR-mediated support in real-time,

spontaneous ELF encounters, when intelligibility issues arise naturally. It was found that listening to text is much more intuitive with real-time automatic speech recognition (ASR) recording in addition to spoken speech, particularly when processing technical words, low-frequency words, and sentence-end data that may be reduced due to accent. These intelligibility gains benefited not only from increased clarity in the language but also from visual textual support, which facilitated the processing of phonological variations during continuous interaction. Its accessibility, usability, and communicative support were rated positively by users as both hearers and speakers, suggesting that the tool helped decrease comprehension difficulties and interaction anxiety in multilingual situations. From a theoretical perspective, these results consolidate and supplement existing models of ELF intelligibility and CALL that emphasize the mediating effect of technology in listening perception and meaning negotiation in accented speech. Although there are constraints to ASR accuracy, device variability, and sample size, this study provides empirical evidence of AI-mediated language use in authentic communicative situations and presents directions for future research, including longitudinal studies, cross-linguistic and cross-accent comparisons, and continued exposure to ASR in ELF communication.

Acknowledgments

The author expresses sincere gratitude to the Principal of Bakalan Krajan 1 Public Elementary School, Malang City, as well as to the grade IV B teachers and all students for their support and active participation throughout the implementation of this research. Appreciation is also extended to the academic advisor and the team of examiners from Universitas PGRI Kanjuruhan Malang for their valuable guidance, constructive feedback, and encouragement during the completion of this study.

Authors' Note

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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